WORLD INSTITUTE FOR
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Global Needs Analysis for Nuclear Security Training

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GLOBAL NEEDS ANALYSIS FOR NUCLEAR SECURITY TRAINING

A SYNTHESIS OF WINS' ASSESSMENT OF THE WORLDWIDE GAP BETWEEN SUPPLY AND DEMAND OF PROFESSIONAL DEVELOPMENT PROGRAMMES

ABOUT THIS PAPER[1]

It is the responsibility of the State to establish, implement, maintain and sustain a nuclear security regime. Similarly, it is the responsibility of Licensees and Operators to ensure the safety and security of the nuclear/radioactive materials, personnel and facilities in their charge.[2] To carry out their responsibilities effectively, both States and Operators should ensure that personnel with accountability for nuclear security are demonstrably competent to perform their duties. This is similar to the professional bodies of numerous disciplines, such as medicine, engineering and accountancy, which require that all practitioners demonstrate they meet the educational and vocational standards necessary to perform their jobs well.

In recognition of this need, organisations around the world are beginning to establish training and educational programmes focused on nuclear security. For example, in 2009 the International Atomic Energy Agency (IAEA) created the International Network for Nuclear Security Training and Support Centres (NSSC) to encourage collaboration and coordination of industry-related training initiatives. In 2010, the IAEA founded the International Nuclear Security Education Network (INSEN) in conjunction with various academic institutions to promote and support nuclear security education, especially at the academic level.

These new networks and training programmes will, over time, make a strong contribution to nuclear security training. However, key questions remain. For example:

- How many personnel with accountability for nuclear security already work in State and Operating organisations, including nuclear power facilities, research labs, hospitals and well logging companies in the oil and gas industry?
- What is the potential worldwide demand for nuclear security training and professional development (PD)?
- What level of training and PD currently exist?

1 This paper is a synthesis of an in-depth report that is available only to WINS members. For more information about joining WINS, go to: www.wins.org.

2 IAEA publication: Nuclear Security Series No. 20, Objective and Essential Elements of a State's Nuclear Security Regime: http://www-pub.iaea.org/MTCD/PUblications/PDF/Pub1590_web.pdf

To help answer these questions, the WINS Academy conducted a gap analysis on 180 countries from August 2012 to December 2012 using a quantitative estimation approach.[3] For the purposes of this research, "gap" was defined as the difference between the availability of professional-level nuclear security courses (i.e., supply) and the number of individuals with nuclear security responsibility who require training (i.e., demand). The research focused on leadership (boards of directors and executive managers) because it is they who bear the responsibility and potential liability for ensuring that their organisation's security programme is both effective and timely.

To determine the demand by onsite professionals, the study examined nuclear power plants, fuel cycle facilities, research reactors, medical institutes, and well logging companies in the oil and gas industry that use radioactive sources. To determine the demand by offsite professionals, the study examined emergency response services, governmental regulators, policy makers and border guards dedicated to nuclear security.

Omitted categories

All military nuclear facilities and bases that use nuclear and radioactive sources were omitted from the study. The study also omitted materials like IR-192, Te-99 and similar smaller sources. Due to a lack of comprehensive, open-source information, the study omitted food irradiators; producers of equipment that measures density, thickness and moisture; and modes of nuclear transport, including trains, trucks, airplanes and ships.

As a result of such omissions, many more professionals with accountability for nuclear security undoubtedly exist than are included in this study's estimates.

Research methodologies

The study used two research strategies: primary and secondary. Primary research was conducted using open sources only. (Consequently, the numbers presented here must be considered to be estimations.) To validate the results of the primary research, secondary research was conducted on a sampling of individual countries. A synthesis of the results of primary and secondary research was used to determine overall demand. To determine overall supply, research was conducted to identify the training centres and universities around the world that provide nuclear security training.

3 Note that WINS' study was not intended to be exhaustive, but rather an indication of the most significant gaps in the market for professional managerial training.

ASSESSING DEMAND

Primary research

The 180 countries in this analysis were grouped into six regions: Europe, Asia, North America, Central America/South America/Caribbean, Africa and Australia/New Zealand/Pacific Islands. Using open source information, the sample was analysed to determine the total number of onsite and offsite organisations with responsibility for managing nuclear and/or radiological materials in each country.

The next step was to identify job titles that are typical for key managerial roles in onsite and offsite organisations. Although job titles and employment schemas inevitably vary from one country and one organisation to another, a linear organisational structure was assumed to exist globally for all onsite and offsite organisations in order to enable a "like with like" comparison.

The final step was to determine how many people are typically employed in each position within each organisation. In assigning the number of positions to each job title, an effort was made to be conservative at all times. For example, if one corporation owned three power plants, just one CEO and two board members were counted, not three CEOs and nine board members. The reasoning behind this decision was that when one organisation owns multiple plants, the same board members and CEO are frequently responsible for managing all of the plants as a whole.

Data sources

The data used in this study were chosen according to two criteria. The first criterion was that the data had to come from open sources of information so that anyone would be able to verify the results of the analysis. The second criterion was that the data had to be reliable. Table 1 presents a detailed breakdown of the data sources used in this study.

Table 1: Data Sources for WINS' GAP Analysis

FACILITIES/INSTITUTES /COMPANIES	DATA SOURCE
Power reactors	IAEA – PRIS, WNA database
Fuel cycle facilities (milling and mining were not included)	IAEA – INFCIS
Medical facilities using radioactive sources	IAEA – DIRAC
Research reactors	IAEA – RRDB
Well logging	Database of NOC, Libya
Population size for the weighting factor of offsite emergency response services	Database of CIA

Key
PRIS = Power Reactor Information
INFCIS = Integrated Nuclear Fuel Cycle Information System
RRDB = Research Reactor Database
CIA = U.S. Central Intelligence Agency
WNA = World Nuclear Association
DIRAC = Directory of Radiotherapy Centres
NOC = National Oil Corporation

Secondary research

Secondary research consisted of preparing detailed research case studies for selected countries from each region. Sources for secondary research included:

- Information and feedback from government regulators
- Open-source information from company websites
- Information obtained from international organisations

The majority of the sources consisted of nuclear security regulators.

