PNNL-24690

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# Enhancing International Radiation/Nuclear Detection Training Opportunities

**September 2015**

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Prepared for the U.S. Department of Homeland Security
under a Work-for-Others Agreement with the U.S. Department of Energy
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U.S. DEPARTMENT OF ENERGY

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Pacific Northwest National Laboratory
Richland, Washington 99352

# Executive Summary

The U.S. Department of Homeland Security Domestic Nuclear Detection Office (DNDO) is charged with assisting in the development of the Global Nuclear Detection Architecture (GNDA). This world-wide architecture includes a series of sensors, telecommunications, and personnel, with the supporting information exchanges, programs, and protocols that serve to detect, analyze, and report on nuclear and radiological materials that are out of regulatory control. The term "out of regulatory control" refers to material that is being imported, possessed, stored, transported, developed, or used without authorization by the appropriate regulatory authority, either inadvertently or deliberately.[1]

In executing that responsibility, DNDO has worked with talented peers to provide radiological and nuclear detection initiatives and training aimed at interior law enforcement. However, a gap has been identified in that international partners predominately focused their efforts on border and customs officials. To help mitigate this gap, DNDO was funded by the U.S. State Department to conduct a 1-week training course at the International Law Enforcement Academy (ILEA) in Budapest, Hungary to inform interior law enforcement personnel on the overall mission, and to provide an understanding of ways law enforcement professionals can combat threats of radiological and nuclear terrorism through detection efforts. This course and similar courses offered at other ILEA sites have created an increased awareness and subsequent increased demand for such training. Additional courses are planned in fiscal year (FY) 2016. However, DNDO would like to evaluate strategic actions to increase the course impact and potentially transfer measured course responsibilities to other partners. Based upon their initial analysis and course feedback, DNDO requested that the Pacific Northwest National Laboratory (PNNL) conduct a study to identify a series of strategic options DNDO can pursue to help ensure the sustainability and impact of the existing ILEA course, and to include potential partnerships and course implementation plans for DNDO's consideration. In a multi-phased approach, PNNL researched and analyzed several possible global training locations and venues, and other possible ways to increase the impact of the course using an agreed-to data-gathering format.

In the first phase, PNNL analyzed the costs and benefits of sustainment, expansion, and other options to leverage and increase the impact of the current ILEA course content. This analysis assisted DNDO in determining effective advancement for such courses. Each option's analysis included helping advance U.S. efforts to develop multilateral engagement and outreach to international law enforcement officials. During the data-gathering and analysis phase, PNNL analyzed existing course content using the Systematic Approach to Training and feedback from students and instructors.

Funding and time limited the scope of the review, but where significant activities warranted mentioning, they were included. For instance, current DNDO courses only address land/border crossings. PNNL experts believe course impact could be increased by adding specific discussions on maritime crossings and small vessel threats. While many of the current students may not routinely encounter small vessel threats, starting the discussion and eventually offering standalone courses would help address this growing radiation/nuclear concern.

[1] Morris FA, IM Cameron, OO Elkhamri, ZN Gastelum, X Duan, SV Mladineo, AJ Kurzrok, and SL Frazar. 2013. I*nternational Mechanisms to Enhance the Global Nuclear Detection Architecture (GNDA)*. PNNL-22624, Pacific Northwest National Laboratory, Richland, Washington. (Limited Distribution)

### *Options for Sustaining the ILEA Course*

Strategic options included exploration of dual-benefit incentive structures that encourage national law enforcement entities to take ownership of and responsibility for future radiation detection training and activities. For example, as noted in a recent report about the GNDA,

> "…it may be beneficial for nuclear security to be a component of a larger initiative aimed at civilian protection. For instance, a capacity building/training initiative focused on detection of various types of smuggling—with nuclear and radiological material as one component of such a program—would likely receive greater acceptance than a program focused on nuclear/radiological security alone."[1]

Other options suggested in the report include integration of future ILEA courses with United Nations Security Council Resolution 1540 Committee activities and development of international instruments or guidance focusing specifically on interior detection capabilities. Such instruments and guidance might support more effective and sustainable training in this area.

### *Options for Improving Course Impact and Defining DNDO's Involvement*

In conjunction with the analysis of strategic options for sustaining the ILEA Course, PNNL also addressed the following questions about ensuring the course's long-term impact and DNDO's involvement in that process. DNDO and PNNL discussed 24 possible training partners listed in Table ES.1.

**Table ES.1**. Possible Training Partners to Sustain the ILEA Course

| | |
|---|---|
| INTERPOL | European Union Joint Research Centre (JRC)/European Nuclear Security Training (EUSECTRA) Center |
| Customs and Border Patrol (CBP) | European Union Chemical Biological, Radiological, and Nuclear Centres of Excellence (COEs) |
| Transportation Security Administration (TSA) | International Atomic Energy Association (IAEA) |
| Global Threat Reduction Initiative (GTRI)[(a)] | IAEA Nuclear Security Support Centres (NSSCs) |
| Second Line of Defense (SLD)[(b)] | Other ILEA locations |
| U.S. Department of Energy (DOE) Center for Radiological Nuclear Training (CTOS) | Middle East Scientific Institute for Security (MESIS) |
| Association of Southeast Asian Nations (ASEAN) | Asia Pacific Center for Strategic Studies (APCSS) |
| Federal Law Enforcement Training Center (FLETC) | Federal Bureau of Investigation (FBI) |
| Organization of American States (OAS) | Office of the Secretary of Defense/Acquisition, Technology, Logistics/International Affairs |
| Volpentest HAMMER Federal Training Center/PNNL Radiation Academy HAMMER/RADACAD | Washington (WA) State Training Providers |
| Department of State, Bureau of International Narcotics and Law Enforcement (INL) | Secretary of the Air Force/International Affairs |
| Department of State, Export Control and Related Border Security (EXBS) Program | Defense Threat Reduction Agency Weapons of Mass Destruction Proliferation Prevention and International Counter Proliferation Program |
| (a) GTRI program activities are now under the NNSA Office of Global Material Security, Radiological Security.<br>(b) SLD program activities are now under the NNSA Office of Global Material Security, Nuclear Smuggling Detection and Deterrence. | |

[1] Morris FA, IM Cameron, OO Elkhamri, ZN Gastelum, X Duan, SV Mladineo, AJ Kurzrok, and SL Frazar. 2013. I*nternational Mechanisms to Enhance the Global Nuclear Detection Architecture (GNDA)*. PNNL-22624, Pacific Northwest National Laboratory, Richland, Washington. (Limited Distribution)

However, during the engagement process, programmatic cuts necessitated limiting which providers PNNL would engage. The exact level of engagement with each provider is detailed in the report as well as recommendations which form the basis of those included in the Executive Summary. As a guide, the following structure was used to guide the engagement:

- How can DNDO more effectively expand the ***impact*** of the existing ILEA course beyond the limited number of international participants (~20 per offering) in each course?
  - Could the course be transitioned more broadly (and what would the associated impacts be) using other international forums?
  - Could course content be transitioned to domestic courses to ensure consistency across the GNDA?
- How can DNDO most effectively advance such a course?
- Does DNDO continue to support the course by providing direct assistance or should DNDO transition to a support and leadership role that requires fewer resources?
  - Would some other option be more effective?
  - What are the pros and cons of each?
- At the same time, how can DNDO sustain enough of a footprint to still maintain visibility and provide guidance as needed without losing the GNDA-focused presence?

### Phase 1 Data Gathering and Initial Analysis

During Phase 1, PNNL reached out to various training providers to determine possible leverage areas to improve the sustainability and impact of the course. DNDO provided a list of possible partners and PNNL added to the listing. PNNL prioritized the course providers, contacted them, and asked a standardized set of engagement questions to determine possible engagement options. Sometimes multiple engagements were required. This iterative process helped ensure a consistent level of data mining across several unique potential course providers. The contacted providers were assembled into three groups: those who appear to be good candidates for DNDO partnerships and have current courses/processes that might feed directly into DNDO's requirements; those providers who might be good partners but do not have a representative "off-the-shelf" course for leveraging; and those providers who are not a good fit for DNDO engagement.

### Phase 2 Final Analyses and Reporting

PNNL used the data that were gathered to develop the analysis and recommendations that make up the remainder of the report.

### Conclusions and Recommendations

Of the various organizations discussed in this report, PNNL recommended that several be considered to partner with DNDO to supply training and leverage their processes and training for promoting sustainability of the ILEA course. PNNL suggested that DNDO consider the following methods of engagement:

- Collaborate with U.S. Department of Energy (DOE) National Nuclear Security Administration's (NNSA's) Global Threat Initiative (GTRI)[1] to discuss training procedures for its International Response Training (IRT) and consider facilitating a joint course with GTRI to leverage material and lessons learned from both training programs.

- Leverage the Defense Threat Reduction Agency's (DTRA's) training venue, the Defense Threat Reduction University (DTRU), to host modified ILEA courses in collaboration with DTRA.

- Engage partner organizations and government agencies that the Federal Law Enforcement Training Center (FLETC) works with rather than engaging directly with FLETC.

- Leverage the Radiation Academy (RADACAD) course conducted by PNNL to incorporate existing ILEA curriculum or modules into RADACAD courses or possibly even consider hosting an ILEA course at the Volpentest HAMMER Federal Training Center (HAMMER) In Richland, Washington, in partnership with PNNL.

- Nurture a relationship with Secretary of the Air Force/International Affairs (SAF/IA) country experts to discuss student training requirements and possible training funding options. The authors are familiar with points of contact in SAF/IA and would be willing to help facilitate starting the engagement should assistance be necessary.

- Consider adding a module addressing identification of maritime threat vectors, and eventually including a maritime practical in collaboration with various state and local programs already operating this type of program.

- Consider adding appropriate (export control-approved) emerging detection technologies into the course, to allow the students and their respective countries longer lead time to assess the new technologies for possible fit in their programs.

- Consider hosting and conducting training courses at locations other than ILEA locations. For instance, the Middle East Scientific Institute for Security (MESIS) in Jordan has provided low costs, easy access, and exceptional service in the past.

- Nurture a relationship with the DOE Center for Radiological/Nuclear Training. While the venue would not be suitable for offering ILEA training, it could still provide helpful information, best practices, and lessons learned for DNDO.

### Consider Developing a Career Field Education and Training Plan

The current ILEA course paradigm does not afford career-long traditional skill development opportunities or a "train-the-trainer construct." To maximize sustainability and impact of the DNDO ILEA course, the authors recommend that a "career field" needs assessment be conducted for the target audience. The course impact could further be enhanced by using a more structured skill set development program as outlined in many U.S. Department of Defense career fields—i.e., a career field education and

[1] GTRI program activities are now under the NNSA Office of Global Material Security, Radiological Security. The authors will continue to refer to the training materials as belonging to the Global Threat Reduction Initiative, or GTRI, throughout this report.

training plan. Currently, many students are chosen based upon established criteria, for one class only, and there appears to be no structured plan for honing or improving their skill set at a later point, to include when the students advance to increased professional levels of responsibility.

# Acronyms and Abbreviations

| | |
|---|---|
| APCSS | Asia Pacific Center for Strategic Studies |
| ASEAN | Association of Southeast Asian Nations |
| CBP | U.S. Customs and Border Protection |
| CBRN | chemical, biological, radiological, and nuclear |
| CBRNE | chemical, biological, radiological, nuclear, and explosives |
| CFETP | career field education and training plan |
| COE | Centres of Excellence |
| CTOS | U.S. Department of Energy Center for Radiological Nuclear Training |
| DHS | U.S. Department of Homeland Security |
| DNDO | Domestic Nuclear Detection Office |
| DOD | U.S. Department of Defense |
| DOE | U.S. Department of Energy |
| DOS | U.S. Department of State |
| DTRA | Defense Threat Reduction Agency |
| DTRU | DTRA's Defense Threat Reduction University |
| EU | European Union |
| EXBS | Export Control and Related Border Security |
| FBI | Federal Bureau of Investigation |
| FLETC | Federal Law Enforcement Training Center |
| FY | fiscal year |
| GNDA | Global Nuclear Detection Architecture |
| GTRI | Global Threat Reduction Initiative |
| HAMMER | Volpentest HAMMER Federal Training Center |
| IAEA | International Atomic Energy Agency |
| ILEA | International Law Enforcement Academy |
| INL | (U.S. Department of State) Bureau of International Narcotics and Law Enforcement |
| INTERPOL | International Criminal Police Organization |
| IRT | International Response Training |
| JRC | European Union Joint Research Centre |
| JRC-ITU | Joint Research Centre's Institute for Transuranium Elements |
| MESIS | Middle East Scientific Institute for Security |
| NNSA | National Nuclear Security Administration |
| NSSCs | IAEA Nuclear Security Support Centres |
| PNNL | Pacific Northwest National Laboratory |
| RADACAD | Pacific Northwest National Laboratory Radiation Academy |

| | |
|---|---|
| SAF/IA | Secretary of the Air Force International Affairs |
| SLD | Second Line of Defense Program |
| SME | subject matter expert |
| WMD | weapons of mass destruction |

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# 1.0 Introduction

The U.S. Department of Homeland Security's (DHS) Domestic Nuclear Detection Office (DNDO) is charged with assisting in the development of the Global Nuclear Detection Architecture (GNDA). The GNDA is a worldwide network of sensors, telecommunications, and personnel, with the supporting information exchanges, programs, and protocols that serve to detect, analyze, and report on nuclear and radiological materials that are out of regulatory control. The term "out of regulatory control" refers to materials that are being imported, possessed, stored, transported, developed, or used without authorization by the appropriate regulatory authority, either inadvertently or deliberately.

While the United States has worked domestically to develop and provide radiological and nuclear detection training and education initiatives aimed at interior law enforcement, the international community has predominantly focused efforts at border and customs officials. The interior law enforcement officials of a State play a critical role in maintaining an effective national-level nuclear detection architecture. To meet this vital need, DNDO was funded by the U.S. Department of State (DOS) to create and deliver a 1-week course at the International Law Enforcement Academy (ILEA) in Budapest, Hungary to inform interior law enforcement personnel of the overall mission, and to provide an understanding of how the participants can combat the threats of radiological and nuclear terrorism through detection efforts. Two courses, with approximately 20 students in each course, were delivered in fiscal year (FY) 2013, two were delivered in FY 2014 and FY 2015, and as of this report's writing more are planned in FY 2016. However, while the ILEA courses produced measurable success, DNDO requested Pacific Northwest National Laboratory (PNNL) research potential avenues to further increase the course impact.

# 2.0 Report Approach and Organization

This report analyzes and identifies a series of strategic options that DNDO could pursue to help ensure the sustainability and impact of the existing ILEA course. The strategic options will include potential recommendations for DNDO to consider. PNNL researched the organizations and programs listed below, highlighting those for opportunities to leverage existing course material to ensure the sustainability and impact of the current ILEA course. Because of programmatic changes during the conduct of this work scope, not all organizations were contacted but are listed below in an historical reference list, and the level of engagement is captured in this report.

### *U.S. Government Programs*

- Asia Pacific Center for Strategic Studies (APCSS)
- U.S. Customs and Border Protection (CBP)
- Defense Threat Reduction Agency (DTRA)–specifically the Weapons of Mass Destruction (WMD) Proliferation Prevention Program and the International Counterproliferation Program
- DOS, Bureau of International Narcotics and Law Enforcement (INL)
- DOS, Export Control and Related Border Security (EXBS) Program
- U.S. Department of Energy (DOE) Center for Radiological Nuclear Training (CTOS)
- Federal Bureau of Investigation (FBI)
- Federal Law Enforcement Training Center (FLETC)
- Global Threat Reduction Initiative (GTRI)[1]
- Pacific Northwest National Laboratory RADACAD (Radiation Academy)
- Office of the Secretary of Defense/Acquisition, Technology, Logistics/International Affairs
- Second Line of Defense (SLD)[2]
- Secretary of the Air Force/International Affairs (SAF/IA)
- Transportation Security Administration (TSA)
- Washington State Training Providers

### *International Programs*

- Other ILEA locations
- Association of Southeast Asian Nations (ASEAN)

[1] GTRI program activities are now under the National Nuclear Security Administration Office of Global Material Security, Radiological Security. The authors will continue to refer to the training materials as belonging to the Global Threat Reduction Initiative or GTRI throughout this report.

[2] SLD program activities are now under the National Nuclear Security Administration Office of Global Material Security, Nuclear Smuggling Detection and Deterrence. The authors will continue to refer to the training materials as belonging to the Second Line of Defense, or SLD throughout this report.

- European Union (EU) Chemical, Biological, Radiological and Nuclear (CBRN) Centres of Excellence (COEs)
- EU Joint Research Centre (JRC)
- European Nuclear Security Training (EUSECTRA) Centre
- International Atomic Energy Agency (IAEA)
- IAEA Nuclear Security Support Centres (NSSCs)
- International Criminal Police Organization (INTERPOL)
- Middle East Scientific Institute for Security (MESIS)

## 2.1 Options for Improving Course Impact and Defining DNDO's Involvement

In conjunction with the analysis of strategic options for sustaining the ILEA Course, PNNL also addressed the following questions about ensuring the course's long-term impact and DNDO's involvement in that process:

- How can DNDO more effectively expand the ***impact*** of the existing ILEA course beyond the limited number of international participants (~20 per offering) in each course?
  - Could the course be transitioned more broadly (and what would the associated impacts be) using other international forums?
  - Could course content be transitioned to domestic courses to ensure consistency across the GNDA?
- How can DNDO most effectively advance such a course?
- Does DNDO continue to support it through providing direct assistance or should DNDO transition to a support and leadership role that requires fewer resources?
  - Would some other option be more effective?
  - What are the pros and cons of each?
- At the same time, how can DNDO sustain enough of a footprint to maintain visibility and provide guidance as needed without losing the GNDA-focused presence?

In conjunction with the DNDO client, PNNL produced a new set of questions to help better identify possible courses of action. These questions are recorded in Appendix A.

# 3.0 Current ILEA Radiological/Nuclear Detection Course

DNDO requested PNNL review the current "Radiological and Nuclear Smuggling and Detection for Law Enforcement Awareness Course" through the prism of the Systematic Approach to Training (SAT) shown in Figure 3.1. While the project was not funded to or expected to complete an exhaustive instructional systems design calculus, the SAT model provided a recognized and repeatable framework for evaluating course content and instructor and student feedback, thereby providing lessons learned and instructional improvements for the course.

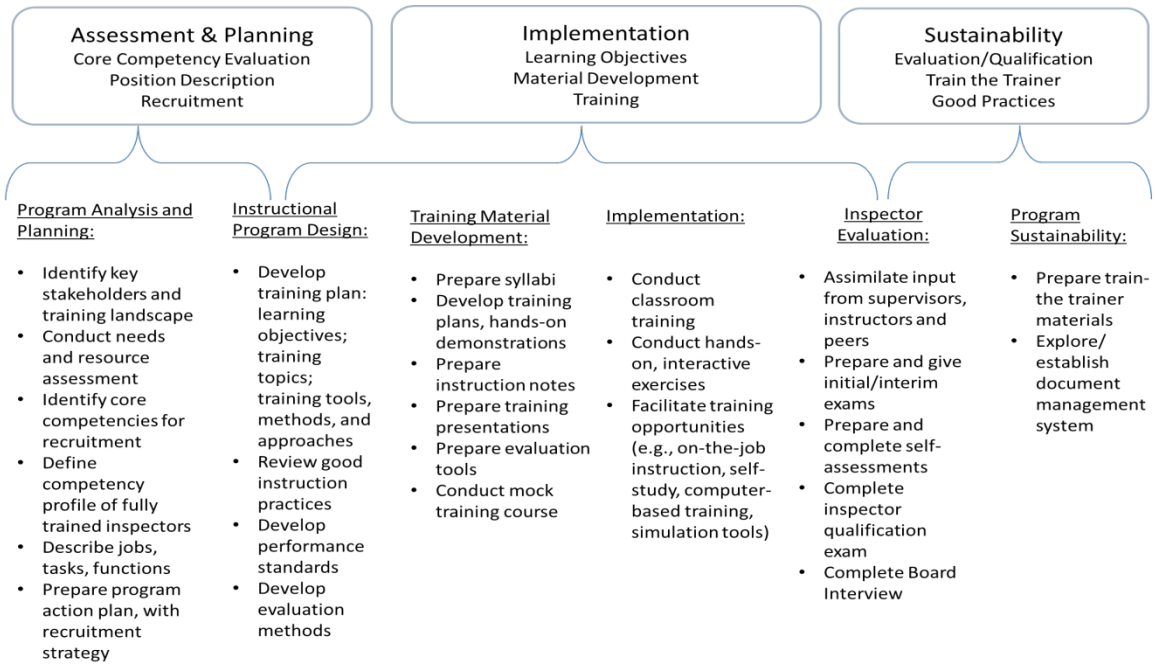


**Figure 3.1**. Systematic Approach to Training

## 3.1 Current Curriculum

The "Radiological and Nuclear Smuggling and Detection for Law Enforcement Awareness Course" is a 4½-day course designed to foster law enforcement awareness of radiological and nuclear threats and provide practical training to combat these threats. The target audience for the course is international law enforcement personnel with little or no experience with radiation detection.

The training strategy uses a combination of classroom lectures, small group breakout sessions, and practical exercises. Participants are provided radioactive material lists, nuclear response guide handbooks, radioactive sources handbooks, and pocket guides associated with handheld radiation detectors.

Appendix B contains the generic training schedule, and a synopsis is provided here.

- **Day One - An Introduction to Radiological and Nuclear Threats and Radiation Safety.** The morning sessions are classroom lectures focused on the threat of radiological and nuclear materials,

law enforcement's role in the detection of those materials, and the fundamentals of radiation safety and awareness. In the afternoon, the class is divided into groups for tabletop discussions, which concern uranium and plutonium trafficking in the participants' respective countries, and an introduction to radiation materials and their detection with handheld devices.

- **Day Two - Radiological and Nuclear Materials and Transportation.** Morning lectures cover radiological materials and weapons, legitimate shipments of radioactive materials, and radiological and nuclear smuggling. In the afternoon the students participate in practical exercises that demonstrate radioactive materials shielding; handheld search techniques using personal radiation detectors, radiation isotope identification devices, and a backpack detector; and a vehicle search scenario in which sealed sources are hidden and students search for the source in the vehicle using handheld instruments.
- **Day Three - Presentations and Field Activities Related to Radiological and Nuclear Detection.** Presentations in the morning focus on the global nuclear detection architecture, radiation technologies, and an introduction to concepts of operation that focus on primary and secondary screening in a situation where radiological or nuclear weapons may be present. The afternoon engagement focuses on naturally occurring radioactive material and industrial applications of radioactive material tabletop discussions and a demonstration of a mobile detection system.
- **Day Four - Advanced Detection Operations and Establishing Radiological and Nuclear Detection Awareness in an Organization.** Following these lectures, time is provided for students from each country to develop presentations, based on a provided list of questions. Day four concludes with practical exercises consisting of vehicle-, pedestrian-, and building-search scenarios. These are "red team" exercises in which a team of students assume the role of smugglers and hide the sources under instructor supervision.
- **Day Five - Lectures on International and Regional Cooperation in Radiological and Nuclear Detection and Nuclear Forensics and Student Presentations.** This half day of training comprises lectures, followed by the students giving their country presentations developed on day four. The course concludes with a final examination and an opportunity to provide course feedback.

## 3.2 Student Feedback

For the first four iterations of the class, students are given an evaluation form at the end of each day designed to gather feedback regarding the topics of the day. The daily evaluation forms consist of the following three questions:

1. Which topics were most useful to you today?
2. Which content areas or topics apply to your duties? Which topics do not?
3. Do you have any suggestions on how to improve today's activities?

ILEA also conducts a survey at the end of the course to gather feedback regarding course content, the instructors, and logistics. These surveys rate the course content and instructors with several questions using a divided scale to capture the degree of "agreement" (i.e., agree to disagree). Students also have the opportunity to provide written comments. The results of these surveys are compiled into an End-of-Course Evaluation Report prepared by ILEA.

The available daily evaluation forms and End-of-Course Evaluation Reports were reviewed by PNNL to identify common observations for course improvement. Daily evaluation forms did not include forms from all students for all days. It is not known whether these forms were not completed by the students or were not supplied to PNNL.

The majority of the feedback received was very favorable. Students liked the course and were very complementary of the instructional staff. The vast majority of ratings in the End-of-Course Evaluation Report on both of these topics fell under "Strongly Agree" or "Agree." Appendix C contains a table of the ratings received.

Common themes seen in the feedback include the following.

- While the majority of the topics covered each day were felt to be beneficial, some of the students commented that part of the information was excessively technical on Day One. The uranium enrichment and plutonium production topics were often mentioned as not applicable to law enforcement officers. However, other students mentioned these topics as useful. This discrepancy may be the result of the disparate backgrounds of the students. The diverse experience levels of student regarding radiation/nuclear topics were a continually noted challenge faced by the instructors.
- The videos were very popular. In fact, students would like to see more videos and pictures integrated into the course materials.
- As is typical with courses of this nature, students would like to see more practical exercises.
- A few students mentioned that the order of the lessons and practical exercises could be better organized by providing background information and guidance prior to conducting the exercises. Students also indicated that they would like to receive real-time feedback during the exercises, as opposed to the after-exercise critique.
- Students indicated that they would like to be able to provide real-time feedback during the exercises, as opposed to the after-exercise critique. Also, some students suggested improvements that could make the practical exercises more challenging—such as introducing deadlines, using more sources, and hiding multiple sources more stealthily.
- The Bulgarian scenario (a case study) was mentioned several times as being beneficial. Adding more such case studies would be well-received. With current resource limitations and the sequential building nature of the course, it is unclear to the researchers what would be removed, unless the introductory materials were provided in a non-classroom setting, such as distance learning or as homework outside of formal class hours.

Appendix D contains a compilation of the comments received on the daily evaluation forms and End-of-Course Evaluation Reports. The logistical comments (i.e., facility comfort, etc.) are not included in the appendixes because they are handled by ILEA, not PNNL or DHS.

One item of note regarding the DHS feedback form itself is the confusion caused by question two on the daily evaluation form: "Which content areas or topics apply to your duties?" and "Which topics do not?" Students often answer with just the title of a topic or several topics with no distinction to which category (applies/does not apply) those topics belong. Given the favorable response to the course as a whole and the feedback given in question one, it was generally assumed that the majority if not all of

these response relate to “Which content areas or topics apply to your duties?” but, that assumption cannot be confirmed. These two questions should be separated in future feedback solicitations.

The course is designed for interior law enforcement; however, at least half of the students are in Customs or some other related field.

The daily evaluation forms included several comments regarding how useful the course material was for students. A sampling of these comments is listed below.

- I already knew the other information that we received.
- “Radiological and Nuclear Threat” and “Radiation Safety and Awareness” apply to our duties partially. However the specialists in this field should attend the other topics that were more technical.
- Irrelevant to my tasks is how to enrich it.
- Not applicable: chemistry and physics.
- Not applicable: topics related to production of plutonium and uranium.
- Not applicable: Production.
- Not applicable: Production of uranium and plutonium.
- In some topics, there were many technical details. Because of my profession, I could not concentrate on the details that much.
- The part on law enforcement not so relevant, detection, and identification very relevant to my work.
- The practical application does not apply to my work field since I work in the role of the international security coordination.
- Uranium enrichment methods are not applicable in my work.
- Police work implications are less relevant, and detection methods very relevant to my job.
- Not in the sphere of my responsibilities but nevertheless were very useful for the discussion about the implementation of some systems in the work of our law enforcement.
- What is not related to my duties is role of LE [law enforcement] in detecting of radioactive materials and their seizure.

These comments are a direct reflection on the disparate backgrounds of the participants. In order to be presented optimally to the intended target audience—internal law enforcement personnel with little or no background with radiation detection—the technical information in the course must be structured for the novice. However, this increases the risk of boring students possessing a more substantial nuclear/radiation background.

## 3.3 Instructor Feedback

Instructors provide feedback on the course in trip reports, course reports, and similar correspondence. The verbatim comments found in course correspondence are included in Appendix E. Common themes found in these comments include:

- Do a better job screening students. The course information was focused primarily for interior law enforcement personnel who have very little or no experience with radiation detection. However, each section included some very experienced personnel with formal training in radiological and nuclear detection or work in a role other than interior law enforcement.
- Tailor more of the content for law enforcement audiences.
- Enhance the content by adding timely country-specific information and pictures.
- Include a section on "How to manage an incident" to include radiological crime scene management and radioactive evidence collection. This information should also be incorporated into exercise scenarios.
- Exercises should be better documented and introduced. Including more sources to find would also increase the effectiveness of the exercises.

## 3.4 Instructional Design Review

The current curriculum was reviewed by an experienced instructional designer. The items below were identified for improvement to the existing course. However, there is information in the course which may not correlate to the role of a law enforcement officer. Also, there may be content appropriate to an officer such as radiological crime scene management, which is not covered. Prior to updating the current course, conducting or revisiting the course analysis to determine the exact training needs of front-line law enforcement officers would be the beneficial.

- The presentations have no or limited instructor notes. This made the review of the curriculum challenging since the discussion that accompanies each slide was not available for auditing. Comprehensive instructor notes are needed to achieve sustainability and to ensure consistent implementation, especially if a train-the-trainer approach is implemented.
- There are several practical exercises, table-top discussions, and activities which were not accompanied by instructor guidance on how they should be implemented. Again, for sustainability purposes, comprehensive guidance is required.
- There are several training aids that are listed in associated course documents, such as the instructor details document, the use of which are not documented in the presentations. The use of all training aids should be documented in the instructor notes showing where and how they are used.
- Traditionally, learning objectives should clearly state the *measurable*, *observable* performance the student will be able to demonstrate at the conclusion of training. There are a number of objectives in the current curriculum that do not meet this standard.
- There should be clear link between the objectives for each lesson and the content in the lesson. Some of the lesson objectives do not have this clear correlation.
- Compare the course objectives against Blooms Taxonomy (Bloom 1956) to ensure teaching matches appropriate retention expectations.
- The order of the lessons should be reviewed to ensure optimal learning. For instance, Lesson 3B – Radiation Detection Technologies, is the first lecture to introduce the instruments, however the instruments are used in exercises on previous days. This lesson should be moved early in the training.

- Also, consider administering the final examination prior to the students conducting their country presentations. Students often experience test anxiety prior to taking a test which can cause them to think about the upcoming test rather than listen to what is being presented. Since the content provided in the country presentations is not tested, the final examination should be given prior to the country presentations.
- Each lesson has one or more knowledge check questions at the end of the lesson. However, these checks only assess one or two objectives. The use of knowledge checks is an effective instructional strategy. However, since the objectives define what you want students to take away from the lesson, the knowledge checks questions should assess all the lesson objectives.
- There is some redundancy between lessons. For instance, historical cases of radiological weapons are given in both Lessons 1A and 2A, even repeating one of the examples (Ismailovsky Park). Also, a slightly different definition of a radiological dispersion device (RDD) is given in separate lessons. While it is an effective instructional technique to repeat material the notes/slide should acknowledge it as a repeat—or better yet, make it a student activity, having students recall the details. The activity would promote higher levels of learning, based on Bloom's Taxonomy (1956).
- The use of terms should be consistent throughout a course to limit confusion. This is particularly important when you have students whose primary language is not English. In this course, detection architecture is referred to as "Nuclear security detection architecture," "National Nuclear detection architecture," and "Global Nuclear Detection Architecture." One term should be used throughout.
- There are several grammatical and formatting errors in the lessons. Also, there are several acronyms that are not defined prior to use. The course reviewers recommend a technical editor review the material prior to public release.
- To ensure the course remains current the course reviewers recommend reviewing current International Atomic Energy Agency (IAEA), World Institute for Nuclear Security (WINS), United Nations Security Council Resolution 1540, and the Global Initiative to Combat Nuclear Terrorism documentation to update the course.

## 3.5 Course Improvement Options

The following are PNNL suggestions for course improvement.

- Revisit the desired target audience. If the audience remains interior law enforcement with little or no experience with radiation, reduce the technical information not applicable to law enforcement operations. If the target audience is expanded to include non-law enforcement personnel who have radiation experience, then consider having instructional tracks designed for different target audiences. For instance, have a set of law enforcement topics in one track and a set of more radiation technical topics in another track. Students can be assigned a track based on their experiences and educational background.
- Develop consistent instructor notes for the lecture and exercise portion of the course.
- Add more case studies such as the Bulgarian scenario.
- Add more videos, pictures, and country-specific information to the course.

- Review the order of the lessons to ensure that technical information needed to be successful during the practical exercises is provided prior to the applicable exercises.
- Revise the Daily Evaluation Form so that only one question is asked per item. In particular separate the “Which content areas or topics apply to your duties?” and “Which topics do not?” questions.
- If the audience has a general technical understanding of radiation detection, consider adding a Search and Release exercise or video to illustrate detection scenarios and decision processes.

# 4.0 Training Options – U.S. Government Programs

This section identifies and describes the various possible training options with domestic U.S. government programs to increase the impact of the ILEA training course. This list is not exhaustive, but is a combination of PNNL and DNDO's representative sampling of possible training providers to help effect an increase in ILEA training impact. Additional training would be bound by the following:

- Binding and nonbinding international instruments—binding international treaties, conventions, and agreements, as well as nonbinding documents that enjoy broad political support in the international community
- International guidance documents—IAEA publications in the Nuclear Security Series (NSS)
- Multilateral initiatives—joint undertakings by the international community to support State actions that promote nuclear security.

## 4.1 Asia Pacific Center for Strategic Studies

Serving as an extension of U.S. Pacific Command's international outreach, the Asia Pacific Center for Strategic Studies (APCSS), one of five U.S. Department of Defense regional security study centers authorized under 10 U.S.C. Section 184, provides unique academic fora to build strong, sustainable international networks of security leaders (Defense Security Cooperation Agency 2015). APCSS was officially opened September 4, 1995, in Honolulu, Hawaii. The Center focuses on and addresses regional and global security issues, inviting military and civilian representatives of the United States and Asia-Pacific nations to its comprehensive program of executive education and workshops, taught both in Hawaii and throughout the Asia-Pacific region (APCSS 2015).

The Center supports the U.S. Pacific Command by developing and sustaining relationships among security practitioners and national security establishments throughout the region (USPACOM 2015). APCSS's mission is to build capacities and communities of interest by educating, connecting, and empowering security practitioners to advance Asia-Pacific security (APCSS 2015). When asked about similar training courses, APCSS experts responded they do not offer radiation or nuclear detection courses, the closest is their "Advanced Security Cooperation Course," which is targeted towards mid- to senior-level managers, exposing them to a wide variety of threats, including radiological and nuclear threats.[1]

### 4.1.1 Advanced Security Cooperation Course Overview

Advanced Security Cooperation (ASC) course is an executive education course that addresses the major security challenges confronting Asia-Pacific security practitioners. The course is slated as holistic because it evaluates the complex nature of traditional and nontraditional security dynamics. Specifically, it affords fellows (country participants) the opportunity to think critically about security issues and explore opportunities to directly develop collaborative strategies that address a range of challenges

[1] Williams TL. 2014. Email and phone exchanges with Dr. William Wieninger (Associate Professor of Security Studies, Asia Pacific Center for Strategic Studies) from TL Williams (Pacific Northwest National Laboratory), August 15-30, 2014.

directly. These involve topics of internal security, including governance, the rule of law, security sector development, whole of government, and economic development. The curriculum also includes issues of external and transnational security involving transborder challenges associated with the global commons, which require international collaboration and policy cooperation. These include maritime security, terrorism, and disaster management. Through the practical application of critical thinking and problem solving, the course allows fellows to effectively understand and, in turn, address the Asia-Pacific's most pressing security issues. The course is a participant-centered learning experience in which interactive and dynamic teaching methods are adopted for the benefit of a multinational audience of practitioners.

The Advanced Security Cooperation course lasts 4½ weeks and is designed to enhance individual leader capabilities in critical thinking, communication, collaboration, and decision-making in complex and culturally diverse environments. Created specifically for senior-level security practitioners from across the Asia-Pacific region and beyond, the course provides an international setting that seeks to:

- Enhance decision-making capacity in order to capitalize on opportunities for regional collaboration.
- Improve international cooperation and interagency effectiveness on regional security issues
- Construct solutions for addressing protracted challenges associated with the global commons.
- Enhance civil-military relations and security sector effectiveness.
- Increase capacity for improving governance and security sector integration.
- Develop extensive networks and relationships with a community of mid-career and senior-level security practitioners and experts.

### 4.1.2 Asia Pacific Center for Strategic Studies Student Logistics

When asked how their students are selected, an APCSS representative responded that they are always striving to improve this area, believing their success is largely driven by getting the right people into their courses/workshops. Similar to the student selection for the ILEA course, APCSS does not control all aspects of student selection as every country's selection process is slightly different. In order to try to assuage some of these factors, APCSS:

- Sends short and long course descriptions of each of its courses to the Embassies well in advance of the start of a new fiscal year. The Embassies are helpful in championing the courses and helping communicate successful student profiles as well as passing back emerging country requirements.
- Hosts the defense cooperation (DC) representatives at a workshop almost every year to talk over the program with them to get the DC representatives' input and buy in. This also provides much needed lead time to work any intergovernmental agreements that are required. The DC representatives are also a very useful venue for vetting country requirements.
- Frequently contacts course alumni requesting their help identifying who the alumni think would make the best class participants.
- Hired a full-time person to focus exclusively on recruiting.

APCSS pays travel, lodging, and per diem for all students from Title 10 countries (developing countries based upon determinations made by the Secretary of Defense, and based upon criteria found in

US Code Title 10). All other students are responsible for arranging their own funding. In addition, there is no tuition cost for any courses. PNNL has sent staff members to APCSS courses and has funded their travel and per diem.

### 4.1.3 DNDO Engagement Recommendations

Further discussion with APCSS leaders led the authors to determine that the Center is an education provider, rather than a training provider. Therefore, the Center should not be considered as a strong training partner for DNDO courses at this time. However, the authors recommend strong consideration be given to APCSS's multipronged student selection approach. Additionally, of the other four Regional Centers, the authors recommend the George C. Marshall European Center for Security Studies be considered for engagement, based upon the location of current and planned ILEA courses and depending on which ILEA course location is desired.

## 4.2 Department of Energy National Nuclear Security Administration Second Line of Defense Program

### 4.2.1 Overview

The mission of the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) Second Line of Defense (SLD) Program is to strengthen the capabilities of partner countries to deter, detect, and interdict illicit trafficking of radioactive materials at international border crossings including border checkpoints, airports and seaports, internal locations, and other controlled land and maritime borders. SLD supports the installation and deployment of fixed and mobile radiation detection equipment at border checkpoints. It also provides guidance, methodology, and training for the partner countries as they assume fully operational, maintenance, and management responsibilities of the implemented radiation detection equipment.

Training provided by the SLD Program focuses on the operation and maintenance of the specific equipment installed by the program, and teaches the standard operating procedures of the checkpoint where the equipment will be used. It is also intended to foster sustainability of the equipment. A copy of the current SLD course catalog is available upon request.

*Note: SLD (now Office of Global Material Security, Nuclear Smuggling Detection and Deterrence, or NSDD) works with its partners to collaboratively identify an appropriate cross-section of students to attend each course and the final list of attendees is provided by the partner country. NSDD provides training from a standard curriculum according to the identified needs of the partner country.*

### 4.2.2 DNDO Engagement Recommendations

The current Radiological and Nuclear Smuggling and Detection for Law Enforcement Awareness Course was developed using SLD course materials. Because the SLD program is heavily focused on specific topics (rather than general principles) and equipment that are different from the ILEA course, the applicability overlap is minimal. However, there are limited similarities in types of equipment and concepts are taught, and PNNL recommends the programs communicate with each other to share lessons learned and improved training strategies.

## 4.3 Department of Energy National Nuclear Security Administration Global Threat Reduction Initiative

### 4.3.1 Overview

The mission of the DOE NNSA Global Threat Initiative (GTRI) is to identify, secure, recover, and facilitate the disposition of vulnerable nuclear and high-risk radioactive materials located at civilian sites worldwide. GTRI has established partnerships with more than 100 countries. All GTRI work follows applicable IAEA guidance and is performed in coordination with relevant national, regional, and international organizations.

GTRI has established a comprehensive set of training courses and workshops designed to ensure personnel at the sites where they implement upgrades are aware of their roles and responsibilities, and know how to properly operate security equipment and implement security procedures. Appendix F contains the table of current GTRI offerings.

The majority of GTRI training and workshops are focused on regulatory authority and source custodian personnel rather than law enforcement. However, one course, International Response Training (IRT), is designed for first responders. This 5-day course provides an overview of radiological security incident response, specifically for site staff, security personnel, and law enforcement officials.

The IRT course covers the following topics:

- Defining the Threat
- Physical Protection Principles
- Basics of Radiation Awareness
- Radioactive Sources, Locations, and Awareness for Law Enforcement
- Effective Use of Radiation Detection Equipment
- Incident Response – First Responder Duties and Actions
- Site Visit, Site Survey, Target Folder Development
- Response Assessment Exercise (Tabletop Response Scenarios).

Student selection occurs the same way as for DNDO's ILEA course, in that partner nations select who they wish to attend the course. This presents similar challenges (to the ILEA course) of a potential-wide spectrum of academic and experience levels.

### 4.3.2 DNDO Engagement Recommendations

The IRT course would be a favorable course to consider to request additional students, or to offer as an enhanced radiation/nuclear detection training opportunity. While GTRI courses tend to fill to capacity quickly, GTRI staff has indicated a willingness to discuss offering additional courses if measures of effectiveness, budget, and schedule can be resolved.

A review of the GTRI curriculum would help ensure that DOE and DNDO are providing a consistent message and would highlight opportunities to augment the Radiological and Nuclear Smuggling and Detection for Law Enforcement Awareness Course with some of the content from the GTRI curriculum.

Because of the similar (but not identical) training areas, the authors recommend DNDO consider discussing training procedures and requirements with GTRI and SLD program managers or support staff.

## 4.4 U.S. Department of State, Bureau of International Narcotics and Law Enforcement

### 4.4.1 Overview

The DOS, Bureau of International Narcotics and Law Enforcement (INL) advises the President, Secretary of State, other bureaus in DOS, and other departments and agencies within the U.S. government on the development of policies and programs to combat international narcotics and crime. INL programs support two of the DOS's strategic goals: reduce the entry of illegal drugs into the United States; and minimize the impact of international crime on the United States and its citizens (DOS 2015b).

More specifically, INL works with international partners to develop regional and national approaches to border and maritime security. INL designs, plans, and funds foreign assistance programs to address border security, cross-border crimes, maritime security, aviation security, migrant smuggling, and trafficking in persons, to include the provision of training, workshops, and technical support provided by other U.S. agencies and international organizations. INL assistance courses provide technical, legal, and managerial training to enhance the participating foreign officials' ability to implement border security professionally and effectively. INL coordinates with and complements the activities of U.S. federal law enforcement agencies to disrupt and dismantle major migrant smuggling rings that operate both domestically and overseas in source, transit, and destination countries. INL provides a broad array of law enforcement training to partner countries on ways to combat migrant smuggling including training on interdiction and on how to prevent passport fraud. A number of INL's bilateral assistance programs incorporate border security elements, as well. Such support includes training and equipment for border forces, border infrastructure such as outposts and roads, and technical assistance (DOS 2015a).

### 4.4.2 DNDO Engagement Recommendations

Because of programmatic changes, the authors did not contact this training provider about further course options for DNDO. Therefore, PNNL was not able to make a conclusive recommendation.

## 4.5 U.S. Department of State, Export Control and Related Border Security Program

### 4.5.1 Overview

The DOS, Export Control and Related Border Security (EXBS) Program seeks to prevent the proliferation of weapons of mass destruction (WMD) and destabilizing accumulations and irresponsible transfers of conventional weapons by helping to build effective national strategic trade control systems in

countries that possess, produce, or supply strategic items, as well as in countries through which such items are most likely to transit.

EXBS is designed to help countries develop and improve their strategic trade and related border control systems. In developing and improving these systems, EXBS works to ensure conformity with international standards for regulating trade in items on the control lists of the multilateral export control regimes, to prevent the authorization of transfers to end-uses and end-users of proliferation concern, and to detect and interdict illicit transfers at the border. In building countries' capacity in this critical area, EXBS advances U.S. efforts to establish a global WMD detection architecture and helps key partners meet their obligations and commitments pursuant to important U.S. and international initiatives, including the United Nations Security Council Resolution 1540, the Proliferation Security Initiative, the National Security Strategy, and adherence to the guidelines of multilateral export control regimes.

EXBS works with partner governments to identify regulatory and institutional gaps and to develop resource requirements. EXBS provides a wide range of technical assistance, from executive exchanges to training workshops to the provision of detection equipment and specialized training for border control and enforcement agencies. EXBS provides assistance in five core areas: Laws and Regulations, Licensing, Enforcement, Government-Industry Cooperation, and Interagency and International Cooperation and Coordination.

The EXBS Program is active in over 60 countries and had a budget of about $55 million in FY 2013. The EXBS Program's comprehensive approach, flexibility, responsiveness, and interagency approach make it a unique resource for addressing critical aspects of the United States' nonproliferation objectives (DOS 2015c).

### 4.5.2 DNDO Engagement Recommendations

Because of programmatic changes, the authors did not contact this training provider about further course options for DNDO. Therefore, PNNL was not able to make a conclusive recommendation.

## 4.6 DOE Center for Radiological/Nuclear Training

### 4.6.1 Overview

The DOE Center for Radiological Nuclear Training (CTOS) at the Nevada Nuclear Security Site (NNSS) provides radiological/nuclear WMD counter-terrorism training preparing responders to take immediate, decisive action in preventing or responding to terrorist use of a radiological/nuclear WMD. CTOS conducts performance-based training and workshops through resident courses at NNSS, web-based training, mobile training teams, or courses at local jurisdictions using site instructors trained via train-the-trainer programs.

The target audiences for CTOS courses are domestic state, local, and tribal law enforcement; emergency medical services; emergency management agencies; fire service; hazardous material; public works; governmental administrative; public safety communications; health care; and public health personnel. The CTOS program is supported by a Memorandum of Agreement among DHS, Federal Emergency Management Agency, National Preparedness Directorate (FEMA/NPD), National Training

and Education Division (NTED) and the DOE/NNSA Nevada Field Office. CTOS is not funded to train federal employees or Title 10 Military. However, they can allow them to attend courses (at their own expense) if they compose less than 50 percent of the class.

CTOS courses focus on the Prevention and Response mission areas of Presidential Policy Directive 8: National Preparedness. The prevention curriculum teaches responders to detect and locate the presence of radiation and radiological material, employ various radiation detection equipment, use radiological/nuclear material recognition factors to assist in assessing situations, and use technical reachback assistance to evaluate instrument readings.

The response curriculum provides four tiers of response-level training starting with the Awareness Level, continuing with the Operations Level, Technical Level, and Management and Planning. The 2014 CTOS course and workshop offerings are listed in Appendix G.

All CTOS courses are subject to a DHS certification process that uses third-party subject matter experts (SMEs) to validate the content of the course materials and ensure that the lessons are meeting industry standards and regulations. All courses undergo certification, and all instructors possess both DHS and National Domestic Preparedness Consortium instructor certifications.

### 4.6.2 DNDO Engagement Recommendations

CTOS does not conduct training for foreign nationals. They would be willing to consider requests to train foreign nationals as a work-for-others endeavor. However, the course is not designed for this target audience and the course content would need to be modified before offering it to that audience.

It may be beneficial to send an instructional designer or instructor(s) to one or more of the CTOS train-the-trainer courses to share experiences and identify ILEA course enhancements. It may also be helpful to discuss their instructor and course certification process with CTOS to look for improvement opportunities and lessons learned.

## 4.7 Defense Threat Reduction Agency

### 4.7.1 Overview

The Defense Threat Reduction Agency (DTRA) is the U.S. Department of Defense's official Combat Support Agency for countering WMD and is part of U.S. Strategic Command. DTRA staff members are subject matter experts on WMD, and address the entire spectrum of chemical, biological, radiological, nuclear and high yield explosive threats. DTRA's programs include basic science research and development, operational support to U.S. warfighters on the front line, and an in-house WMD think tank that aims to anticipate and mitigate future threats long before they have a chance to harm the United States or its allies. The U.S. Strategic Command Center for Combating Weapons of Mass Destruction (SCC-WMD) synchronizes combating WMD efforts across the military's geographic commands and leverages the people, programs, and interagency relationships of DTRA at a strategic level. DTRA works with the military services, other elements of the U.S. government, and countries around the globe on counterproliferation, nonproliferation, and WMD reduction issues with one goal in mind: making the world safer (DTRA 2015b).

From his testimony to Senate Armed Services Committee, Subcommittee on Emerging Threats and Capabilities on May 10, 2011, Kenneth Handelman, Acting Assistant Secretary of Defense for Global Strategic Affairs stated (Handelman 2011):

> "While securing WMD materials at their sources is an important component of the CTR [Cooperative Threat Reduction] program, our strategy requires a layered defense against WMD proliferation threats. CTR's WMD Proliferation Prevention Program (PPP) can enhance partners' ability to detect and interdict WMD "on the move" through provision of detection, surveillance, and interdiction capabilities. DTRA's International Counterproliferation Program (ICP) complements the capital-intensive investments of the WMD-PPP program through its modest "train and equip" efforts. ICP is unique in its legislative authority to partner explicitly with the Federal Bureau of Investigation (FBI) and U.S. Customs and Border Protection (CBP) in furtherance of deterring the proliferation of WMD across the FSU [former Soviet Union], the Baltic States, and in Eastern Europe."

Radiation and Nuclear Training is fundamentally provided through DTRA's Defense Threat Reduction University (DTRU) and the Defense Nuclear Weapons School (also administered by DTRA) (DTRA 2015a). The courses span the gambit, from tactical, such as "Introduction to Radiological and Nuclear Incident Response," to strategic, such as "Senior Leader Nuclear Management." Several of the courses have unclassified and classified modules. DTRU also offers a variety of venues to include distance learning, on campus (at Kirtland Air Force Base in New Mexico) and a Partnership Training and Education Program. It is the partnership training and education program that seems to provide the best possible linkage for DNDO course offerings. DTRU is open to partnering with various content providers or customers to develop tailored training to meet user's needs as long as it is consistent with DTRA's mission and leadership approval. Their basic premise is offering core training modules (such as "Basics of Radiation" or "Nuclear Reactor Basics") and weaving those blocks into the customer's needed specialized training. The specialized training can be developed by DTRA or developed jointly and taught by another party.

### 4.7.2 DNDO Engagement Recommendations

Hypothetical course activities make precise cost estimating difficult. It is expected, however, that reworking the current ILEA course into DTRU would yield minimal to no cost savings. However, as DNDO considers other options such as expansion of course offerings to include possible journeyman-level training, DTRU might offer the best training venues. Student training is generally unit-funded (i.e., buying a seat), or contracted-organizational-funded (i.e., buying a course) as part of various pipeline training activities. DTRU is open to follow-on discussions.

## 4.8 Federal Law Enforcement Training Center

### 4.8.1 Overview

The Federal Law Enforcement Training Center (FLETC) is the U.S. government's principal provider of world-class, interagency training of federal law enforcement personnel. FLETC prepares new and experienced law enforcement professionals to fulfill their responsibilities in a safe manner and at the

highest level of proficiency. Training consists of all phases of law enforcement instruction, from firearms and high-speed vehicle operations, to legal case instructions and defendant interview techniques. FLETC has training centers in multiple locations including: Glynco, Georgia; Artesia, New Mexico; Charleston, South Carolina; and Cheltenham, Maryland.

FLETC provides law enforcement training to more than 90 partner organizations, and also trains state, local, tribal, campus, and international law enforcement officers and agents. The number of agencies attending training, the number of students trained, and the number of student-weeks delivered has steadily increased over the FLETC's 37-year history. FLETC's collaborative approach with its partner organizations uses research, training, and education in a shared mission of protecting democratic institutions, ensuring public safety, and preserving law and order (FLETC 2015b).

FLETC's key strategic issues and priorities focus on increasing capacity, emerging state-of-the-art training technology, expanding training programs through partnerships in the most cost-effective manner using the consolidated law enforcement concept of training, and providing accredited law enforcement training for all law enforcement personnel. FLETC's strategic goals include providing training that enables its partners to accomplish their missions, fostering a high-performing workforce, providing mission-responsive infrastructure, and optimizing business practices (FLETC 2015a).

### 4.8.2 DNDO Engagement Recommendations

FLETC trains over 90 partner organizations and government agencies in the core elements of law enforcement. Beyond this core training provided through FLETC, each agency provides its own agency-specific training on a broader range of topics related to law enforcement. Radiological and nuclear detection is not considered a core training topic or element for FLETC law enforcement, so there would be very little potential for ILEA to partner and engage with FLETC in incorporating or implementing radiological and nuclear detection training. Rather, ILEA would make more progress by engaging the various partners and agencies that FLETC trains. Those partners include, but are not limited to: U.S. Department of Agriculture, U.S. Department of Commerce, U.S. Department of Defense, U.S. Department of Education, U.S. Department of Health and Human Services, U.S. Department of the Interior, and the U.S. Department of Justice. That being said, many of those partners are included in this report, so PNNL's recommendations elsewhere in the report will cover the topic of engaging partners and affiliates of FLETC.

## 4.9 Pacific Northwest National Laboratory Radiation Academy Training

### 4.9.1 Overview

PNNL's Radiation Academy (RADACAD) is a hands-on training course designed to increase awareness of radiological and nuclear WMD and the detection, identification, and interdiction of illicit transfers of material, commodities, and components used in the development, production, or deployment of radiological and nuclear WMD and their associated delivery systems. The course also covers detection and interdiction of illicit traffic of radioactive materials. RADACAD training is intended to raise awareness and train personnel in a broad range of disciplines, including policy, research, enforcement, and security applications.

PNNL holds its RADACAD course at DOE's Volpentest HAMMER Federal Training Center (HAMMER) in Richland, Washington, which contains facilities that represent ports, land border checkpoints, pedestrian and cargo screening areas, and allows wide-area-search techniques for realistic configurations of detection scenarios. HAMMER also has a classroom building with built-in interpretation booth and equipment allowing simultaneous translation.

PNNL hosts RADACAD for various clients, including DHS, CBP, and DOS. Courses range in length from three to five days, depending on client needs and course objectives. The target audience for RADACAD includes frontline officers, including CBP, international border security officers, and domestic and international law enforcement officials. The course includes small group discussions with internationally recognized experts and hands-on activities that involve highly enriched uranium, weapons-grade plutonium, medical isotopes, and other radioactive sealed sources to demonstrate the proper use of radiation detection equipment. The ability to use sealed sources in training adds a significant realistic dimension to this classroom environment. Training has been provided to international partners to include students from India, Iraq, and Armenia, among others.

The RADACAD course includes formal instruction in the following areas (PNNL 2015):

- Radiation Safety
- Uranium and Plutonium Pathways to Weapons
- Radiation Portal Monitors
- Radioactive Materials Transport
- Nuclear Smuggling
- Radiological Weapons
- Improvised Explosive Devices (IEDs).

RADACAD field exercises include hands-on instruction in the following areas:

- Naturally Occurring Radioactive Materials and Commercial Uses
- Concealment and Smuggling Techniques
- Neutron Shielding and Uranium Overview (ore, yellow cake, low-enriched uranium, and highly enriched uranium)
- Primary Screening with Portal Monitors
- Secondary Screening with Handheld Detectors and Inspection Equipment
- Advanced Radiation Detection Training.

PNNL is exploring the possibility of conducting RADACAD courses on a pay-to-train basis in which individual participants can register and pay to attend the course. PNNL has not scheduled specific dates for these courses yet. DNDO might consider engaging PNNL staff supporting RADACAD to look at options for sending students to the RADACAD course in addition to possibly incorporating ILEA curriculum to include maritime radiation/nuclear detection training in part of the RADACAD course.

### 4.9.2 DNDO Engagement Recommendations

Class sizes for the RADACAD courses are typically limited to no more than 26 participants because when working groups become too large, space, equipment, and instructor-student interaction become issues. With that in mind, PNNL would only have capacity to add students to a course if DNDO could arrange funding to secure spots for a specific number of students. PNNL has the capacity to deliver more RADACAD courses if there is client demand for them, so if the need arose, DNDO could fund an entire course or a portion of a course if a partner sponsor could be secured.

The five-day RADACAD course for international delegations funded by DOS costs approximately $249.6K for a class of 24, or $10.4K for each participant. This cost includes labor for PNNL to facilitate the course, subcontracts with HAMMER, SME instructors, supplies and equipment needed for the course, local transportation, meal per diem, lodging, and translation and interpretation equipment. The four-day RADACAD course for CBP costs approximately $90K for a class of 20 participants, or $4.5K for each student. The CBP course is significantly less because the cost does not include translation and interpretation equipment and local transportation for participants, and the course is also shorter and requires less labor time to facilitate.

Engaging with PNNL to leverage its RADACAD course would be a good opportunity for DNDO to enhance impact and sustainability for its ILEA program. DNDO would work with PNNL to incorporate existing ILEA curriculum or modules into RADACAD courses or possibly even consider hosting an ILEA course at the HAMMER facility in partnership with PNNL. Furthermore, DNDO would be able to leverage ILEA curriculum to engage international partners by partnering with PNNL, as RADACAD students are typically frontline officers and law enforcement personnel from all over the world.[2]

## 4.10 Secretary of the Air Force/International Affairs

### 4.10.1 Overview

The Secretary of the Air Force International Affairs' (SAF/IA's) mission is to strengthen U.S. and global security through partnerships in air, space, and cyberspace by integrating security cooperation activities, advancing partner capabilities and interoperability, and developing international airmen. Each U.S. Department of Defense (DOD) service has an equivalent "International Affairs" mission. One of the key aspects of SAF/IA's mission includes foreign military sales and the logistics and training associated with those sales. Specifically for this project, SAF/IA countries of interest overlap with DNDO's interest areas. While engaging with this organization it was clear that they rely on DTRA's DTRU or the Defense Nuclear Weapons School to provide their required radiological/nuclear training. While not a training partner, organizations such as SAF/IA could provide a valuable cross-check on country requirements, potential student populations, and help identify other funding sources.

[2] Spracklen J. 2014. Personal interview with Jim Spracklen (Senior Technical Advisor, PNNL) by Rosalyn Leicht (PNNL) "HAMMER Training Operations," December 15, 2014.

### 4.10.2 DNDO Engagement Recommendations

DNDO should consider establishing or developing a relationship with SAF/IA country experts to discuss student training requirements and possible training funding options. The authors are familiar with points of contact in SAF/IA and would be willing to help facilitate the discussions should assistance be necessary, as well as being available to reach out to the other military service international training providers.

## 4.11 Federal Bureau of Investigation

### 4.11.1 Overview

The FBI provides extensive training both through its Academy and by providing SMEs to support other domestic and international course work. Specific to their international work, their international training mission focuses on strengthening legal and police systems around the globe. In fact, FBI personnel have substantially supported many ILEA courses to include having a permanent presence (and facility head) in Budapest, Hungary, as well as supplying instructors for courses in Bangkok, Thailand, and Gaborone and San Salvador, Chile. This support to the ILEA courses has worked well; however, there are areas for improvement. For example, if the ILEA program evolves beyond initial training, the FBI Academy or SMEs might be called upon to develop and host additional training and train additional students. But, as has been noted for other training venues, schedule, budget, and other logistical challenges would need to be resolved. Current in-house academy courses do not intersect well with current ILEA course needs, and while the ILEA course needs could be considered for inclusion into current FBI courses—such as those dealing with smuggling— it is possible the ILEA course materials would be trimmed if course conflicts emerged.

### 4.11.2 DNDO Engagement Recommendations

Consider engagement with the FBI beyond what is currently conducted. The authors understand FBI is part of the current ILEA course, and any expansion of FBI to teach more of the course or host the courses would probably be accomplished through using the current points of contact as a starting point. Based upon limited engagements, DNDO could potentially lose quite a bit of course autonomy should a combined course be hosted by the FBI.

## 4.12 State and Local Training Options

### 4.12.1 Overview

Organizations such as the 110th Chemical Training Battalion, headquartered at Joint Base Lewis McCord in Washington, have contacted various training providers to provide basic radiation and nuclear detection training. As with many organizations, the 110th contracts out the training because since they do not have SME talent in-house to provide the training. Usually these types of organizations have specific training needs and pay their own training and travel bills, although they would rather use “close to” off-the-shelf training materials, than have to pay full-training development costs.

An example of pulling together training for a disparate group of agencies can be found when DNDO led the first joint federal, state, local, and tribal Small Vessel Preventative Rad/Nuc Detection program maritime pilot in 2007-2010. In the program, maritime first responders and law enforcement personnel were trained in the operations of human-portable and spectroscopic boat-mounted radiation detection systems. Additionally the first responders and law enforcement personnel were able to exercise and modify their concept of operations and tactics, techniques, and procedures addressing nuclear material detection for small vessels. The program has since changed to include quarterly training for 21 different agencies. The funding and in-kind support came from a myriad of sources to include state and local providers, Port Security grants, personnel, equipment, and more traditional project funding.

### 4.12.2 DNDO Engagement Recommendations

Creative cost sharing and agreed-upon training standards (and therefore buy-in) were pivotal to the successful execution of this program. This threat vector (a small vessel used as a smuggling platform) has been identified as a rapidly growing, yet unmet need globally that could easily be added to the current ILEA course for situational awareness. PNNL recommends that if DNDO wishes to expand the impact of its program, it consider adding a module that includes identification of maritime threat vectors, and eventually includes a maritime practical.

# 5.0 Training Options – International Programs

This section identifies and describes the various possible training options with international programs to increase the impact of the ILEA training course. Several international policy mechanisms exist to promote nuclear security, including:

- Binding and nonbinding international instruments - binding international treaties, conventions, and agreements, as well as nonbinding documents that enjoy broad political support in the international community
- International guidance documents - IAEA publications in the NSS
- Multilateral initiatives - joint undertakings by the international community to support State actions that promote nuclear security.

## 5.1 IAEA Division of Nuclear Security

### 5.1.1 Overview

In collaboration with Member States and other units of the IAEA Secretariat, the IAEA's Division of Nuclear Security (NANS) is responsible for coordinating and implementing the IAEA's nuclear security plan to prevent, detect, and respond to acts of nuclear terrorism and threats thereof. NANS works with IAEA Member States to assess nuclear security needs, priorities, and threats; support the establishment of international networks and partnerships; strengthen physical protection capacity by conducting training courses and workshops; and develop policy guidance and technical recommendations (IAEA 2015).

The U.S. government provides in-kind SME support for NANS in the following ways:

- Developing of policy, guidance documents, technical tools, and curriculum
- Hosting or providing instructors for physical protection training and engagement
- Participating in nuclear security peer reviews and advisory services, such as International Nuclear Security Advisory Service (INSServ) and International Physical Protection Advisory Service (PIPES) missions.

The Division of Nuclear Security comprises four sections, one of which is the Nuclear Security of Materials Outside of Regulatory Control (MORC) section. This section provides assistance to Member States, upon request, in their efforts to establish the necessary infrastructure to combat illicit trafficking in nuclear and other radioactive material (IAEA 2015).

The MORC section facilitates a number of training courses relevant to DNDO's global nuclear detection architecture, including:

- Advanced Detection Equipment for Frontline Officers and Mobile Expert Support Teams
- Detection and Response – Techniques and Coordination
- Development of a Mobile Expert Support Capability

- Radiation Detection Techniques for Frontline Officers
- Radiation Detection Techniques:  Train-the-Trainers
- Workshop on Threat Assessment and Risk Informed Approach for Nuclear and Other Radioactive Material out of Regulatory Control
- Training Course on Nuclear Security Detection Architecture
- Introduction to Nuclear Forensics
- Nuclear Forensics Methodologies.

IAEA training courses are free, but participants are responsible for paying their own travel and living expenses. However, while each country typically pays for its own instructors and participants to attend a course, the IAEA will occasionally pay for travel and living expenses if needed.

### 5.1.2 DNDO Engagement Recommendation

Because of programmatic changes, the authors did not contact this training provider about further course options for DNDO. Therefore, PNNL was not able to make a conclusive recommendation.

## 5.2 IAEA Nuclear Security Training and Support Centres

### 5.2.1 Overview

The objective of a State's national nuclear security program is to prevent, detect, and respond to a criminal or unauthorized act involving nuclear or other radioactive material. This can be reached, *inter alia*, through the establishment of a Nuclear Security Support Centre (or a Centre of Excellence that attempts to build competences and skills through the implementation of a tailored training program and the establishment of sustainable technical and scientific support services (IAEA 2015).

In an effort to assist Member States in meeting and implementing their obligations under relevant legal instruments for international nuclear security, the IAEA developed a concept to establish national nuclear security support centers that can be developed in any State. The concept has thus far been rolled out in several States (such as Colombia, Ghana, Malaysia, Morocco, Pakistan, and the United Republic of Tanzania), which have been willing to share their lessons learned with the international community.

Upon request, the IAEA arranges an NSSC workshop in cooperation with the national competent authorities responsible for nuclear security. Expected outcomes from the workshop include: a tangible work plan for the implementation of an NSSC, a path forward to establish a national nuclear security committee in a State, and enhanced communication among nuclear security competent authorities at the national level.

The IAEA established an International Network for Nuclear Security Training and Support Centers in close collaboration with Member States in January 2012. The network is designed to accelerate the systematic approach of developing nuclear security knowledge and skills and to build up sustainable capacities to maintain an appropriate national nuclear security program. With this network, the IAEA has

organized an international platform to bring together all interested States, organizations, and communities to discuss and share their diverse expertise and lessons learned, and to identify similarities that will optimize the efforts of the international community to enhance global nuclear security.

A number of countries have already applied the IAEA NSSC concept, and many others have expressed interest in strengthening their national nuclear security programs through human resource development and technical and scientific support at the national or regional level. (IAEA 2015).

### 5.2.2 DNDO Engagement Recommendation

Because of programmatic changes, the authors did not contact this training provider about further course options for DNDO. Therefore, PNNL was not able to make a conclusive recommendation.

## 5.3 European Commission Joint Research Centre

### 5.3.1 Overview

The European Commission's Joint Research Centre (JRC) is an in-house science service designed to provide the European Union (EU) policies with independent, evidence-based scientific and technical support throughout the whole policy cycle. The JRC draws on more than 50 years of scientific work experience and continually builds its expertise based on its seven scientific institutes—located in Belgium (Brussels and Geel), Germany, Italy, the Netherlands, and Spain—which host specialist laboratories and unique research facilities. The JRC collaborates with more than a thousand organizations worldwide whose scientists have access to many JRC facilities through various collaboration agreements. Among other activities, the JRC conducts a significant amount of work related to nuclear science that is funded by the EURATOM Research and Training Program. JRC's objective for nuclear work is the pursuit of research, knowledge management and training activities with an emphasis on nuclear safety and security (JRC 2015b).

The JRC's Institute for Transuranium Elements (JRC-ITU) is a facility that provides the scientific foundation for the protection of European citizens against risks associated with the handling and storage of highly radioactive material. The Institute is based mainly in Karlsruhe, Germany, with the Nuclear Security Unit located in Ispra, Italy, and has a multidisciplinary team of more than 370 academic, technical, and support staff. JRC-ITU's prime objectives are to serve as a reference center for basic actinide research, to contribute to an effective safety and safeguards system for the nuclear fuel cycle, and to study technological and medical applications of radionuclides/actinides. JRC-ITU works very closely with national and international bodies in the nuclear field, both within the EU and beyond, as well as with the nuclear industry. In addition to playing a key role in EU policy on nuclear waste management and the safety of nuclear installations, JRC-ITU is also heavily involved in efforts to combat illicit trafficking of nuclear materials, and in developing and operating advanced detection tools to uncover clandestine nuclear activities (JRC 2015a).

### 5.3.2 DNDO Engagement Recommendation

Because of programmatic changes, the authors did not contact this training provider about further course options for DNDO. Therefore, PNNL was not able to make a conclusive recommendation.

## 5.4 European Union Chemical, Biological, Radiological, and Nuclear Centres of Excellence

### 5.4.1 Overview

As part of an initiative to better coordinate the knowledge and expertise needed to mitigate chemical, biological, radiological, and nuclear (CBRN) risks, the EU established a framework to mobilize national, regional, and international resources for risk mitigation. This framework, known as the EU CBRN Risk Mitigation Centres of Excellence (COEs) Initiative, is designed to facilitate a coherent and comprehensive approach to addressing legal, regulatory, enforcement, and technical issues associated with CBRN response and mitigation (CBRN COE 2015).

The EU CBRN Risk Mitigation COE Initiative is implemented jointly by the European Commission's Joint Research Centre (JRC and the United Nations Interregional Crime and Justice Research Institute [UNICRI]). Within the CBRN COE structure, there are Regional Secretariats that operate in the following eight regions: African Atlantic Façade, North Africa and Sahel, Central and Eastern Africa, Middle East, Gulf Cooperation Council, Central Asia, South East Asia, South East and Eastern Europe (CBRN COE 2015).

The EU CBRN Risk Mitigation COE Initiative is based on the following principles (CBRN COE 2015):

- Networking, regional and international partnerships, consolidating, coordinating and optimizing existing capabilities in terms of expertise, training, technical assistance or equipment
- Addressing regional CBRN needs through specific tailored projects in fields of concern
- Strengthening a regional culture of safety and security by increasing local ownership, local expertise and long-term sustainability
- Institutional capacity building at regional and national levels; reinforcement of national CBRN policy, improvement of institutional capacities in legal, regulatory, control, scientific/technical support and law enforcement domains
- A coherent interagency approach to enhance coordination and effective response
- Cooperation with international organizations and EU Member States to ensure synergy and avoid duplication of efforts
- Coherence and visibility of the EU action.

### 5.4.2 DNDO Engagement Recommendation

Because of programmatic changes, the authors did not contact this training provider about further course options for DNDO. Therefore, PNNL was not able to make a conclusive recommendation.

## 5.5 INTERPOL

### 5.5.1 Overview

INTERPOL describes itself as the world's largest international police organization, whose mission is to facilitate cooperation among law enforcement agencies in 190 Member States. Of particular interest is INTERPOL's Radiological Nuclear Terrorism Prevention Unit and the Chemical Biological Radiological Nuclear and Explosives (CBRNE) Terrorism Prevention Programme, which assist States in addressing the illicit trafficking threat. A variety of mechanisms are employed to address these missions. Each Member State maintains a National Central Bureau (NCB), linking national police with the INTERPOL network providing a gateway to INTERPOL databases and a platform for sharing criminal information among law enforcement agencies. INTERPOL's CBRNE Terrorism Prevention Programme distributes a Monthly CBRNE Intelligence Report, which includes results from Project Geiger, an open source analysis of radiological and nuclear trafficking, available since 2005. Through conferences and other means, INTERPOL promotes formation of national Counter Nuclear Smuggling Teams to secure stolen radioactive and nuclear material, arrest and successfully prosecute suspects, and dismantle smuggling networks (King 2013).

### 5.5.2 DNDO Engagement Recommendation

Because of programmatic changes, the authors did not contact this training provider about further course options for DNDO. Therefore, PNNL was not able to make a conclusive recommendation.

## 5.6 Middle East Scientific Institute for Security

### 5.6.1 Overview

Located in Amman, Jordan, the Middle East Scientific Institute for Security (MESIS) is an independent, nongovernmental organization associated and co-located with the Royal Scientific Society. MESIS is listed as one of the few nongovernmental agencies working in the CBRN field in the Middle East. MESIS provides technical training venues to government and nongovernmental audiences. While possessing a goal to create a space for the scientific community to address chemical, biological, radiological and nuclear risks, MESIS staff (and the Director, HH Nasser bin Nasser) enjoy internationally recognized reputations in nuclear, chemical, and biological material security. MESIS also provides venues for other non-law enforcement training, such as in the field of electricity, as well as tabletop and field-exercise venues. Of note, according to their recent press release, MESIS hosted the most sophisticated on-site inspection exercise conducted to date for the Comprehensive Test Ban Treaty Organization (MESIS 2014). MESIS does have easy access to radiation sources for training, as well as auditoriums, classrooms, dining facilities, and space to conduct field exercises. MESIS' location allows easy transportation and training of personnel from North Africa, the Levant, and Arab Gulf States. PNNL staff members used MESIS to support project training of Iraqi students, when in-country training was not an option. Classes are conducted on a fee-for-service basis.

### 5.6.2 DNDO Engagement Recommendations

While not an ILEA academy, several national laboratories have used MESIS to host and conduct various training with very positive results. As DNDO considers other possible locations for foreign national training, MESIS is one organization that has provided low costs, easy access, and exceptional service in the past.

In a broader context, one of the considerations for course location is the strategic proximity to affected countries. Often course locations were chosen for political expediency, but sometimes the locations do not fulfill the broader need of strategic impact. While the ILEA course locations do serve a strategic end, the authors recommend that part of the course review include possible training locations that may not be ILEA locations. Training locations such as MESIS can help bridge to primary and secondary strategic training locations as well as possibly help reduce travel costs. DOS or DOE Program Managers can help identify other possible venues that also meet strategic objectives. The authors of this report can also help make those connections as well.

## 5.7 International Law Enforcement Academy

### 5.7.1 Overview

ILEA conducts regular courses for the international law enforcement community on a variety of law enforcement topics. The scope of this project included both review of the current course instructional materials, evaluation of instructors, and student feedback, and other ILEA training venues (i.e., Gaborone, Botswana; San Salvador, El Salvador).

### 5.7.2 DNDO Engagement Recommendations

Because of programmatic changes, the authors did not contact this training provider about further course options for DNDO. Therefore, PNNL was not able to make a conclusive recommendation.

# 6.0 Education and Training Plan

## 6.1 Overview

The current ILEA course paradigm does not afford career-long traditional skill development opportunities or a "train-the-trainer" construct. Impact of the course could be enhanced by using a more structured skill set development program as outlined in many DOD career fields. Specifically, there appears to be no career field advancement plan. Many students are chosen based upon established criteria, for one class only, and there appears to be no structured plan for honing or improving their skill set at a later point, to include when the students advance to increased professional levels of responsibility.

The first step for developing a career field education and training plan (CFETP) is to conduct a skills set needs assessment. This multidimensional cross-walk not only looks at what skills are needed to be successful in a career field, but also what level of training should be performed and at what milestone points of a career progression. After the skill set needs and timing are agreed to (usually conducted by senior SMEs and training experts in the respected career fields) a logical training plan (a CFETP) is produced. This CFETP accompanies the student throughout their career, providing a road map of training that has been accomplished (and expected to be performed) as well as training that still needs to be accomplished (U.S. Air Force 2014).

Tables 6.1 and 6.2 presents notional skill levels and timing for a radiological specialist. The breakdown includes task performance levels, task knowledge levels, and skill knowledge levels. Each area is crucial to ensure the proper balance of classroom and field experience.

The plan also lays out an orderly advancement plan from 3-level (apprentice) to 9-level (supervisor and "train-the-trainer" expert), as shown in Table 6.2. This orderly progression provides insights into which skills are important to continually reinforce or teach to an increasing level of complexity according to systematic instructional design and Bloom's Taxonomy guidance to promote higher levels of thinking and knowledge development (Bloom 1956). The CFETP also provides a very structured feedback loop from end users who work with, supervise and in many cases approve completion of the training task. This feedback loop is critical when discussing adjusting, adding, and removing training. Because the student may not be available to do other work while in training and many career fields are chronically understaffed, there is a constant focus and review of what is the minimal training required at each level.

Once the CFETP is developed, professional training developers design the courses. The courses include lecture, practicals, and course evaluations developed to ensure the student acquires skills and knowledge retention expected for each proficiency level. The course documentation also addresses location and significant logistical requirements for the course (i.e., identifying sealed source radiological materials). Instructors develop their instructor guides for each block of the material. This procedure feeds into the professional instructor certification process and helps the instructors obtain community college credit in their respective areas of expertise.

**Table 6.1**. Proficiency Codes and Qualitative Requirements

| | Scale Value | Definition: the Individual |
|---|---|---|
| Task Performance Level | 1 | Can do simple parts of the task. Needs to be told or shown how to do most of the task. (Extremely Limited) |
| | 2 | Can do most parts of the task. Needs only help on hardest parts. (Partially Proficient) |
| | 3 | Can do all parts of the task. Needs only a spot check of completed work. (Competent) |
| | 4 | Can do the complete task quickly and accurately. Can tell or show others how to do the task. (Highly Proficient) |
| Task Knowledge Levels[(a)] | a | Can name parts, tools, and simple facts about the task. (Nomenclature) |
| | b | Can determine step-by-step procedures for doing the task. (Procedures) |
| | c | Can identify why and when the task must be done and why each step is needed. (Operating Principles) |
| | d | Can predict, isolate, and resolve problems about the task. (Advanced Theory) |
| Subject Knowledge Areas[(b)] | A | Can identify basic facts and terms about the subject. (Facts) |
| | B | Can identify relationship of basic facts and state general principles about the subject. (Principles) |
| | C | Can analyze facts and principles and draw conclusions about the subject. (Analysis) |
| | D | Can evaluate conditions and make proper decisions about the subject. (Evaluation) |

[(a)]A task knowledge scale value may be used alone or with a task performance scale value to define a level of knowledge for a specific task. (Example: b and 1b)

[(b)]A subject knowledge scale value is used alone to define a level of knowledge for a subject not directly related to any specific task, or for a subject common to several tasks.

**Table 6.2**. Notional Career Field Education and Training Plan

| Notional Tasks, Knowledge and Technical References | 3-Skill Level (Apprentice) | | 5-Skill Level (Craftsman) | 7-Skill Level (Journeyman) | 9-Skill Level (Superintendent) |
|---|---|---|---|---|---|
| Radiation physics | B | B | B | C | D |
| Operate fixed and mobile radiographic equipment | 2b | 3c | C | 4b | - |
| Control scatter radiation | 2b | 3b | c | 4a | 4b |
| Monitor equipment performance | A | 2b | b | C | 3c |
| Technical aspects of radiation | 2a | 2b | 3b | 3c | X |
| Radiation physics | B | B | B | - | C |
| Personal radiation detection systems | B | - | B | - | C |
| Nuclear radiation production | B | B | B | X | X |
| Operate fixed and mobile detection equipment | 2b | 3c | c | - | 3c |
| Control accidental radiation | 2b | 3b | c | - | 4c |
| System overview (terminology/topology) | A | A | B | - | C |
| Process instrument results | 2b | 3c | C | - | 4D |
| Conduct sources material search | 2a | - | 3a | 4c | 4d |
| Conduct vehicle examination while resolving malfunction | - | 2b | 3c | 4d | 4D |

- This mark is used alone instead of a scale value to show that no proficiency training is provided in the course or career development course.
X This mark is used alone in the course columns to show that training is required but not given because of limitations in resources. This is also used as a placeholder to identify additional priority training should additional resources become available.

## 6.2 DNDO Engagement Recommendations

To maximize sustainability and impact of the DNDO ILEA course, the authors recommend that a "career field" needs assessment be conducted for the target audience. In generating this assessment, many strategic documents could be used as a framework. These documents include the DHS 2014 quadrennial review with its "Train and Exercise Frontline Operators and First Responders" mission area (DHS 2014). Other framing documents for consideration include the *Department of Defense Strategy for Countering Weapons of Mass Destruction* (DOD 2014) and *Countering Weapons of Mass Destruction* (Joint Chiefs of Staff 2014, p 1-4). Both of these documents outline the DOD's strategy for countering weapons of mass destruction. Specific to this report, the three major thrust areas shown in Figure 6.1 (Respond to Crisis, Prevent Acquisition, and Contain and Rollback Threats) serve as guiderails for building the assessment.

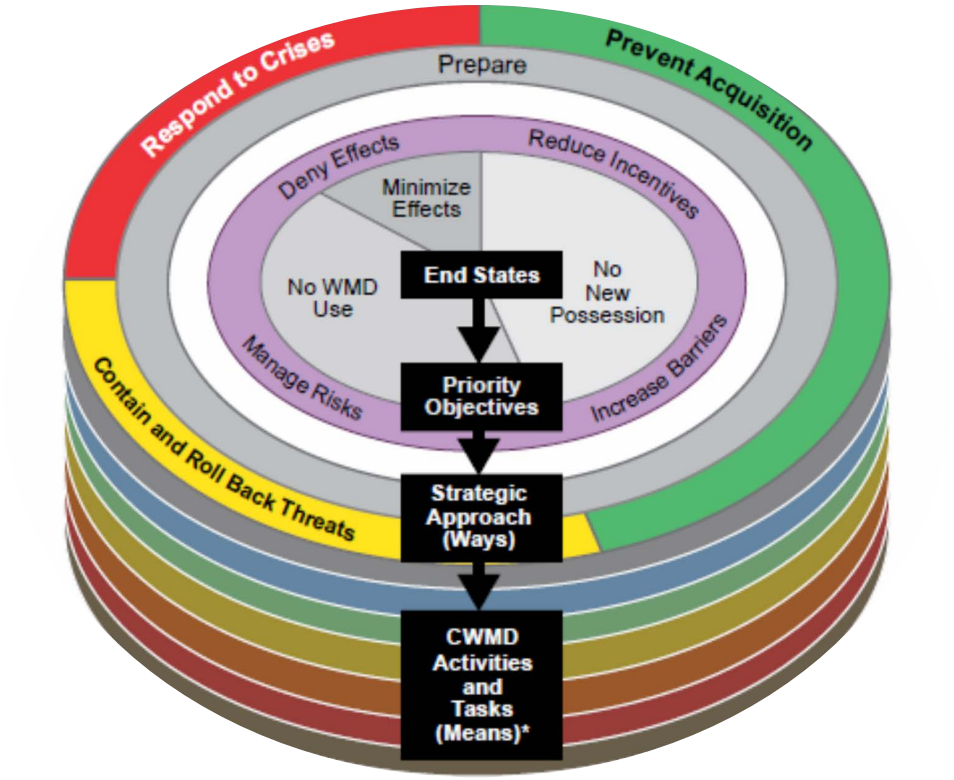


**Figure 6.1**. Department of Defense Strategy for Countering Weapons of Mass Destruction (DOD 2014)

These documents recognize the importance of cooperating with and supporting strategic partners for building specific training objectives. These guiderails (or others) should be reinforced throughout the training life cycle of the students as the training curriculum is developed, implemented and modified, again in accordance with the systematic approach to training paradigm.

Ideally, the assessment would contain two notable areas: a general skills requirements assessment and a country-specific skills assessment. Once these skills sets are identified and approved, the results would be used to generate a career field education and training plan. Next, DNDO would partner with training providers, or in cases where no training exists, partner with training developers to create the training. Of note, a CFETP for a specific career field in the DOD is structured to span the career of a military member—up to 30 years. While it might not be feasible to develop such an expansive look for the ILEA students, even a 5-year 3-level-to-5-level guide would be beneficial and increase the impact of the current ILEA course.

When a DOD entity goes through a career field skill needs assessment, senior leaders from all end-user communities and training development experts assemble to conduct a structured review, including the presentation of resource constraints (i.e., only 40 course hours are available for basic 3-level training), and a discussion of cost versus benefit for the potential performance level of students. During these discussions, required training not taught in a formal classroom is left for the student to self-instruct through distance learning options, or be taught by a qualified supervisor once the individual arrives at their first duty station.

# 7.0 Conclusions and Recommendations

## 7.1 Conclusions and Recommendations

### 7.1.1 Engagement Recommendations

Of the various organizations discussed in this report, PNNL recommends that several be considered for partnering with DNDO to supply training and leverage their processes and training for promoting sustainability of the ILEA course. PNNL suggests that DNDO consider the following methods of engagement, and PNNL will be willing to assist in the completion of the following recommendations.

- Collaborate with DOE NNSA's GTRI to discuss training procedures for its IRT and consider facilitating a joint course with GTRI to leverage material and lessons learned from both training programs.

- Leverage DTRA's training venue for the DTRU to host modified ILEA courses in collaboration with DTRA.

- Engage partner organizations and government agencies that the FLETC works with rather than engaging directly with FLETC.

- Leverage the RADACAD course conducted by PNNL to incorporate existing ILEA curriculum or modules into RADACAD courses, or possibly even consider hosting an ILEA course at the HAMMER facility in partnership with PNNL.

- Nurture a relationship with SAF/IA, and other DOD international country experts to discuss student training requirements and possible training funding options.

- Consider engagement with the FBI training providers beyond what is currently conducted in the ILEA course, understanding that some course control may be forfeited.

- Consider adding a module addressing identification of maritime threat vectors, and eventually include a maritime practical in collaboration with various state and local programs.

- Host training courses at other non-ILEA venues such as MESIS. As DNDO considers other possible locations for foreign national training, MESIS is one that has consistently provided low costs, easy access, and exceptional service.

- DNDO engage and review courses from the DOE Center for Radiological/Nuclear Training. While the venue would not be suitable for offering ILEA training, mining for helpful information, best practices, and lessons learned applicable to the ILEA course should be fruitful.

### 7.1.2 Organizations Not Engaged

Because of programmatic changes, the authors did not contact several programs to provide further course options for DNDO. Therefore, PNNL was not able to make conclusive recommendations for

several potential training partners. If funding does become available, the authors recommend consideration be given to readdress with these providers:

- U.S. Department of State, Bureau of International Narcotics and Law Enforcement (INL)
- U.S. Department of State, Export Control and Related Border Security Program
- U.S. Department of Homeland Security, Customs and Border Patrol (CBP)
- U.S. Department of Homeland Security, Transportation Security Administration (TSA)
- IAEA Division of Nuclear Security
- IAEA Nuclear Security Training and Support Centres
- European Commission Joint Research Centre
- European Union Chemical, Biological, Radiological and Nuclear Centres of Excellence (COEs)
- INTERPOL.

### 7.1.3 Consider Developing a Career Field Education and Training Plan

The current ILEA course paradigm does not afford career-long traditional skill development opportunities or a "train-the-trainer" construct. To maximize sustainability and impact of the DNDO ILEA course, the authors recommend that a "career field" needs assessment be conducted for the target audience. PNNL believes that impact of the course could be enhanced by using a more structured skill set development program as outlined in many DOD career fields—a career field education and training plan.

# 8.0 References


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# Appendix A

# Engagement Questions

# Appendix A

# Engagement Questions

Pacific Northwest National Laboratory (PNNL) is working with the U.S. Department of Homeland Security's (DHS) Domestic Nuclear Detection Office (DNDO) to evaluate options to improve the impact of, and identify how to properly sustain radiological and nuclear detection training focused on all law enforcement. While the United States has worked domestically to develop and provide radiological and nuclear detection training and education initiatives aimed at all law enforcement, the international community has predominantly focused efforts at border and customs officials. Law enforcement officials of a State play a critical role in maintaining an effective national-level nuclear detection architecture. To meet this vital need, DNDO was funded by the U.S. Department of State to create and deliver a 1-week course at the International Law Enforcement Academy (ILEA) in Budapest, Hungary to inform law enforcement personnel of the overall mission, the role they play in a detection architecture, and to provide an understanding of how they can combat the threats of radiological and nuclear terrorism through detection efforts.

In order to evaluate strategic options to ensure the sustainability and expand the impact of the existing ILEA course, we would like to benchmark against existing training in this area and gauge potential opportunities for collaboration.

On that note, we would we would greatly appreciate if you could answer the questions below to provide us with information about your existing training offerings and gauge potential for future collaboration.

Questions will differ. See below for more guidance.

### *Questions for Organizations Currently Hosting Radiological and Nuclear Detection Training*

For each radiological and/or nuclear detection course you offer, please provide the information below (if applicable):

- What is the course name and duration?
- What are the course goals and objectives?
- What is the general content and format of the course?
- Who is your target audience?
- What is the cost per student to take this course? What does that cost include?
- Are their special requirements to attend (security clearance, U.S. citizen, etc.)?

### *General Questions*

- Where are these courses offered?
- Do you have capacity to add students to any of your courses?
- Would you be interested in incorporating additional modules or lessons on radiological or nuclear detection into existing course?
- Would you be interested and able to host an ILEA course? If so:
  - Do you have the capacity, and would there be sufficient student interest?
  - What type of facilities do you have?
  - What is the maximum number of students you could host?
  - Would you be willing to share any valuable lessons learned on promoting sustainability for your existing training program?

### *Questions for organizations NOT currently hosting Radiological and Nuclear Detection Training*

- What is the general focus of training at your organization (nuclear security, nonproliferation, WMD, CBRNE, counterproliferation, etc.)?
- What is your average student demographic for these courses (background, profession, nationality, education, skill set, and level of expertise)?
- Do you have courses that could incorporate modules or lessons on radiological and/or nuclear detection?
- Would you be interested and able to host an ILEA course? If so:
  - Do you have the capacity, and would there be sufficient student interest?
  - What type of facilities do you have?
  - What is the maximum number of students you could host?
- Would you be willing to share any valuable lessons learned on promoting sustainability for your existing training program?

# Appendix B

# Typical ILEA Training Schedule

# Appendix B
# Typical ILEA Training Schedule

## Radiological and Nuclear Smuggling and Detection for Law Enforcement Awareness Course

| Day One | Day Two | Day Three | Day Four | Day Five |
|---|---|---|---|---|
| 8:00 Registration | 8:30 ILEA 2A: Radiological Materials and Weapons | 8:30 ILEA 3A: The Global Nuclear Detection Architecture | 8:30 ILEA 4A: Adavanced Detection Operations | 8:30 ILEA 5A: International and Regional Cooperation |
| 8:30 Course Opening Administrative Issues Class Photo | 9:40 Coffee Break | 9:00 ILEA 3B: Radiation Detection Technologies | 10:10 Coffee Break | 9:00 ILEA 5B: Nuclear Forensics |
| 10:00 Coffee Break | 10:00 ILEA 2B: Legal Shipments of Radioactive Materials | 10:00 Coffee Break | 10:30 ILEA 4B: Establishing Radiological and Nuclear Detection Awareness in your Organization | 10:00 ILEA 5C: Country Presentations |
| 10:20 ILEA 1A: The Radiological and Nuclear Threat | 10:45 ILEA 2C: Radiological and Nuclear Smuggling | 10:20 ILEA 3C: Introduction to Concepts of Operation | 11:00 ILEA 4C: Development of Country Presentations | 11:00 Post Test |
| 11:10 ILEA 1B: Law Enforcement's Role in R/N Detection | | 11:30 Lunch | | 11:30 Course Evaluations |
| 12:00 Lunch | 12:00 Lunch | 12:30 ILEA 3D: Nuclear and Radiological Detection Hands-on Activities • *Naturally Occurring Radioactive Material* • *Industrial Applications of Radioactive Material* • *Mobile Detection Systems Demonstration* | 12:00 Lunch | 12:00 Final Discussions Graduation Ceremony |
| 13:00 ILEA 1C: Radiation Safety and Awareness | 13:00 ILEA 2D: Radiological and Nuclear Smuggling Activities • *Shielding Radioactive Material* • *Handheld Search Techniques* • *Vehicle Search Scenario* | | 13:00 ILEA 4D: Nuclear and Radiological Threat Demonstrations • *Vehicle and Pedestrian Search Scenario* • *Cargo Search Scenario* • *Area Search Scenario* | 13:00 Lunch |
| 14:00 ILEA 1D: Nuclear and Radiological Threat Table Top Discussions • *Uranium and Nuclear Trafficking* • *Plutonium Production and Trafficking* • *Introduction to Radioactive Materials of Interest and Radiation Detection* | | 14:45 ILEA 3E: Daily De-brief and Next Steps | | |
| 16:00 ILEA 1E: Daily De-brief and Next Steps | 16:00 ILEA 2E: Daily De-brief and Next Steps | | 16:00 ILEA 4E: Daily De-brief and Next Steps | |

# Appendix C

# ILEA Course Student Ratings

# Appendix C

# ILEA Course Student Ratings

### Ratings from ILEA End of Course Evaluation Report

Iteration One – April 22-26, 2013

*Note: Based on the percentages given, it appears that feedback was only received from 27 of the 29 students.*

**Course Content**

| Statements | Strongly Agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree | N/A | Average[(a)] |
|---|---|---|---|---|---|---|---|
| The objectives of this course were clearly explained | 77.78% | 22.22% | 0% | 0% | 0% | 0% | 4.78% |
| The course was organized in a logical manner | 81.48% | 18.52% | 9.09% | 0% | 0% | 0% | 4.81% |
| The training materials used in the course were useful | 77.78% | 18.52% | 0% | 0% | 0% | 3.70% | 4.81% |
| This course provided me with information that will help me to do my job better | 62.96% | 29.63% | 0% | 3.70% | 0% | 3.70% | 4.58% |
| Overall, I believe this course was: | Excellent | Very good | Good | Fair | Poor | N/A | Average |
| | 81.48% | 18.52% | 0% | 0% | 0% | 0% | 4.81% |

[(a)]Iteration 1 was the only iteration to use a four-point rather than a five-point scale so for easy correlation to the other iterations these averages were adjusted as if based on a 5-point scale.

**Instructors**

| Statements | Strongly Agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree | N/A | Average[(a)] |
|---|---|---|---|---|---|---|---|
| The instructor was easy to understand | 59.26% | 40.74% | 0% | 0% | 0% | 0% | 4.59% |
| The instructor demonstrated knowledge of the subject | 81.48% | 18.52% | 0% | 0% | 0% | 0% | 4.81% |
| The instructor's behavior was professional | 96.30% | 3.70% | 0% | 0% | 0% | 0% | 4.96% |
| The instructor was easily approachable | 92.59% | 3.70% | 0% | 0% | 0% | 3.70% | 4.96% |
| Overall, I would rate this instructor as: | Excellent | Very good | Good | Fair | Poor | N/A | Average |
| | 96.30% | 3.70% | 0% | 0% | 0% | 0% | 4.96% |

[(a)]Iteration 1 was the only iteration to use a four-point rather than a five-point scale so for easy correlation to the other iterations these averages were adjusted as if based on a 5-point scale.

Iteration Two – September 30-October 4, 2013
No report was received from iteration two.

Iteration Three – May 5-9, 2014

**Course Content**

| Statements | Strongly Agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree | N/A | Average |
|---|---|---|---|---|---|---|---|
| The objectives of this course were clearly explained | 83.87% | 16.13% | 0% | 0% | 0% | 0% | 4.84% |
| The course was organized in a logical manner | 80.65% | 19.35% | 0% | 0% | 0% | 0% | 4.81% |
| The training materials used in the course were useful | 64.52% | 32.26% | 0% | 0% | 0% | 3.23% | 4.67% |
| This course provided me with information that will help me to do my job better | 70.97% | 29.03% | 0% | 0% | 0% | 0% | 4.71% |
| Overall, I believe this course was [(a)] | Excellent | Very good | Good | Fair | Poor | N/A | Average |
| | 29.03% | 12.90% | 3.23% | 0% | 0% | 0% | 4.81% |

[(a)]It appears from the math that only 14 students responded to this question.

**Instructors**

| Statements | Strongly Agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree | N/A | Average |
|---|---|---|---|---|---|---|---|
| The instructor was easy to understand | 83.87% | 16.13% | 0% | 0% | 0% | 0% | 4.84% |
| The instructor demonstrated knowledge of the subject | 67.74% | 32.26% | 0% | 0% | 0% | 0% | 4.68% |
| The instructor's behavior was professional | 83.87% | 16.13% | 0% | 0% | 0% | 0% | 4.84% |
| The instructor was easily approachable | 87.10% | 12.90% | 0% | 0% | 0% | 0% | 4.87% |
| Overall, I would rate this instructor as: | Excellent | Very good | Good | Fair | Poor | N/A | Average |
| | 90.32% | 9.68% | 0% | 0% | 0% | 0% | 4.90% |

Iteration Four – September 22-26, 2014

**Course Content**

| Statements | Strongly Agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree | N/A | Average |
|---|---|---|---|---|---|---|---|
| The objectives of this course were clearly explained | 63.64% | 36.36% | 0% | 0% | 0% | 0% | 4.64% |
| The course objectives were achieved[a] | 60.61% | 39.39% | 0% | 0% | 0% | 0% | 4.61% |
| The course was organized in a logical manner | 39.39% | 51.52% | 9.09% | 0% | 0% | 0% | 4.30% |
| The training materials used in the course were useful | 60.61% | 39.39% | 0% | 0% | 0% | 0% | 4.61% |
| This course provided me with information that will help me to do my job better | 54.55% | 45.45% | 0% | 0% | 0% | 0% | 4.55% |
| Overall, I believe this course was: [b] | Excellent | Very good | Good | Fair | Poor | N/A | Average |
| | 45.45% | 30.3% | 0% | 0% | 0% | 0% | 4.70% |

[a] These questions were only asked for iterations four and five
[b] It appears from the math that only 25 students responded to this question.

**Instructors**

| Statements | Strongly Agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree | N/A | Average |
|---|---|---|---|---|---|---|---|
| The instructor was easy to understand | 51.52% | 42.42% | 0% | 0% | 3.03% | 3.03% | 4.44% |
| The instructor demonstrated knowledge of the subject | 60.61% | 36.36% | 0% | 0% | 0% | 3.03% | 4.63% |
| The instructor's behavior was professional | 72.73% | 24.24% | 0% | 0% | 0% | 3.03% | 4.75% |
| The instructor was easily approachable | 69.70% | 21.21% | 0% | 0% | 3.03% | 6.06% | 4.65% |
| The instructor spoke clearly and was easily understood[a] | 60.61% | 36.36% | 0% | 0% | 0% | 3.03% | 4.63% |
| The instructor effectively used training aids[a] | 60.61% | 36.36% | 0% | 0% | 0% | 3.03% | 4.63% |
| Overall, I would rate this instructor as: | Excellent | Very good | Good | Fair | Poor | N/A | Average |
| | 84.85% | 12.12% | 0% | 0% | 0% | 3.03% | 4.88% |

[a] These questions were only asked for iterations four and five.

Iteration Five – June 8-12, 2015

**Course Content**

| Statements | Strongly Agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree | N/A | Average |
|---|---|---|---|---|---|---|---|
| The objectives of this course were clearly explained | 60.53% | 39.47% | 0% | 0% | 0% | 0% | 4.6% |
| The course objectives were achieved[(a)] | 50.0% | 50.0% | 0% | 0% | 0% | 0% | 4.5% |
| The course was organized in a logical manner | 47.37% | 50.0% | 2.63% | 0% | 0% | 0% | 4.45% |
| The training materials used in the course were useful | 50.0% | 50.0% | 0% | 0% | 0% | 0% | 4.5% |
| This course provided me with information that will help me to do my job better | 71.05% | 28.95% | 0% | 0% | 0% | 0% | 4.71% |

| The length of the course was | Too Short | About Right | Too Long | Average |
|---|---|---|---|---|
| | 39.47% | 60.53% | 0% | 4.39% |

| For me, the pace of the course was | Very Fast | Somewhat Fast | About Right | Somewhat Slow | Very Slow | Average |
|---|---|---|---|---|---|---|
| | 5.26% | 42.11% | 52.63% | 0% | 0% | 3.5% |

| | Excellent | Very good | Good | Fair | Poor | N/A | Average |
|---|---|---|---|---|---|---|---|
| The translation for this course was | 23.68% | 36.84% | 34.21% | 0% | 5.26% | 0% | 3.68% |
| Overall, I believe this course was: [(b)] | 36.84% | 52.63% | 10.53% | 0% | 0% | 0% | 4.26% |

| Would you recommend this course to others? | Yes | No | |
|---|---|---|---|
| | 100% | 0% | Yes |

[(a)]This questions were only asked for iterations four and five.
[(b)]It appears from the math that only 25 students responded to this question

**Instructors**

| Statement[(a)] | Anderson | Libby | Siefken | Wittrock | Yezzi |
|---|---|---|---|---|---|
| The instructor was easy to understand | 4.5 | 4.5 | 4.4 | 4.5 | 4.4 |
| The instructor demonstrated knowledge of the subject | 4.5 | 4.5 | 4.4 | 4.5 | 4.3 |
| The instructor's behavior was professional | 4.6 | 4.6 | 4.6 | 4.6 | 4.4 |
| The instructor was easily approachable | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| The instructor spoke clearly and was easily understood[3] | 4.5 | 4.4 | 4.4 | 4.4 | 4.3 |
| The instructor effectively used training aids | 4.6 | 4.6 | 4.6 | 4.6 | 4.5 |
| Overall, I would rate this instructor as: | 4.4 | 4.3 | 4.4 | 4.3 | 4.3 |

[(a)]In this iteration each instructor was rated individually.

# Appendix D

# ILEA Course Student Feedback Summary

# Appendix D

# ILEA Course Student Feedback Summary

**Student Comments from Daily Evaluation Forms *(First four iterations only)***

Day One Feedback

**Q1: Which topics are most useful to you today?**

Iteration 1

1. All topics…*(11 comments of this nature).*
2. 1A (Radiological and Nuclear Threat), 1B (Law Enforcement's Role in Radiological and Nuclear Detection), 1D (Nuclear and Radiological Threat Table Top Discussions).
3. 1D; 16.30 – 18.00 (Nuclear and Radiological Threat Table Top Discussions).
4. All topics were very useful, Theme № 1 was the most useful.
5. Detecting radioactive elements. Bulgarian seizure.
6. Practical example from Bulgaria
7. Location and use of radiological materials
8. Module 1B Effective methods of work of the law enforcement agencies …*(2 comments of this nature).*
9. The role of the prosecution authorities in the criminal proceedings when detecting radiological and nuclear materials, discussion on the first day.
10. Monitored chain reaction, acquiring of radiological materials.
11. Nuclear power stations.
12. The most interesting topic for me was the uranium enrichment process and the production of plutonium. I already knew the other information that we received. The list of radiological materials was also interesting for me.
13. Uranium processing.
14. Enrichment of uranium and production of plutonium.
15. Plutonium production.
16. Production (enrichment) of uranium, plutonium; Information about household objects and materials containing radioactive materials.

17. Radiation detection (Equipment).

18. Radiation fundamentals for safety, materials used in nuclear weapons.

19. Radiological and nuclear safety. Practical class where we used equipment detecting radioactive materials.

Iteration 2

20. All the mentioned items.

21. All the subjects, but most importantly, radiation awareness and safety.

22. Especially the afternoon session was very useful for me.

23. For me, “how can High Enriched Uranium (HEU) be made?” topic was the most useful topic today.

24. “Materials that are used in Nuclear Weapons” presentation was useful.

25. Forms and types of radiation materials and the extent of their effect on the person.

26. Identifying and transferring radioactive materials.

27. Radiation safety and awareness; Role of Law Enforcement in Nuclear Detection; Radiological Materials and Weapons.

28. Radiation hazard/ Types of radiation.

29. Nuclear and radiological threats and characteristics; Risks of using them; ways of obtaining rad/nuc sources and examples.

30. Radiological and nuclear threat.

31. Nuclear and radiological materials; types of radioactive materials; real case examples (case of Bulgaria).

32. The distributed material.

33. Types of uranium.

34. Nuclear threats; Connection of nuclear threats with terrorism.

35. Recognition, shipment, usage and storage of radiological and nuclear materials.

36. The devices which were trained on to detect smuggled material, how and what happens during smuggling operations.

37. Methods of enrichment.

Iteration 3

1. All the topics were useful. I received a lot of new information.

2. I felt that the module on Radiological and Nuclear Hazard was the most useful, but everything else was useful too.

3. Of all the topics discussed today I derived useful information from the Bulgarian case, the way Plutonium is produced, etc.

4. Production and use of U235 and U238, as well as PU238.

5. Radiation safety and awareness.

6. Radiological and nuclear threat, Radiation safety and awareness.

7. Types of radioactive materials and detection materials. Production process of radioactive materials. Detection equipment, search methods for buildings, vehicles and passengers.

Iteration 4

1. All of the topics…*(6 comments of this nature).*

2. All topics were useful, especially the smuggling of radioactive materials.

3. Radiological and nuclear threats.

4. Identification of materials used in nuclear weapons and early detection of such materials at border crossings.

5. Production of nuclear materials.

6. Production of uranium and plutonium …*(2 comments of this nature).*

7. The most useful topic for me was production of nuclear materials.

8. Transportation and detection of radiological materials.

**Q2: Which content areas or topics apply to your duties? Which topics do not?**

Iteration 1

1. All topics…*(4 comments of this nature. No indication of applying to duties or not.)*

2. All themes are related my duties. …*(8 comments of this nature).*

3. Almost everything is related to my duties.

4. I think I can apply all.

5. I can use all the knowledge that we gained, i.e., the information on how to raise awareness and how to get a general overview.

6. Bulgarian seizure discussion/Plutonium production.

7. Monitoring in Bulgaria.

8. Detection – practical cases.

9. Detection of radiological and nuclear materials, identification of materials.

10. I cannot say.

11. I cannot say so far.

12. Maybe the theory.

13. Industrial cycle of uranium.

14. Module 1 A The use of uranium and plutonium in nuclear weapons …*(2 comments of this nature).*

15. Production of radioactive elements is NOT related to my duties.

16. Ways of detection of nuclear weapons and materials used for their production.

<u>Iteration 2</u>

1. All the topics are convenient.

2. All the topics of the first day were things that a security officer has to know.

3. "Radiological and Nuclear Threat" and "Radiation safety and awareness" apply to our duties partially. However the specialists in this field should attend the other topics that were more technical.

4. "The Role of the Law Enforcement in Nuclear Material Detection" applied to my duties.

5. Role of Law Enforcement in Nuclear Detection.

6. The law's entry into force.

7. Connection of nuclear threats with terrorism; nuclear weapons; law enforcements.

8. Detection of nuclear radiation, awareness and safety

9. Detectors for radioactive materials topic were good.

10. Extent of exposure to radiation annually.

11. How to control the primary material used in the nuclear area.

12. Learning about the nuclear and radiological weapons; storing, shipment and smuggling of radioactive materials.

13. Relevant to my tasks are the ways and methods of smuggling these materials and how to deal with them. Irrelevant to my tasks is how to enrich it.

14. Since I am a police officer, I liked the practical parts about the detection of nuclear/radiological sources instead of the intense technical details.

15. Usage of radiological and nuclear materials for terrorism or selling these materials for bad purposes.

Iteration 3

1. All of them.

2. All topics are applicable.

3. Detection of shipments of potentially radioactive substances, documenting incidents, timely sharing of information with relevant entities.

4. Detection, intelligence, international cooperation.

5. Radiological and nuclear threat, Uranium and illegal trade of nuclear materials.

6. Reaction to radiological emergencies.

7. We use practical exercises in our training. About the enrichment and production of uranium we are in a situation of dual-use materials.

Iteration 4

1. All topics were applicable in our work, I only wish we had more modern devices at our disposal.

2. Almost all …*(2 comments of this nature).*

3. Applicable: The example of the seizure in Ruse, Bulgaria since I am a police officer.

Not applicable: chemistry and physics.

4. Applicable: Smuggling of radioactive material.

Not applicable: Production.

5. Applicable: Smuggling of radioactive material.

Not applicable: Production of uranium and plutonium.

6. Applicable: topics related to safety and awareness of radiation. Not applicable: topics related to production of plutonium and uranium. Yet, these topics were also useful.

7. My work is related to the topics presented today and, in this sense, all of them are more or less applicable.

8. The presentation of basic data on radioactive materials was especially useful.

9. The smuggling-related topics are not applicable in my work since in our country there are no uranium mines nor uranium production.

10. Detection of radioactive materials; Protection(shielding) from harmful radiation.

11. Detection of radioactive materials.

12. The topics related to detection of radiological/nuclear material.

13. Ways of detection of radioactive materials, such as the use of the personal radiation detection device.

**Q3: Do you have any suggestions to improve today's activities?**

Iteration 1

1. *9 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.*

2. Nuclear Power Stations.

3. Uranium industrial cycle.

4. More practical classes.

5. More practical examples, what should we do, what we should not do, mistakes, weaknesses.

6. More detailed information is needed on seizures of uranium and other radioactive materials.

7. More video footages will be appreciated.

8. More video materials should be shown.

Iteration 2

1. Attempt for hot drinks like tea and coffee; city tours and learning about the history and culture of Hungary; considering cultural and religious differences in selection of food and drinks.

2. Natural and manufactured radiation material.

3. I think today's program was successful. I hope the rest will be very good too.

4. In some topics, there were many technical details. Because of my profession, I could not concentrate on the details that much.

5. Training activities are sufficient and explanatory.

6. Activities were very good. Thank you.

7. It will be good if there is more time for teaching how to use the PRD, RIIP devices.

8. I think that the training can include more videos as support materials.

9. More visuals and more hands on practice.

10. We benefited by the questions paused during the discussions and how to integrate them into the program and make use of them in the next course.

11. This course should have been extended to two weeks, for its importance.

Iteration 3

1. Everything was well prepared and organized.

2. No, the activities were useful.

3. More time for the presentations.

4. I wish we had more hours of practical work with identifiers of radioactive materials.

5. Outstanding instructors who are deeply familiar with the subject and have a lot of expertise.

Iteration 4

1. 4 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.

2. Everything was ok, yet I would like to receive more information on the mass destruction-related laws in the US legislation and to know if these laws are available on Internet.

3. Interaction might be more strongly encouraged.

Day Two Feedback

**Q1: Which topics are most useful to you today?**

Iteration 1

1. All topics…(*7 comments of this nature).*

2. 2C (Radiological and Nuclear Smuggling); 2D (Radiological and Nuclear Materials and Smuggling Activities).

3. Radiological and nuclear material smuggling.

4. Examples of detection of smuggling, I also liked the theoretical part.
5. Detection of materials.
6. Methods of examination of vehicles and buildings for radioactive materials.
7. Organisation of search of objects; search itself and seizure.
8. Shielding.
9. Declaring legal shipments of radio materials.
10. Marking of legitimate shipment, recognizing, practical sessions.
11. Shipment of radiological materials, ways of smuggling, ways of detecting of suspicious material.
12. Sources of ionized radiation.
13. Practical classes.
14. Practical training and search of sources.
15. Practical training, examples of smuggling, search of premises.
16. The practical programs were the most useful.
17. Vehicle search scenario, handheld search techniques.

Iteration 2

1. All the topics.
2. I could use practically all subjects presented today in my work.
3. General information on the subject (e.g., types of radiation, related dangers, etc.).
4. When we consider today's training together with yesterday's, I can say that it is getting more and more useful each day. I found all topics useful today.
5. All subjects were equally useful.

   - Practical demonstration of tools/instruments.

   - The presentation on smuggling, difficulties of intercepting / detecting smuggling.
6. Connection of radiological and nuclear threats with terrorism. Learning the non-equipment methods. Labels.
7. Detailed presentation of the table of radiation materials.
8. Detection of radiological and nuclear materials, their shipment and storage. Materials used in the hands on session should be increased and materials should be more hidden.

9. Detection performed during the inspection.

10. Demonstration of detection devices.

11. Hands on practice was the most useful.

12. Practical exercises, and the presentations linked to practical issues.

13. Practical part in the afternoon was very useful.

14. Presentation of effects.

15. All subjects were useful, but the practical parts were the most useful.

16. How to use and how to search and knowledge the equipment and the methods of measuring radiation.

17. Identifying the shields type of the radioactive materials.

18. Shielding.

19. Legitimate transportation of radioactive materials.

20. Radiological and nuclear detection; Legitimate shipment of radioactive materials.

21. Radiological and nuclear smuggling …*(2 comments of this nature).*

22. Smuggling of rad. and nuclear materials.

23. The smuggling of the radioactive and nuclear materials plus all topics.

24. Today I have benefited from all topics in general and mostly was regarding the operations and smuggling stories, and the hands-on training activities was very fun.

25. Role of law enforcement in radiological and nuclear detection.

26. Searches we did in the vehicle and the building and the hands on practice about shielding were very useful. It is also useful to watch videos that support the training materials.

27. Shipment.

28. Shipment of nuclear and radiological materials; smuggling; careful use of the devices.

29. Presenting non-radioactive materials used in making weapons.

30. Trade of uranium and other nuclear materials.

31. We learned about the radiological weapons and materials.

    A – Methods of detection of the illegal materials, and to work within one team work.

    B – The alternative laws of radioactive materials shipments.

C – Ways of different methods of smuggling used by smugglers and terrorists.

Iteration 3

1. All the topics that were approached are useful. I will share this experience with my coworkers when I go back to Moldova.

2. The practicals, of course, but the theoretical parts were pretty useful as well.

3. They were all useful, especially the practicals.

4. Discussion of the international standards for shipping radioactive materials. Shipping documents, packaging, labeling, paneling and information in the documents.

5. Legal transportation.

6. The role of law enforcement and their methods to detect RN materials.

7. Shielding radioactive materials; vehicle inspection scenario; practical exercises; legal shipping.

Iteration 4

*1.* All topics…*(4 comments of this nature).*

2. Almost all, especially the vehicle search exercise.

3. How to use the instruments.

4. Legal shipments; rad mat smuggling.

5. Smuggling of rad/nuc material.

6. Rad/nuc material smuggling.

7. Rad/nuc threat detection.

8. Radioactive material detection.

9. Radiological material smuggling; Search of vehicle and driver.

10. Legal framework. Search of vehicles and rooms.

11. The exercise aimed at showcasing the importance of good organization in our work as well as adhering to the procedures and supervision.

12. The methods based on detection equipment.

13. I think all of the practical part was so useful, and I enjoyed it so much.

14. They were all excellent, but what I found interesting was the practical exercise.

**Q2: Which content areas or topics apply to your duties? Which topics do not?**

Iteration 1

1. All topics…*(5 comments of this nature. No indication of applying to duties or not.)*
2. All themes are related to my duties.
3. Everything is related to my duties.
4. I can apply all of them, especially the afternoon's projects. I enjoyed them a lot (practices).
5. I cannot say, I think that all the topics are useful for me.
6. I do not know.
7. Doesn't touch me directly.
8. Not related.
9. Theory.
10. Prevention of smuggling, knowledge on how to use detectors.
11. 2C – related in terms of detection and prevention of illegal activities and operations with radiological and nuclear materials.
12. Searching and seizing objects – are related.
13. Area search and practical issues.
14. Practical training and search of sources. I cannot say.
15. Namely the practical search of sources of radiation and their identification.
16. Everything was instructive, new theoretical and practical knowledge.
17. Practical sessions.
18. What will I use: handheld search techniques, detection of shielded radioactive material.
19. Transportation and shipment of radioactive materials and handling them.
20. Examination, search of building, persons.

Iteration 2

1. All topics…*(5 comments of this nature. No indication of applying to duties or not.)*
2. All topics applicable…*(3 comments of this nature.)*

3. All of them were useful as they are related topics, but the detection of a radiological source was the most useful.

4. I certainly will benefit from all the additional and valuable information's in my work field, but the practical application does not apply to my work field since I work in the role of the international security coordination.

5. The part on law enforcement not so relevant, detection, and identification very relevant to my work.

6. The role of law enforcement in radiological and nuclear detection.

7. Information on both nuclear, and radiological weapons are relevant to my work.

8. Inspection and methods of detecting and finding any prohibited materials.

9. Detection of radioactive materials using the instrumentation of the MDS mobile lab (searching for the radiation source in the room).

10. Detection of radiological/nuclear materials.

11. Legal shipments of radioactive materials.

12. Legitimate shipments of rad. materials (they DO apply).

13. Practical parts I listed above were the topics that apply to my duties the most.

14. Prevent the spread of such materials in our country and the ways of how to detect them.

15. Radiological and Nuclear detection; Legitimate shipment of radioactive materials; Radiological materials and weapons; How to use technical equipment is very useful for me.

16. Radiological and nuclear threats.

17. Shielding of radiological materials.

18. Smuggling and shipment of radiological and nuclear materials.

19. Search for radioactive materials.

20. Search techniques using manual instruments.

21. Space and vehicle search practices were related to my post as a police officer.

22. The hands-on training application activities on how to deal with the equipment and Inspection.

23. Theoretical and hands-on training topics.

24. Vehicle and building search.

25. We noticed that radiological materials can be found in vehicles and we do a lot of searches in the vehicles, and we should also pay attention to this. We acquired a different perspective.

Iteration 3

1. All.

2. They are all applicable.

3. The practical exercises that constitute a daily activity. The main goal is to have the appropriate reaction in an actual radiological event.

4. What is applicable in my work is secure transports of RN materials. More specifically regulations in this domain.

5. Legitimate transports of radioactive materials, and detection of illegal transports of RN materials are applicable in my work.

6. The basic principles of radiation shielding towards reducing exposure risk. Uranium enrichment methods are not applicable in my work.

7. Recognition of common forms of signaling radioactive hazard; various inspection scenarios and their use in everyday practice.

Iteration 4

1. All are applicable …*(8 comments of this nature.)*

2. All topics we touched upon today are part and parcel of LE work.

3. Applicable - smuggling; Inapplicable – production.

4. Both the theoretical knowledge and the practical exercises.

5. Practical application of the theory on rad/nuc material detection.

6. Rad mat smuggling.

7. Radioactive material smuggling.

8. Smuggling and search of rooms and vehicles.

9. Search of vehicles.

10. The search of the vehicle and the person.

**Q3: Do you have any suggestions to improve today's activities?**

Iteration 1

1. *8 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.*

2. When searching for sources in a building it's necessary to use more than 3 sources.
3. Manual for Backpack should be printed in Ukrainian.
4. Explanation when doing a demonstration.
5. Feedback from practical sessions, their evaluation.
6. It's necessary to solve the problem of replacing ... *(cannot make out – handwriting too small).*
7. More practical demonstrations.
8. More time for practical parts.
9. Perhaps we could form smaller groups, like in real life.
10. Interesting definition of possible source of intelligence related to smuggling and illegal operations with nuclear and radiological materials.
11. It's necessary to hide objects better (during search exercise), with more tricks being used.
12. To make practical exercises more complicated while introducing deadlines.

Iteration 2

1. *5 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.*
2. It would be worthwhile screening the group based on level of knowledge to ensure that everyone understands, but at the same time nobody is faced with unnecessary basic information.
3. Police work implications are less relevant, and detection methods very relevant to my job.
4. Broadening of the protocol (scenario?) of vehicle searches, and adding a more specific, and more detailed version.
5. Differences between close and open sources.
6. C type form (package).
7. More detailed definition of the transport index and supplementing it with a measurement unit.
8. Number of videos and pictures can be increased.
9. A little more time on manual radiation detectors would have been better.
10. Hands on session should be longer.
11. Increasing hands-on training field operations.
12. More exercises will be good.

13. Practical session can be more and it will be more useful if they are based on scenarios.

Iteration 3

1. Everything was OK.
2. No, everything is super.
3. More work with the detection equipment that is used in this training. More exercises.
4. Discussion of various inspection scenarios and responses to radiological incident. Applying such procedures and scenarios in practical exercises.
5. Would like more details on legal transport. Dual use materials.

Iteration 4

1. 5 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.
2. No, good practical exercises.
3. The activities are great.
4. Kudos to the instructors for their patience and thoroughness. Everything was OK.
5. More practical exercises.
6. We should be shown how to use the devices before we do actual detection.

Day Three Feedback

**Q1: Which topics are most useful to you today?**

Iteration 1

1. All topics…*(6 comments of this nature.)*
2. All the topics were beneficial, especially those about special devices for radioactive sources detection and identification.
3. All topics were complimented by the situations from the real life.
4. Composition of sources of ionizing radiation; working with sources of ionizing radiation.
5. The topic on the sources used in industry, national nuclear architecture.
6. Theoretical topics (in the morning) were very good as regards their demonstration but also as regards their explanation.

7. 3C *(Introduction to Concepts of Operation).*

8. 3C *(Introduction to Concepts of Operation),* 3D *(Nuclear and Radiological Detection Hands-on Activities).*

9. Technologies to detect radiation, concept of operations, naturally occurring radioactive material.

10. Working with Pack Eye was a useful theme as we don't have a description of that device. "The concept of operations": I'll use a couple of interesting things from there in my work.

11. Radiation detection technologies.

12. The class about using devices of detection and localization of radioactive materials and their technical characteristics.

13. Devices used to detect radiation materials (both portable and mobile).

14. I am familiar with all the introduced devices and I also used to work with them in the past in a real environment.

15. Information on the use of detection devices – handling and possibilities.

16. Methods of detecting radiological threats.

17. National structure of detection.

18. Operation of each detection and localization device.

19. Practical demonstrations.

20. Practical demonstrations of techniques.

21. Practical exercises, the order of search, the city tour.

22. Practical use of detection devices, ways of protecting and possibilities of protection of law enforcement authorities on the crime scene.

23. Practical use of detectors.

24. Presentation about a vehicle [containing?] radiation control devices.

<u>Iteration 2</u>

1. All topics.

2. All topics were very beneficial to me and I benefited a lot from it.

3. All what was mentioned in the lecture and hands-on training.

4. Since the beginning of the course, each and every day has been connected with one another; therefore, all the activities and presentations offered within the course have been, in my opinion, very beneficial.

5. All the topics that have been discussed in terms of how to use the equipment.

6. We learned the radiation technical equipment by examining them in detail; we learned how to use them and their areas of use.

7. Concepts of operation, Global Nuclear Detection Practices.

8. Introduction to the devices, use of the devices and the calibration settings of devices.

9. It was beneficial to learn the devices used in the search process in individual presentations for each device.

10. It was entirely beneficial. The practical vehicle detector is a good technology.

11. Learn more about the radiation detection equipment and its specifications and the methods of use and maintenance.

12. Radiation detection technologies (all devices). Introduction to the concept of operation.

13. The practical explanations about the use of devices were beneficial.

14. The use of mobile and personal detectors which are employed in Radiological and Nuclear Detection practices.

15. Today, we were able to convert the technical information we have so far obtained into practice via videos in a visual sense and via the scenarios we implemented on site.

Iteration 3

1. All topics…*(3 comments of this nature.)*

2. About the equipment used in Hungary (the exercise).

3. Technologies to detect radiation, and the national architecture.

4. The scenario with the crossing of the green border by the van carrying radiological source.

Iteration 4

1. All of them are useful, but it would be great if we had more practical exercises for detecting rad/nuc threats.

2. All were useful, especially the practical exercises.

3. Rad threat identification and identification.

4. The rad id technology.

5. The RIID and the pagers.

6. Detection equipment.

7. Equipment and detection.
8. The detection van, as well as the RIID, which I use at work.
9. Practical exercises.
10. The exercises for using detection equipment.
11. The practical exercises in front of the building and the detection exercises.
12. The practical exercises that explain the theory.

**Q2: Which content areas or topics apply to your duties? Which topics do not?**

Iteration 1

1. All topics applicable…*(9 comments of this nature.)*
2. The topic on the sources used in industry, national nuclear architecture.
3. This course has many topics that will be useful for me.
4. Everything.
5. I do not know.
6. I think I can apply all, especially about the equipment's use, but I can also apply the background knowledge.
7. Almost all of them.
8. Not in the sphere of my responsibilities but nevertheless were very useful for the discussion about the implementation of some systems in the work of our law enforcement.
9. (*Handwriting difficult to make out*). All themes were new to me but somewhat related to my work. Detection procedure and involvement (role) of law enforcement officers.
10. 3A – *(Global Nuclear Detection Architecture)*; 3B – Radiation Detection Technologies; 3C *(Introduction to Concepts of Operation).*
11. 3C *(Introduction to Concepts of Operation).*
12. Operations.
13. Detection of radioactive and nuclear materials.
14. Nuclear detection.
15. Practical use of detectors, naturally occurring radioactive materials.

16. Practical use of devices.

17. Technologies to detect radiation, concept of operations, naturally occurring radioactive material.

Iteration 2

1. All topics are applied to my work field duties.

2. Very specialized topics and it is as additional information's to my work area certainly very useful.

3. I believe that all these practices are beneficial for us since they all fall in our area of duty as police officers.

4. These topics all applied to my duties: Radiation detection technologies. Introduction to operation technologies. Industrial use of radioactive materials.

5. The parts where we performed the practical training with the vehicle; learned about the shielding of radiological materials and focused on distinguishing among enriched materials have been beneficial.

6. The topics about the shipment of nuclear materials were in line with our area of duty.

7. Prevent the entry of these materials.

8. Customs search plus inspection.

9. Detection and inspection processes and the measures that used before and during and after the detection and inspection.

10. Primary and secondary scanning, Assessment of radiological hazards, Identifying the location of the source, Practical applications (mobile detections), Using the devices.

11. Scanning people. Searching a suspect passing by the vehicle.

12. The use of devices aiding in the detection of radiological materials on site.

13. Using the devices.

14. Radioactive material detection devices and the vehicle.

15. We saw the use of the 'radioactive material detection vehicle', which we can especially use in our continuous practices on the road, especially as police officers. I believe that this vehicle can also be used actively in our duties.

Iteration 3

1. All of it.

2. All of it is applicable.

3. About searching for orphan sources and about reaction in case of smuggling.

4. Radiological detection in border checkpoints.

5. Today we discussed and presented the applicability matters and the procedures under national law to reaction to a radiological incident.

6. We have received two mobile detection vans that we will be soon start using.

Iteration 4

1. Most of the topics are useful.

2. All are applicable (most of them.)

3. All are applicable with the appropriate detectors.

4. Everything.

5. Some rad detection techniques are applicable, and some are not in our work environment.

6. The national detection architecture.

7. Detecting rad/nuc threats, detection technology; the mobile detection units are more applicable; the portal monitors are not applicable, i.e., they are less applicable.

8. It would all be useful if we have the appropriate detectors.

9. The pagers and the detection van.

**Q3: Do you have any suggestions to improve today's activities?**

Iteration 1

1. 6 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.

2. No suggestions or comments. The classes were conducted on a very high professional level. The material presented was clear and easy to understand.

3. More practical classes needed.

4. No, it was sufficient. The demonstration of the use of a vehicle was very useful.

5. Finding solutions for real cases from practice, to inform about good and bad practice.

6. To introduce a practical exercise were all services would be deployed (technicians, bomb techs) to detect the violations.

7. The Slovak written translation of the questions at the end of the presentations does not correspond with what they really mean.

8. To improve the written translations of the presentations in the Slovak language.
    - grammatical mistakes, mistranslations (i.e., whenever ≠ kdekoľvek).
    - not complete translations.
    - some parts were not translated.

Iteration 2

1. *5 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.*
2. I believe it would have been more beneficial if everyone had the devices in their hands as the devices were being explained.
3. You can do more practical exercises.
4. Extension of the duration of practical training.

Iteration 3

1. *3 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.*
2. More videos during breaks.

Iteration 4

1. *3 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.*
2. Since the instructors promised to provide more practical exercises and videos in the training, I think it will all be fine.
3. The training and the trainers are amazing.

Day Four Feedback

**Q1: Which topics are most useful to you today?**

Iteration 1

1. All of the topics …(*5 comments of this nature.*)
2. The whole module focused on direct performance of duties.
3. The organization of the systems of control.
4. Radiological materials and weapons.

5. 4A (Advanced Detection Operations); 4B (Establishing Radiological and Nuclear Detection Awareness in your Organization).

6. 4A (Advanced Detection Operations); 4D (Nuclear and Radiological Threat Demonstrations).

7. Advanced detection operations, practical training.

8. Methods of detecting radiological and nuclear materials.

9. Practical training (*5 comments were of the nature.)*

10. Theoretical and practical topics.

11. Cargo search scenario – neutron shielding.

12. Performing a vehicle search.

13. Practical exercises on detection and localization of potential [radiological] threat.

14. Searches and examinations.

<u>Iteration 2</u>

1. All topics.

2. I have benefited from all topics.

3. Advanced detection operations and demonstration.

4. Advanced Detection Operations and Development of National Detection Capacities.

5. Advanced detection operations, practical exercises.

6. Advanced detection operations, raising awareness about the detection of materials.

7. Operation, detection and cooperation in these matters.

8. Planning processes.

9. The chemical, and radiological parts training exercise.

10. I believe that they were all useful. However, the part where we scanned the person who triggered an alarm was more beneficial.

11. The presentation on the instruments.

12. Identify the equipment and technology used in the inspection process.

13. Informing the senior management of the risks.

14. Inspection of pedestrian, vehicles and residential areas.

15. Inspections and detection and safety processes.

16. All of the practical trainings in the afternoon were beneficial.

17. I believe that the practical training in the afternoon was beneficial. The use of stronger radioactive materials in the practical sessions was also well-directed.

18. It was beneficial to have a practical training on searching and finding radioactive materials by using the devices.

19. It was nice to do on site the pedestrian, packs, vehicle and building search practices as part of the advanced detection operations.

Iteration 3

No comments discernable for iteration 3.

Iteration 4

1. Raising the awareness on the dangers arising from the misuse of radioactive materials.

2. It is important to raise the awareness of all state institutions or all units that work on detection of nuclear and radiological material.

3. Procedures for detection of nuclear and radiological material.

4. All topics were beneficial, especially the practical part – the boat, wide area and vehicle scenarios.

5. Detection of radiation in a vehicle, a wide area and pedestrian searching.

6. Detection of radiological and nuclear threats.

7. Detection practical exercises.

8. The exercise referring to locating and recognizing radiological materials in buildings and motor vehicles.

9. The vehicle search exercises, especially the reaction (including how fast the reaction should be) will be most beneficial in the context of all state institutions in the country.

10. Vehicle search …(*2 comments of this nature*.)

11. Wide area search and detection, international programs for strengthening of detection capabilities.

12. The practical exercise with the smuggling of radioactive materials.

**Q2: Which content areas or topics apply to your duties? Which topics do not?**

Iteration 1

1. All topics…(*4 comments of this nature. No indication of applying to duties or not.*)
2. All topics applicable…(*4 comments of this nature*.)
3. All of them do although circumstantially.
4. Not now but maybe in the future.
5. Related: Role of law enforcement officers in detecting nuclear threat; radiological and nuclear threat; radiation signs.
6. In my work I could use things discussed in 4B (combating organized crime).
7. Nuclear detection awareness.
8. Detection operations.
9. Detection tactics, superficial (primary) search aimed to detect anything illegal, including radiological threat.
10. Practical trainings.
11. Practical work with sources of ionizing radiation.
12. Search scenarios – vehicle and pedestrian, area, cargo.
13. Searching, examining buildings, people.
14. Examination and seizures.
15. When having practical trainings, tactical failings were also detected. I remember it in order to prevent them.

Iteration 2

1. All fields and topics.
2. All topics are applicable.
3. As required by our duty, the topics on search and scan were suitable for my area.
4. Developing an effective awareness and the trainings parts were all suitable for us.
5. Advanced Detection Operations are suitable for us.
6. Operation.
7. Training, rules, detection technologies.

8. Planning, follow up, and inspection and take precautions.

9. Detection methods – scans. Raising awareness on a regional level. Searches and scenarios.

10. Inspections and detection and safety processes.

11. Learning the ways in which radioactive and nuclear materials can be smuggled; performing a practical exercise on detection and capture.

12. Demonstration of radiological and nuclear threats.

13. Searching.

14. The inspection of passengers and vehicles.

15. Practical exercises.

16. The practical activity that I mentioned above was suitable for my area.

17. The practice related to scanning and the scanning of suspicious persons, vehicle search and building search have been useful. At the end of all practices, the question marks that we had about the use of the devices were eliminated.

Iteration 3

*No comments discernable for iteration 3.*

Iteration 4

1. All topics applicable…(*4 comments of this nature.)*

2. All covered topics on radiological and nuclear threats.

3. All of the topics were useful, but we need better equipment in addition to the pagers (personal detectors).

4. Applicable: training programs, detection operation, raising the level of safety culture, strengthening of detection capabilities.

5. Radiation detection.

6. The exercise with the vehicle suspected of transporting radioactive materials (the importance of following a procedure).

7. The practical exercises of searching a building, boat and vehicle.

8. The source hiding and searching exercise will help me in the organization of trainings for police and customs officers.

9. The exercises performed today are applicable in our work.

**Q3: Do you have any suggestions to improve today's activities?**

Iteration 1

1. *6 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.*

2. Everything was very good especially the practical exercises.

3. A general suggestion: It might be necessary not only to examine public places with lots of people for radioactive materials but also to combine it with examination for explosives (using search dogs etc.) in view of a great threat of using an explosive device with radioactive materials.

4. It would be better to practice in town in natural surroundings.

5. I'd like to know if there are examples of recording and detecting extremist people who were planning and getting ready to commit terrorist acts or other illegal activities using chemical or radiological weapons or materials.

6. More documentary (science) video needed.

7. More time for practical trainings.

Iteration 2

1. None. All was optimal.

2. The lecture about the instruments should be before the students are expected to use the instruments, so we know what we are doing and why.

3. The use of strong radioactive materials makes the use of devices more understandable.

4. A little more time should be set apart to demonstrations. They were very useful even this way, but with some more time available they could be even more interesting and useful.

5. I believe it may be more beneficial to provide the explanations while the practical exercises are done.

6. It would have been more useful to have personal protective equipment and masks during the practical exercises in order to have a more realistic exercise.

7. In relation to the vehicle search, I believe that it would be more useful to prepare a vehicle with specially designed stashing compartments and that it would also be better if the instructors did the hiding of sources in the vehicle. In addition to the instructors, other officers can also do that.

8. I believe that more time should be allocated to practical training and that it should be adapted to real life situations.

9. It would be useful for us to practical exercises outside the ILEA facilities, this way, such trainings can be improved.

10. It would have been more useful to spend more time on practical training.

11. Practical trainings are more useful.

12. Increase hands-on training inspection processes and have them within the daily basis agenda, and clarify the errors that occur during inspection processes to be more aware and obviate next time.

13. To increases hands-on training field exercises.

Iteration 3

*No comments discernable for iteration 3.*

Iteration 4

1. No suggestions since this is excellent training.

2. Everything was great.

3. No, everything was ok.

4. Exercises were great.

5. Everything is well organized and balanced – the theory and practice go hand in hand.

6. I would like to express my gratitude for the great lectures.

Day Five Feedback (Feedback from iteration 4 only)

**Q1: Which topics are most useful to you today?**

1. All topics applicable…(*4 comments of this nature.)*

2. Everything was useful, especially the presentations of participant countries.

3. Investigations in detection nuclear or radiological material.

4. Nuclear forensics…(*2 comments of this nature.*)

**Q2: Which content areas or topics apply to your duties? Which topics do not?**

1. All.

2. All topics were useful.

3. Combatting nuclear material smuggling.

4. Cross-border cooperation, cooperation with international organizations.

5. Everything is applicable.

6. In general, all.

7. International cooperation.

8. PRD assisted detection; Investigations.

**Q3: Do you have any suggestions to improve today's activities?**

1. No suggestions, today's activities were excellent.

2. Practical examples.

Feedback Day Unknown

**Q1: Which topics are most useful to you today?**

1. All topics…(*16 comments of this nature*).

2. Atomic analysis.

3. Detecting and identifying radiation materials.

4. Detecting, identifying and checking radioactive materials.

5. The most important themes and international traffic marks, consequences of radiation, radiological materials.

6. Together with theory it's both interesting and useful to have hands on exercises and use the instrument available here.

7. Types of radioactive materials, radioactive safety, shielding. Practical class on using portable hand-held detectors.

8. Interagency cooperation is very important. I enjoyed it.

9. Presentation briefing.

10. Uranium usage topic

11. I liked the best making a presentation on nuclear smuggling. Also, the experience shared by the colleagues.

12. Radioactive material smuggling through the green borders.

13. Information on materials needed to create a nuclear weapon.

14. Operation conducted in Bulgaria.

15. The Bulgarian case and how police reacted …(*2 comments of this nature*).

16. Practical exercises.

17. Searching a vehicle, interviewing the driver, localizing nuclear materials.

18. The most helpful was the seminar on detecting radioactive materials.

19. Working with detection equipment.

**Q2: Which content areas or topics apply to your duties? Which topics do not?**

1. All topics…(*4 comments of this nature. No indication of applying to duties or not.*)

2. All topics applicable…(*8 comments of this nature.*)

3. All topics.

4. Everything. What is not related to my duties is role of LE in detecting of radioactive materials and their seizure. Circumventing green borders.

5. None of the topics and areas are relevant for my job. That's why it was useful for me.

6. They are relevant in a way.

7. Yes.

8. When finding a source we take care of the officers' safety and further research is done by another agency.

9. When we find something other agencies research it further.

10. Cooperating with other agencies in case of finding nuclear materials.

11. Cooperation. Interaction.

12. Detecting nuclear stuff, using PRDs.

13. Detecting the nuclear materials and using PRDs.

14. Detection and identification of nuclear and radiological materials.

15. Radioactive material detection.

16. Responsible for POE's operation to detect radiation materials.

17. Interdiction of domestic illegal trafficking of radioactive waste. Information gathering processing and implementing.

18. Radiation safety and inspection at POE.

19. Receiving operative information on radiation materials, processing and conducting operation.
20. Smuggling of nuclear and radiological materials…(*2 comments of this nature*).
21. Radioactive smuggling on the green borders.
22. I'm interested in instruments, how to use them, and more practicing.
23. Using a vehicle.
24. Using identifinders.
25. Using radiation detection equipment. I am not working at nuclear electrical power station.

**Q3: Do you have any suggestions to improve today's activities?**

1. *21 comments were of the nature that everything was satisfactory and no suggestions for improvement were given.*
2. Big thanks to USA.
3. Everything was on the highest level and I want to thank all organizers for excellent treatment.
4. I want to thank US organizations. Everything was well organized.
5. Special thanks to all instructors for their professionalism.
6. Thanks to ILEA and US Government.
7. More hands on exercises and real testing.
8. More practical exercises.
9. More practical exercises.
10. Everything is good, but it would be better to have a longer course, at least two weeks, to get deeper into details to interdict radioactive materials.
11. We need such trainings in Ukraine at actual checkpoints, using real sources.

**Student Comments from End of Course Evaluation Reports**

Iteration One

**S1: Course Content**

1. Methods of the work of our law enforcement. The only suggestion is to make this course a two-week one in order to understand the material better.

2. A great synergy of theory and practice! A high level of professional preparedness of the instructors. The slides were translated into Russian very poorly. It's a shame!

3. A very high level of professionalism and the best organization one can think of. I would suggest more time for such seminar. The topic of trans-border an international cooperation should be covered in more depth and it takes time.

4. It was a very good and beneficial course. Very close to reality. Hands-on make it even better. I didn't find any weak points.

5. The course was very well organized. The only suggestion would be to extend it to at least 2 weeks in order to make a better use of the material. Besides, the quality of the written translation –the slides - leaves much to be desired, sometimes I wouldn't understand the meaning at all because the written translation was inadequate.

6. The course was very interesting and informative and very topical too. The strongest part of the course were hands-on where we applied the theoretical knowledge acquired.

7. Strong points of the course were practical classes. They were very interesting and useful for further practical work. During a course like that it would have been nice to spend more time learning the order of (*NOT CLEAR*) .... facilities and have practical classes on that in groups.

8. I liked the way they talked about cooperation with law enforcement officers from other agencies.

9. Strong points: 1) Excellent organization 2) Importance of the theme. Weak points: some inaccuracies in translation.

10. The course enables law enforcement officers to learn basic information they need in their professional activity connected with ensuring radiological safety and prevention of proliferation of nuclear materials.

11. Strong points: practical classes, working with equipment (devices), modelling various situations which reflect real events. No weak points found.

12. I believe that the strong point of the course was establishing cooperation with our foreign partners. The weak points were: 1) no practical classes (laboratory sessions) on screening *(? handwriting not clear, but looks like screening)* enriched uranium and plutonium; 2) no Ukrainian or Russian script (version) on the Backpack device.

13. Methods of recording channels of illegal trafficking of radioactive materials and their turnover were not covered from the law-enforcement prospective, using concrete examples from FBI experience and that of the police of other countries. It would have been necessary to provide information about consumers of illegal radioactive materials.

14. (*Handwriting is very difficult to understand – very small print*) Strong point: people from different agencies were involved, which is important in terms of cooperation between them. Week point: too much information and too little time.

15. Strong points were that the material was delivered clearly, which was also thanks to the fact that there were practical classes too.

16. Strong points: the Academy management worked with great responsibility; the Academy has powerful resources, the material was clear to understand.

17. A clear overview at the beginning, logical structure, the slides include everything we need to know but not too detailed either, so that we could listen to the speaker, conclusion and summary at the end.

18. No comments.

19. Strong points – practical demonstrations of radiation detection.

20. Practical exercises / no negative comments.

21. The strong point of this course, in my opinion, was the perfect organization and the combination of theory with practical exercises. I have not noticed any weak points.

22. Very well organized, from simpler things to more complicated ones. Practical exercises were excellent and well organized. The instructors were friendly and professional. I would welcome some more in-depth presentations on the physics of radiation.

23. I liked the fact that in the morning we did theory and in the afternoon we could put into practice all that we learnt in the morning. In practical exercises we also made some mistakes, but that what exercises are for – to eliminate these mistakes in practice. There is nothing I did not like about the course. I liked the fact that the instructors wanted us to ask about anything we did not understand.

24. The course was organized on a high level, practical as well as theoretical parts provided lots of useful information for law enforcement work. The instructors' approach was warm, friendly and with a great deal of patience and I would like to thank them for that. I could not say what were the weak points, perhaps only the duration of the course, it could be longer.

25. Strong points were the excellent job of the instructors, their great presentation and explanation of the topics concerned, they were very well prepared and highly professional. No negatives, all was done on a highly professional level.

**S2: Instructors**

1. The instructors showed a great deal of scientific knowledge, they are very sociable and friendly.

2. The faculty deserve the highest grades. They showed how professional and competent they are besides being very sociable and friendly.

3. The faculty are very professional and knowledgeable.

4. All instructors were very competent and showed a great deal of knowledge and also were very good in passing this knowledge to us.

5. A big thanks goes to the instructors. Their explanations were easy to understand. They are real professionals. Good job!

6. All the instructors acted as high level experts.

7. The most useful instructors were Mark Wittrock and Zac.

8. In general, all the instructors are well prepared experts.

9. The instructors were very competent; the delivery of material was easy to understand, focusing on important issues. They (instructors) can be credited with attracting very good attention of the audience.

10. In general all the instructors, as well as other staff involved in this course, made a very good impression, especially, Paul, Bill and Zac.

11. The instructors delivered the course in an informative and easy-to-understand way. I will try to recommend using some of the information I learnt from them in our work (especially organization of security provision at mass events).

12. The material was delivered very clearly, we had an opportunity to ask questions and clarify some points. The instructors were careful and polite.

13. The instructors are very well prepared professionals. The material was delivered very clearly, in an easy-to-understand way.

14. All the instructors delivered the materials professionally and in an interesting way.

15. Conscientious attitude of the instructors to their duties, excellent organization of classes.

16. Well-prepared, helpful, flexible, admirable both as a professional and as a person.

17. No comments.

18. Professional level, friendly, relaxed atmosphere.

19. No comments.

20. No objections to the instructors' work, they were very professional.

21. Professional, friendly and willing to explain all that we did not understand.

22. The instructors were very flexible, they knew how to react to questions and their professional approach was demonstrated also in the practical exercises.

23. Already mentioned above.

24. No objections, all the instructors were very well prepared which showed that they are experts in their line of work.

Iteration Two

*No report was received from iteration two.*

Iteration Three

*No comments were included in the report for iteration three*.

Iteration Four

**S1: Course Content**

1. Practical exercises.

2. One hurdle: we need a presentation on how to use the instruments before we actually use them.

3. The serious approach of the instructors and all the participants which befits the matter at hand is the strong suit of the training; no weaknesses.

4. Raising awareness of the population about how important it is to prevent smuggling and detect radiological and nuclear radiation.

5. The instructors were among the best. No cons.

6. The agenda was too tightly packed, and still there was room for improvement. We should have had training on using the instruments before we actually used them, not vice versa. Anyway, in general, the organization was exceptional.

7. The instructors had vast theoretical, but also practical knowledge. I don't think we had any weaknesses bar the fact that in my opinion we needed one more week of training.

8. I think the con is the duration of the course; I believe it would have been more useful if it was 10 days, so that we have more time for practical exercises.

9. The course was very useful, because I had some previous knowledge of radiation and rad/nuc detection gear, but now I received additional explanation on the topic from qualified professionals with a theoretical and practical explanation to boot. Thanks to the organizer.

10. A very good use of Power Point, very good practicals, just give us more critique so that we understand where we have gaps in our practice.

11. Strong side – high knowledge. Weak side – too few sources and isotopes.

12. The course gave us a big amount of knowledge. Very good and experienced instructors.

13. A very hot topic for us. I wish the slides contained more information.

14. A high level of organization, excellent training aids it was very informative.

15. Theory and practice combined –super!

16. A very well presented material, very professional instructors, no weak sides at all.

17. Strong sides – very good practical exercises, no weak sides whatsoever.

18. A very good course! I think I will use the acquired knowledge in my work.

19. Technical equipment of the course was very impressive, a lot of handouts – good job!

20. Positive – the use of slides, a lot of practicals, would be nice to hear the instructors critique about what we do wrong and how to do it better.

21. A lot of practical experience shared, interactions with instructors.

22. Well equipped, good timing of lessons and breaks, understandable examples.

23. Strengths – a lot of practical session.

24. The most major strength was the good teaching technique. It was easy to get the knowledge.

25. That was a very interesting and useful course, i liked it as it was. I wish it would be longer, at least a month. At the beginning i was afraid that I won't be able to understand everything because we didn’t have a translator, but now I'm happy that I could practice English, and all of the presentations were crystal clear!

26. Everything is fine, though it might be better if it's longer.

27. The course met all the goals.

28. Everything was fine.

29. All in all, the organization was spot-on. One remark - we have to be shown how the equipment works before we try it out.

30. Everything was ok.

31. The instructors were professionals and they were experts. They were well organized and dedicated to the students.

32. The instruction was very detailed and the instructors knew how to explain the matter.

33. The organization was great.

34. Everybody involved, especially the instructors, was very serious, showed proficiency and professionalism.

35. The instructors were great and professional. No weaknesses, in my view, except perhaps it should last for one more week.

**S2: Instructors**

1. All instructors were top-notch, they had intimate knowledge of the topics they were talking about.

2. Good and professional.

3. They hit the ball out of the park, no negative remarks. Professional in every respect.

4. They were absolutely professional in their conduct and in the way they carried out the instruction.

5. No negative remarks.

6. No special negative remarks.

7. All of the instructors were at the top of their game, especially when they used various scenarios and practical exercises.

8. I liked how professional American instructors are.

9. This is the highest level of professionalism.

10. Very friendly, professional people. They explained everything in an easy-to understand way without unnecessary scientific details.

11. Highly professional instructors, good methodology.

12. Very knowledgeable experts.

13. It was very easy to understand.

14. Good job! Welcome to Kazakhstan!

15. All very competent and knowledgeable instructors.

16. All was excellent. Good job!

17. They are real professionals.

18. I like their teaching method. Very clear ad easy to understand.

19. Thank you for this training course. Excellent!

20. They were perfect.

21. They are very experienced, and ready to share.

22. The instructors have great skills.

23. All of them were so nice, I hope they will teach me again on another course in the future. Thank you!

24. No negative remarks. Excellent instruction. The instructors should continue doing this.

25. Everything is ok.

26. The instructors were great, each an expert in their field.

27. All in all, great.

28. Very good explanations, coupled with practical exercises.

29. No negative remarks, it was all good.

30. Excellent instructors, each in their own field.

31. No negative remarks.

Iteration Five *(for iteration five the comments were based on questions)*

**S1: Course Content**

1. The objectives of this course were clearly explained.
   - Yes, it was explained since the beginning of the class.
   - Excellent pool of instructors.
   - All material objectives are explained at the beginning of the slides.
   - Theory and practical were complete.
   - All objectives were clearly explained by the instructors.
   - Clearly understood expectations of the contents of every topic.

2. The course objectives were achieved.
   - Need more practical than technical.
   - Not too theoretical.
   - Enabled us to conduct identifications by using tools.
   - Participants understood the detection techniques and tactics.
   - Absolutely.
   - It was clearly defined and explained to students.
   - Understand base knowledge to master the operation skills of equipment.

3. The course was organized in logical manner.
   - Absolutely. I loved the socials activities too.
   - Classroom instructions follow by practical exercise in the afternoon is effective teaching methods.
   - Theory and practicals every day.

4. The training materials used in the course were useful.
   - The training was beneficial for our country and unit.
   - Theory was complete.
   - Yes, even though every country has its own problems and challenges. Very good.
   - The students have been familiarized with the course with the help of adequate training materials.

5. The course provided me with information that will help me to do my job better.
   - I have learned usable skills and techniques which I will share with my organization.
   - This will make a more effective law enforcement.
   - Very helpful.
   - Aid our country to anticipate R/N threats by terrorists.
   - I agree with the detection aspect. But I am still confused about the first responder aspect.

6. The length of the course was:
   - Five full days, excluding class administrative time would be better.
   - Wish it was longer.
   - Enough course materials to cover in a week of training.
   - One week was enough.

7. For me, the pace of the course was:
   - Enough to course materials for one week of training.
   - Slow.
   - The material was more focused on personnel capabilities in detection.

8. The translations both verbal and written for this course were:
   - Because this is the first Radiological course, there may have been some translations that were not perfect. Maybe some literature is needed to assist for future courses.
   - Even though the material was very technical, the translations were adequate.
   - Willey is very professional interpreter and Jenney is very nice, both are excellent.

9. Overall, I believe this course was:
   - Different material is needed for comparative purposes.
   - Well structured and well delivered by committed instructors it is good to have instructors from clinical backgrounds.
   - Timely, useful and very Informative.
   - The objectives were delivered more than I expected. Thank you to the instructors.

10. Would you recommend this course to others?
    - Yes, to let other peoples to know the knowledge.
    - Yes, because it's necessary also for awareness of the hazards that process danger to all people.
    - Awareness of people in the government for the public will balance the readiness of the people.
    - Others should be aware too of the threats and hazards that radiological materials brings to man. Hoping for the advance class soon for the same participants.

**S2: Instructors**

1. What could the instructor do to improve his or her performance?
   Anderson
   - Great during working groups.
   - As an instructor with a police background, maybe Gerry can provide more experiences in the field so that we can expand our understanding.
   - Very experienced.

   Libby
   - Instructions by Dr. Libby are clear but needs some elaboration.
   - Mastered the radioactive material.
   - Dr. Libby is an expert in his field, but it would be better if he could provide analogies that are easier to understand for some of us that do not have a radiological background.
   - Outstanding knowledge.

   Siefken
   - Perfectly good.

   Wittrock
   - It would be better if Mark could change his way of speaking, to become more attentive.
   - Very experienced. Will be a good reference for our duties.
   - Try to be humorous in classroom.

   Yezzi
   - He is perfectly well.
   - Should speak louder.
   - When teaching, please speak louder.

2. The instructor was easy to understand.
   Libby
   - It is hard to convey technical knowledge in layman's language. Richard did it so well.

   Wittrock
   - Very effective communication technique

3. The instructor demonstrated knowledge of the subject.
   Yezzi
   - Good to have Chris bringing on ideas for venue security.

4. The instructor's behavior was professional.
   Anderson
   - Jerry is totally committed. Thumbs up.

5. The instructor was easily approachable.
   Siefken
   - Friendly and always encouraging.

6. The instructor spoke clearly and was easily understood.
   Yezzi
   - However he was speaking a little bit low and soft, could not hear him clearly.

7. The instructor effectively used training aids.
   - No comments.

# Appendix E

# ILEA Course Instructor Feedback

# Appendix E

# ILEA Course Instructor Feedback

- During participant introductions, instructors learned that several attendees had advanced degrees in nuclear engineering and chemistry. The Hungarian participants were most experienced in radiological and nuclear detection and had the deepest technical experience. The delegation from the United Arab Emirates (UAE) also had several representatives with nuclear engineering or nuclear licensing backgrounds. The Turkish delegation had the most law enforcement experience. This expertise showed during afternoon practical exercises that related to standard police operations such as a traffic stop.
- It was apparent in the training most recently conducted at International Law Enforcement Academy (ILEA) and in previous Domestic Nuclear Detection Office (DNDO) courses that the competencies of country teams and the experience within the country teams vary greatly. For some country delegations the information provided is a refresher and the major take-aways are the law-enforcement-specific information. For some, the entire concept of radiation is new.
- The students are often not as engaged in the training as the instructors would prefer. Some students, as in the case of the UAE, were primarily administrators and had little interest in radiation detection and identification.
- The course information was focused primarily for interior law enforcement personnel who have very little or no experience with radiation detection. Both the April 2013 and October 2013 courses included some very experienced personnel with formal training in radiation detection or nuclear engineering. Some of these participants also currently work in a customs role instead of interior law enforcement.
- It is understandably difficult to attract participants from different countries with similar experience levels; however, it can be difficult to present the appropriate level of technical information when some participants from a country are very experienced in radiation detection and others do not even know the fundamentals of radiation.
- A basic pre-course test could be given, either prior to travel to ILEA or the day after arrival. The purpose of the test would be to determine basic gaps and deficiencies in students' knowledge before the course begins, allowing sufficient time to schedule basic training on handheld equipment, general radiation information, or other essential topics to get all students at a standard minimal level of knowledge before the course begins.
- Alternatively, on the first or second evening of the course, after required material has been presented, a catch-up, or evening study session could be held to assist participants with less experience learn basic principles in a friendly setting.

- The broad range of participant familiarity with radiation detection makes efficient instruction challenging. Some participants have never had any training on radiation, while others have taken several courses on radiation detection and use handheld detectors frequently.
  - A pre-course survey might be useful to better understand audience experience prior to the course.
  - More advanced training modules could be used to supplement the core curriculum for experienced participants.
- The DNDO tabletop discussion was very helpful during the May course to replace a presentation that was too basic for the audience.
- If a common language exists between a majority of the participants, groups could be formed based on experience level to allow instructors to cater to participant needs.
- 1C Radiation Safety could be streamlined for law enforcement audiences.
- Reduce some content in module 1A, and move that material to subsequent presentations.
- The uranium pathway to a nuclear weapon (concept of enrichment) was difficult for some of the participants to visualize. Additional handouts with pictures of centrifuges might help speed up the background conversation on enrichment to allow more time for discussing trafficking.
- Discussions of critical incident management with the participants during the field exercises were useful to provide a framework for search and detection activities. It might be beneficial to add a slide to presentation 1B Role of Law Enforcement, or at least more formerly address critical incident management with the entire class.
- The specifics of radioactive crime scene management and radioactive evidence collection are of interest to participants.
- Having one experienced Hungarian law enforcement officer in the classroom during the entire course would assist instructors in describing how they employ detection and in answering questions. The Hungarian participants were very proficient in explaining their equipment (MDS van and backpack detector).
- More formal search procedures could be employed during the field exercises later in the week. An incident commander could be selected and systematic search plan developed and enforced for vehicles, checkpoints, and wide area searches.
- To ensure consistency in course delivery, Instructor guides should be developed for all practical exercises (PEs). To date, there are none, which leaves it up to the instructor to improvise and adapt each PE based on the time and resources available.
- Field exercise scenarios could be documented and translated ahead of time to speed up and better explain each rotation.
- A brief vehicle search video (perhaps a U.S. Department of Energy Second Line of Defense animation) would be useful to show to the participants Tuesday morning before the afternoon vehicle search rotation.
- It would probably be best not to let participants chose where instructors should hide sources until the Thursday red team exercises.

- The wide area red team exercise is best performed in the ILEA shoot house, instead of the smaller basement rooms.
- More radioactive sources would improve afternoon field exercises. Including the following items would help the exercises:
  - Multiple neutron sources (ideally 3 neutron sources)
  - More gamma sources (6-9 gamma sources)
  - Examples of industrial radioactive equipment
    - Radium dials or gauges
    - Older density gauges
    - Empty or very weak portable x-ray devices.
- Country-specific information is very useful to engage participants:
  - Pictures in presentations could be updated.
  - Research on past regional radiological incidents may produce historical stories that could be introduced during classroom training.
- Updating the presentation slides with country-specific information for the next course could help participants retain the instruction. Updated slides might include the following information:
  - Local sites that may contain radiological material (major hospitals or industrial sites)
  - Reactors or nuclear research facilities
  - Applicable International Atomic Energy Agency (IAEA) seizure data or orphan source recovery efforts within a participant country
  - Photos from the Hungarian October 2013 country presentation showing recent source recovery efforts in a Budapest apartment and after a car accident.
- Print pictures to pass around to help officers visualize threats, notice radionuclide indicators, and other radionuclide red flags. Some examples of photos to pass around might be of uranium trafficking or the 2000 bomber from Washington State.
- Integrating more DNDO videos evenly throughout the training would be beneficial.
- Several of the end-of-module knowledge check questions could be revised to clarify content and reduce confusion:
  - Module 1C: radiation, in certain situations can be seen
  - Module 5B: simply rewrite the sentence or remove “not” to reaffirm points and avoid translation issues.
- The classrooms, accommodations, and other logistical arrangements are very good. The ILEA support staff is responsive and proactively work to solve instructor and student needs.

**Comments/Feedback from Interpreters (Iteration Five Only)**

- I accompanied the Cambodia and Thai Team for the practical exercise at the dorm library and many of the participants were confused about the natural neutron particle that was leaked through the wall from the laundry. The participants thought that was evidence that needed to be collected. Later, I discussed this situation with Dr. Richard. He explained that the naturally neuron particle appeared only once in a vehicle and not much from the industrial material in the laundry, even though it penetrated through the wall. I suggest that if the instructor for this exercise could explain this concept more thoroughly, the participants would have a better understanding.
- Since this is a new course and very technical, it should not be overlapped with another course. We find it hard to concentrate on each course.
- Some instructors (not all) should improve their presentation skills (speed+clear+flow+etc.).
- Very useful for law enforcement.
- Too technical, should focus more on practical application. In-depth information was too overwhelming (informed to interpreter by participant).
- The materials used in the course were excellent. The participants learned new knowledge and enjoyed the class. They asked many questions and were very eager to learn in the practical. The delivery of presentations was very good. The instructors mastered the content/topic so it was easy to follow the blocks of instruction.
- Good.
- Suggest instructors to improve teaching skills.
- Provide some actual cases to participants.
- Decrease time used for operation equipment and devices.

# Appendix F

# Summary of Global Threat Reduction Initiative Courses and Workshops

## Summary of Global Threat Reduction Initiative (GTRI) Courses and Workshops

| Title/Topic | Delivery Method | Target Audience | Summary | Lessons or Modules |
|---|---|---|---|---|
| **COURSES** | | | | |
| Physical Protection and Security Management | Lecture, discussion, demonstration, and practice exercise | International regulatory authority staff, operators of facilities managing high activity radioactive sources, and others involved in the safety and security of radioactive sources. | Four-day course aims to develop a basic understanding of the principles and practice of physical protection and security management of radioactive sources. The course helps create the basis for development and implementation of a regulatory program of standard setting, assessment, and inspection, as well as an operator implementation and compliance program.<br><br>One of the main goals of this course however is to introduce partner countries to the work that GTRI does. | • Radioactive Sources and Their Beneficial Uses<br>• Briefing on the University Medical Center Facility<br>• Categorization of Radioactive Sources<br>• Consequences of the Malicious Use of Radioactive Sources<br>• IAEA Code of Conduct: Recognizing Best Practices<br>• Understanding and Assessing the Threat<br>• Risk Identification, Analysis and Management<br>• Physical Protection Principles<br>• Physical Protection Equipment<br>• IAEA Security of Radioactive Sources Implementing Guide<br>• Designing a Physical Protection System to Comply with Prescriptive Regulations<br>• Designing a Physical Protection System to Comply with Performance-based Regulations<br>• Security Management: Engaging All the Elements<br>• Security Culture<br>• Final Exercise |

| Title/Topic | Delivery Method | Target Audience | Summary | Lessons or Modules |
|---|---|---|---|---|
| Alarm Response Training | Lecture, discussion, and tabletop and practical exercises | Domestic radiological safety personnel, on-site security force personnel, a central alarm station/dispatch person, training officer, and supporting local police personnel from each facility represented. | Three-day training in the area of response for radiological events and provides an opportunity for the security forces, health and safety personnel, and other responsible parties such as the supporting local law enforcement to develop, discuss, and exercise their own tactics, techniques, procedures, and protocols when responding to a theft and/or sabotage event involving radioactive materials of significance. | • Radiological Threat and Consequences<br>• Effective Use of Security Equipment<br>• Radiation Fundamentals<br>• Radiological Materials of Concern<br>• GTRI Protection Strategy<br>• Radiological Incident Response Annex<br>• Response Planning Practical Exercise<br>• Radiation Instrumentation<br>• Target Folder<br>• Tabletop Exercise<br>• Practical Exercise |
| International Response Training Course | Lecture, discussion, and tabletop and practical exercises | International first responders such as site security guards, police officers, response force personnel, radiation safety officers, and alarm dispatchers. Participants should have duties involving response to a security incident at a facility that involves the possible theft or sabotage of a radioactive source. | This 5-day course provides an overview of radiological security incident response, specifically for site staff, security personnel, and law enforcement officials. | • Defining the Threat<br>• Physical Protection Principles<br>• Basics of Radiation Awareness<br>• Radioactive Sources, Locations, and Awareness for Law Enforcement<br>• Effective Use of Radiation Detection Equipment<br>• Incident Response—First Responder Duties and Actions<br>• Site Visit, Site Survey, Target Folder Development<br>• Response Assessment Exercise (Tabletop Response Scenarios) |
| Personal Radiation Device (PRD) Train-the-Trainer | Classroom and practical application | Radiation Safety Officers | Two-day courses that teaches training staff the proper use of the GTRI-provided RadEye G and PRE-ER units and the proper development of on-site PRD training and maintenance programs. | • Use of RadEyeG and PRD-ER units<br>• Development of on-site PRD training and maintenance programs |

| Title/Topic | Delivery Method | Target Audience | Summary | Lessons or Modules |
|---|---|---|---|---|
| Radioactive Source Security Inspectors (RSSI) | Presentations, group discussions, and interactive exercises | International regulatory authority staff, radioactive source safety inspectors, and others involved in radioactive source security inspections and enforcement. | Four-day course to provide an understanding of implementation requirements and authority surrounding the security of radioactive sources. Also, addresses the inspection of security measures in compliance with those requirements. | • Regulatory Overview<br>• Introduction and Overview of the Inspection Process<br>• Inspection Methodologies: Document Review and Exercise<br>• Inspection Methodologies: Observation<br>• Inspection Methodologies: Interviewing<br>• Inspection Methodologies: Performance Testing and Exercise<br>• Physical Protection Equipment Presentation and Demonstration<br>• Inspection Planning<br>• Inspection Conduct<br>• Comprehensive Planning / Conduct Exercise<br>• Post-Inspection Activities<br>• Mock Inspection Practical Exercise |
| **WORKSHOPS** | | | | |
| National Response Plan Workshop | Lecture | International regulatory authorities, national response authorities, and major users of radioactive sources. | Focuses on high-level national management of and response to a scenario where radioactive material is out of regulatory control. | |
| Search and Secure Workshop | Lecture, discussion, and practical exercises | Radiation protection staff | Five-day workshop designed to discuss locating, identifying, packaging, transporting, and securing orphan radioactive sources | • Developing a Verified Inventory<br>• Organizing a Search Team<br>• Search Planning and Procedures<br>• Using Detection (Search) Equipment<br>• Characterizing Unknown Sources<br>• Packaging and Transporting Radioactive Sources<br>• Orphan Source Searches |

| Title/Topic | Delivery Method | Target Audience | Summary | Lessons or Modules |
|---|---|---|---|---|
| Table Top Exercises | Near-real time game play | Players and participants usually include:<br>• Federal<br>• State (emergency management, regulator, etc.)<br>• Local /Private (safety personnel, site security, local law enforcement agencies, fire department, county/city personnel, etc.) | Customized to a specific site using:<br>• Realistic events based on actual FBI threat information<br>• Video injections with mock-media involvement for fast paced action<br>Challenges first responders to:<br>• Stop theft<br>• Recover missing material<br>• Execute post-dispersal consequence management | No-fault, site-specific scenarios to exercise response to terrorist acts involving nuclear and radioactive materials. |
| Site Security Plan Development Workshop | Lecture, discussion, and independent work | International regulatory staff responsible for license assessment and operator staff responsible for site security management. | A site security plan development effort conducted over a four phase process that consists of two workshops, each followed by independent work by operators to finalize the security plans started during the workshops. The four phases culminate in the completion of site security plans for several sites in the country and providing regulators the ability to facilitate the development of site security plans for the remaining sites in the country. | Accomplished in four phases over a period of several months.<br>• Phase 1: Initial workshop to develop security plan outline and schedule (workshop/lecture)<br>• Phase 2: Model Site Security Plan Development over 2-3 months following initial workshop (conducted remotely)<br>• Phase 3: Security Plan Writing workshop (workshop/lecture)<br>• Phase 4: completion of site security plans (conducted remotely) |

| Title/Topic | Delivery Method | Target Audience | Summary | Lessons or Modules |
|---|---|---|---|---|
| Regulatory Development Workshop | Lecture, discussion, demonstration, and practical exercises | International regulatory and competent authorities who are authorized to draft and implement a regulatory training program.<br><br>High-level stakeholders from the ministries of energy, health and interior, national and municipal law enforcement, military organizations, and public affairs may also attend where appropriate. | Assist regulatory authorities in assessing existing regulations, determining the level of support required from GTRI, and completing the regulatory development or revision process, with the final result being the enactment of effective regulations that require implementation of the range radioactive source security measures. | Due to the unique conditions in each country, the content of each workshop is flexible but is based on foundational concepts around the following topics:<br>• Regulatory Engagement<br>• Security Regulation Development<br>• Drafting Regulations: Recommended Best Practices<br>• How to Review Regulations<br>• Model Regulations<br>• Sessions on *IAEA Guidance* |
| Training Development Workshop | Lecture, discussion, demonstration, and practice exercise | International regulatory authority staff or others who have been assigned the responsibility for developing and delivering relative radioactive source security training in their country. | Guides participants in applying the systematic approach to training in the actual development of training materials to be used in country-specific course delivery. The workshop focuses on training development practices as applied to a specific GTRI course. | • Presentation provided by the partner country on status of current activities involving radioactive source security.<br>• Review of Systematic Approach to Training as the basis for course design, development, and delivery.<br>• Perform a training needs analysis leading to identification and definition of appropriate target audience(s) for training.<br>• Review selected modules of the international course as a foundation for development and customization.<br>• Outline a course syllabus, identify module objectives, and develop course materials appropriate to the target audience(s).<br>• Prepare a plan for completion and delivery of the partner country's own course, typically within 6-12 months after the workshop. |

# Appendix G

# Summary of DOE Center for Radiological/Nuclear Training Courses

**Summary of DOE Center for Radiological/Nuclear Training (CTOS) Courses**

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| Introduction to Improvised Nuclear Device (IND) Effects and Response Strategies | Web-based | 3 hours | Provides first responders, leaders, emergency planners, and support personnel with specific response guidance, such as recognition, immediate actions, response planning, damage zones, fallout/radiation hazards, and shelter and evacuation strategies. This course forms the foundation for additional courses in IND response. This course provides an overview of the expected effects from the detonation of an IND in a major U.S. city. It also provides an overview of the current preplanning guidance and response strategy recommendations to maximize the preservation of life in an urban nuclear detonation of unconscionable magnitude. | • Identify critical elements and planning gaps for IND detonation<br>• Select the identifiers of an IND detonation and the main elements of each damage zone<br>• Identify zones and state the safety considerations for an IND response<br>• Identify effective sheltering and evacuation considerations and why cascading effects multiply the dangers and impede response efforts<br>• Given an overview of PPD-8 and its components, locate the applicable documents and reference<br>• Recognize the hindrances that impede response operations |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| Key Leader: Incident Command Improvised Nuclear Device Response Program, Course 1 – Initial Actions | Web-based | 3 hours | Focuses on command-level responsibilities and functions related to the detonation of an IND in a major U.S. city. This is the first course in a program for senior personnel in jurisdictions likely to be targeted for an IND attack and other jurisdictions throughout the nation that could provide support to, and receive evacuees and casualties from, the targeted jurisdiction. The course incorporates the competencies required to respond to a catastrophic incident. The course incorporates the Response Mission Area core capabilities, stresses the importance of multidisciplinary/ multiagency operations, and engages the entire community. | • Select the reasons why a regional IND annex to the jurisdiction's All Hazards Plan is required for an effective response<br>• Select the immediate tasks to be performed upon activation of the IND Annex to the All Hazards Plan<br>• Interpret situational awareness information to update the common operating picture |
| Personal Radiation Detector Course | Instructor-led, exercise-based | 7 hours | Designed to train the Preventive Radiological/Nuclear Detection (PRND) mission using a personal radiation detector (PRD) to perform a preliminary radiological assessment. Responders operate PRDs to detect radiation, verify the radiation alarm, localize the source of radiation, measure the radiation level, and assess the threat status of the situation. Participants employ PRDs to help adjudicate potential threats regarding situations with people, vehicles, packages, and facilities. Additional information regarding PRND operations in maritime environments is available and included as needed. | • Identify the properties of radiation and radiological/nuclear material<br>• Recognize the difference between exposure and contamination<br>• Practice the concepts of time, distance, and shielding<br>• Operate and employ the PRD under simulated field conditions in accordance with the manufacturer operations guide, recommended standard operating procedures, and the PRD Participant Guide<br>• Discuss legal considerations when employing a radiation detection device for radiological/nuclear detection missions |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| Personal Radiation Detector Course Train-the-Trainer | Instructor-led, exercise-based | 24 hours (3 days) | Designed to train law enforcement and public safety officers to instruct the PER-243 Personal Radiation Detector (PRD) Course. | Participants will be able to instruct agency/jurisdiction personnel assigned primary screener duties on the use of passive techniques to employ a PRD in an operational environment to detect illicit radiological or nuclear materials in accordance with the PRD operating instructions, and apply PRD alarms and readings to the responder's environment and operational principles. |
| Personal Radiation Detector Refresher Course | Instructor-led, exercise-based<br><br>Web-based | 4 hours<br><br>1.5 hours | Provides refresher training to primary screeners who have successfully completed PER-243 PRD Course. This course emphasizes crucial training points from the PRD course, while reviewing the knowledge and skills required in the operation and employment of a PRD during the initial detection of radioactive materials in varying scenarios | • Identify the properties of radiation and radiological/nuclear material<br>• List the recommended procedures for operating the PRD<br>• Select the appropriate response to PRD alarms on facilities, people, packages, and vehicles<br>• Identify legal considerations when using a PRD for radiological/ nuclear detection missions |
| Preventive Radiological/ Nuclear Detection On-Site Program | Instructor-led, exercise-based | 28 hours (4 days) | Offers three of the prevent mission courses in one-week-long training program.<br>1. PER-243 Personal Radiation Detector (PRD) Course<br>2. PER-245 Secondary Screener/Radiation Isotope Identifier Device Course (SS/RIID)<br>3. PER-246 Primary Screener Backpack Basic Course (PS/BB) | Refer to the objectives for each of the individual courses. |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| Primary Screener/Backpack Basic Course | Instructor-led, exercise-based | 7 hours | Designed to train the PRND mission using portable radiation detection systems (backpacks with a higher level of sensitivity than personal radiation detectors) to perform a preliminary radiological assessment. Responders operate backpacks to detect radiation, verify the radiation alarm, localize the source of radiation, measure the radiation level, and assess the threat status of the situation. Participants employ the backpacks to help adjudicate potential threats involving people, vehicles, packages, and facilities. Additional information regarding PRND operations in maritime environments is available and included as needed. | • Describe the fundamentals of radiation that apply to primary screeners<br>• Operate the backpack under simulated field conditions<br>• Employ the backpack to detect, verify, locate, measure, and assess the radiation level of unknown radiological materials in facilities, vehicles, packages, and on people |
| Secondary Screener/Radiation Detection Kit Components and Controls | Web-Based | 1.5 hours | Provides general information on the purpose and operation of the survey meter and probes contained in the Radiation Detection Kit (RDK) and its use in a variety of settings. This WBT is a prerequisite, and prepares participants for the instructor-led PER-247 course. Prerequisites include PER-243 Personal Radiation Detector (PRD) Course and PER-245 Secondary Screener/Radiation Isotope Identifier Device (SS/RIID) Course. | • Describe the contents of the Thermo Scientific Emergency RDK<br>• Identify the controls and components of the FH40G-L survey rate meter<br>• List the steps required to perform a pre-operations check<br>• Identify each of the audio and visual alarms that may occur during the detection of radiation by the FH40G-L with/without probes<br>• Describe the probes contained within the RDK and their characteristics in the detection of radiation |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| Secondary Screener/Radiation Detection Kit Operations and Strategies Course | Instructor-led, exercise-based | 7 hours | Focuses on the operation and employment of the RDK in support of the PRND mission. Responders are taught how to conduct a secondary screener investigation of elevated radiation levels and alarms using the radiation detection instruments and accessories contained in the RDK. Participants learn to detect radiation, verify alarms, localize the source of radiation, identify radioactive isotopes, and assess the threat status of detected material in facilities, packages, and vehicles. | • Assemble and operate the issued RDK in a classroom environment<br>• Employ the issued RDK<br>• Deploy the issued RDK in a simulated tabletop environment |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| Secondary Screener/Radiation Isotope Identifier Device Course | Instructor-led, exercise-based | 14 hours (2 days) | Designed to train the PRND mission using a Radiation Isotope Identifier Device (RIID) to perform a secondary radiological assessment. Responders operate RIIDs to detect radiation, verify the alarm, localize the source of radiation, measure the radiation level, identify radioactive isotopes, and assess the threat status of detected material.<br><br>Participants employ the RIID to help adjudicate potential threats regarding situations with people, vehicles, packages, and facilities. Additional information regarding PRND operations in maritime environments is available and included as needed. | • Identify the core elements of secondary screener knowledge requirements and actions<br>• Describe the RIID operation and, using the RIID and Field Operations Guide, perform the Alarm Response Guide steps to detect, verify, locate, measure, identify, and assess radiological sources, and transfer spectral data files to a personal computer<br>• Employ the RIID to detect, verify, locate, measure, identify, and assess radiological materials on people<br>• Employ the RIID to detect, verify, locate, measure, identify, and assess radiological materials in packages<br>• Employ the RIID to detect, verify, locate, measure, identify, and assess radiological materials in vehicles and facilities<br>• Describe the capabilities of the regional, state, local, and U.S. DHS Joint Analysis Center (JAC) reachback resources<br>• Use the RIID, the RIID data files, and an email-capable computer with RIID software and simulated radiation alarm scenario information, use the JAC to identify and help adjudicate an unknown simulated alarm |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| Secondary Screener/Radiation Isotope Identifier Device Refresher Course | Web-based | 1.5 hours | Provides refresher training to secondary screeners who have successfully completed the instructor-led PER-245 Secondary Screener/Radiation Isotope Identifier Device (SS/RIID) Course. This course emphasizes crucial training points from the SS/RIID course, while reviewing the knowledge and skills required in the operation and employment of a RIID during a radiological incident. Course content also includes information about the Global Nuclear Detection Architecture, the National Preparedness Core Capabilities, and lessons-learned topics. | • Identify the RIID operational characteristics and components, and perform a RIID pre-operations check<br>• Identify the core elements of the primary and secondary screener activities<br>• Describe the role of the secondary screener<br>• Perform the Alarm Response Guide steps to detect, verify, locate, measure, identify, and assess radiological sources<br>• Employ the RIID to detect, verify, locate, measure, identify, and assess radiological materials on people<br>• Employ the RIID to detect, verify, locate, measure, identify, and assess radiological materials in vehicles and facilities<br>• Employ the RIID to detect, verify, locate, measure, identify, and assess radiological materials in packages<br>• Using the RIID, RIID data files, email-capable computer with RIID software, and simulated radiation alarm scenario information, describe the capabilities of the applicable regional, state, local, and U.S. DHSJAC Reachback resources, and use the JAC to identify an unknown source and help adjudicate the simulated alarm |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| Weapons of Mass Destruction (WMD) Radiological/ Nuclear Awareness Course | Instructor-Led<br><br>Web-Based | 6 hours<br><br>6 hours | This instructor-led course presents a radiological/nuclear WMD overview consisting of ionizing radiation fundamentals, terminology, health effects, and recognition factors. This information is requisite knowledge for responders performing the interdiction/ prevention mission as well as first responders and other personnel who are likely to be the first to arrive on the scene of a radiological/nuclear incident. This fundamental knowledge of ionizing radiation and its effects is vital to responder safety, allowing performance of their mission while keeping the risk to themselves and the public as low as reasonably achievable. | • Define the fundamentals of radiation, radioactive material, ionization, and contamination<br>• Describe the indicators, signs, and symptoms of exposure to radiation<br>• Recognize the presence of radiological material from radiological postings (colors and symbols), container shapes/types, or unusual signs that may indicate the threat of a radiological incident, and make appropriate notifications for additional agencies and resources that may be needed<br>• Describe the radiological/nuclear WMD threat and its potential impact on the community |
| WMD Radiological/ Nuclear Awareness Train-the-Trainer Course | Instructor-led | 3 hours | Prepares trainers to deliver the AWR-140 WMD Radiological/Nuclear Awareness Course. It focuses on the delivery of the AWR-140 course, including class preparation, instructional techniques, completion of course paperwork, notes and delivery tips, slide groupings, key points, and information to aid instruction. | Prepare remote instructors to present the AWR-140 WMD Radiological/Nuclear Awareness Course. |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| WMD Radiological/ Nuclear Course for Hazardous Material Technicians | Instructor-led, exercise-based | 32 hours (4 days) | Trains emergency response personnel to respond to radiological WMD incidents while mitigating the health risks to themselves and the public. Using radiological fundamentals, the course incorporates them into applied radiation theory, radiological health effects, and terrorist use of radiation and radiological material with individual performance skills required for the response to a radiological WMD incident.<br><br>Participants learn radiation detection instrument and dosimeter characteristics and operation, radiological survey techniques, and operational considerations for the response to a radiological WMD incident. The gained knowledge and skills are reinforced with detailed drills and exercises using radioactive material. The course advances from individual operation and techniques to tactical employment skills in realistic hazardous material scenarios. The course challenges the responder, incorporating the individual knowledge, techniques, and tactical skills learned throughout the course with a comprehensive radiological terrorism incident final exercise. | • Explain the process for keeping exposure to radiation and radioactive material As Low As Reasonably Achievable (ALARA)<br>• Identify several current radiological/nuclear threats, including who may obtain and locate radiological/nuclear material and the impact and consequences of terrorists' use of the material<br>• Explain the adverse health effects of ionizing radiation and the operational considerations for working near elevated levels of ionizing radiation<br>• Explain the concepts of time, distance, and shielding to reduce exposure while operating in a radiation environment construction features of containers used for the transportation of radiological/nuclear material<br>• Explain how to operate both analog and digital radiological instruments to determine the presence and quantity of radiation<br>• Explain how to conduct radiological surveys of areas and equipment<br>• Explain the basic tactical procedures for handling a WMD radiological/nuclear incident<br>• Explain how to conduct and use personnel contamination survey techniques to determine the presence of radiological contamination |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| WMD Radiological/ Nuclear Responder Operations Course | Instructor-led, exercise-based | 24 hours (3 days) | Trains emergency personnel to respond to radiological WMD incidents while mitigating the health risks to themselves and the public. The course combines individual performance skills with the fundamentals of radiation, radiological health effects, and terrorist use of radiation and radiological material.<br><br>Participants learn characteristics and operation of radiological instrumentation and dosimeters, radiological survey techniques, and operational considerations for the response to a radiological WMD incident. The gained knowledge and skills are reinforced with detailed drills and exercises using radioactive material. The course advances from basic operation and techniques to tactical employment in realistic scenarios. The course concludes with a comprehensive exercise that encompasses all the learned knowledge and skills required to respond to a WMD incident involving radioactive material. | • Describe the terminology and units used for radiation measurement<br>• Explain how to operate an analog radiological instrument to determine the presence and quantity of radiation<br>• Use meter equipment to determine the dose rate and explain why it is necessary to get a dose rate reading<br>• Use survey techniques to determine radiological hazards and to make tactical decisions<br>• Recognize possible radiological/ nuclear threats that could occur within the United States, and identify who may obtain radiological/nuclear material, where they may obtain such material, and the impact and consequences of such an action<br>• Read an analog radiological instrument dial and interpret the radiation in the correct units<br>• Demonstrate the basic operation of a digital survey meter according to the instructions given<br>• Demonstrate the proper use of dosimeters<br>• Recognize and identify the biological effects of exposure to ionizing radiation accompanying radiological/nuclear incidents and how to properly identify, triage, and psychologically support contaminated patients |

| Title/Topic | Delivery Method | Hours | Summary | Objectives |
|---|---|---|---|---|
| | | | | • Describe how to conduct a radiological decontamination for responders and the public<br>• Identify the procedure for selecting, donning, and doffing of personal protective equipment (PPE) for a radiological/nuclear environment<br>• Demonstrate knowledge of radiological threats and tactical considerations required to operate safely and effectively at a radiological incident |

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