Feedback obtained from secondary sources validated, confirmed and improved the study's primary methodology. It also confirmed that the results of the primary research were conservative; in fact, it was found that the results greatly underestimated worldwide demand for nuclear security professional development.

Findings regarding demand

Primary research conducted on the demand for professional nuclear security training found that 332 fuel cycle facilities are in operation worldwide (IAEA-INFCIS). For the purposes of this analysis, only corporate owners were analysed; consequently, the number of fuel cycle facilities was aggregated down to 80 owners of nuclear fuel cycle sites. It was also found that more than 400 commercial power reactors are in operation worldwide (WNA). For the purposes of this analysis, this number was aggregated down to 100 owners of sites. Furthermore, approximately 200 research reactors are in use worldwide, and over 3,000 medical institutions use radioactive sources, i.e., Co-60 and Cs-137. Finally, approximately 140 oil and gas companies in the well logging sector use radioactive sources (NOC).

To ensure a conservative analysis, the smallest number (other than zero) of professionals at nuclear facilities and institutes using nuclear/radioactive material was investigated; results indicated that approximately **230,000 professionals** have accountability for nuclear security worldwide. Approximately 75% of these are onsite professionals, and approximately 25% are offsite professionals. The majority are employed in medical institutes using radioactive sources.

North America, Europe and Asia lead worldwide demand for onsite/corporate professional development training in every job role category, including board members, CEOs, other operational directors, security managers, and scientists and engineers. Altogether, demand for all three regions totals over **200,000 professionals**.

Specific regional findings

Asia (including the Middle East) has approximately **96,000 professionals** with accountability for nuclear security. Due to the large number of countries in the region, Asia is the global leader for offsite professional development for such roles as emergency response services, regulators and border guards. In fact, the demand for offsite training comprises approximately **16,000 professionals**. Asia also has the largest number of medical institutes and oil and gas companies using radioactive sources. Furthermore, many nuclear plants are currently under construction in this region; to remain conservative, however, this study did not include these sites but clearly there is a need to ensure that personnel are effectively trained by the time the plants are constructed.

Europe has approximately **59,000 professionals** with accountability for nuclear security. It also has the second highest number of nuclear power plants and fuel cycle facilities in the world, and the third highest number of medical institutes using radioactive sources. North America has approximately **53,000 professionals** with accountability for nuclear security. It also has the largest number of nuclear power plants in the world. Central America, South America and the Caribbean have approximately **12,000 professionals** with accountability for nuclear security. The majority consist of professionals in medical institutes (about 200 centres) who use radioactive sources.

Africa has approximately **8,000 professionals** with accountability for nuclear security. Most of them are employed in the medical sector as well as in oil and gas industries. Australia, New Zealand and the Pacific Island nations employ the fewest people with nuclear accountability: a little over **1,000 professionals**. Australia has two research reactors, but New Zealand and the Pacific Islands have none. The region has a few oil and gas companies using radioactive sources, but the majority of nuclear professionals are employed by medical institutes using radioactive sources. The Pacific Islands have no civilian nuclear facilities or radioactive sources identifiable through open data sources.

ASSESSING SUPPLY

The next step in WINS Academy's gap analysis was to determine worldwide supply of training and certification opportunities. For the purposes of this study, the term "supply of professional development for nuclear security" includes both training and educational awareness courses. They range from those offered by individual companies, such as AREVA (which provides security training modules for operational staff at nuclear power facilities), to university masters' degrees. Because the content of such courses and trainings varies considerably from university to university, training centre to training centre, and country to country, it is challenging to compare worldwide training opportunities. Nevertheless, it is clear that growing numbers of education programmes and training are being planned or are currently being developed worldwide.

Organisations – most notably the IAEA – provide international nuclear security awareness programmes but these tend not to lead to qualifications or certification. Major universities, such as Texas A&M University, Tennessee University, Khalifa University, MIT, Delft University, Brandenburg University, University of Central Lancashire and Viennese Technical University, are in the process of developing academic nuclear security programmes. The majority of these target scientists and engineers; few of them address the needs of other groups.

There is also evidence for international cooperation. For example, Texas A&M University and the U.S. Nuclear Power Institute are working with the Moscow Engineering Physics Institute and the Obninsk Institute for Nuclear Power Engineering in Russia to develop nuclear security technical education programmes through the Russian Academic Program on Nonproliferation and International Security (RAP-NIS). Another example is the Gulf Nuclear Energy Infrastructure Institute (GNEII), which is bringing universities in the Middle East together with the Sandia National Laboratories in New Mexico, U.S.

However, few opportunities exist for the professional development of managers who are already employed in organisations with nuclear security accountabilities.

A word about certification

As of January 2013, the only certified courses for nuclear security management that could be identified from open sources are those for postgraduate students. The only universities offering certified courses are Kings College and the University of Central Lancashire, both in Great Britain, and Texas A&M University in the United States. (It should be noted that additional programmes are currently in the planning stage.) However, no open source information could be found in any country regarding certified training for professional managers.

ASSESSING THE GAP

The third step in the study was to determine the gap between demand and supply. Because the goal was to create an analysis that was as conservative as possible, the training identified in each country was based on specific assumptions. For example, information on the number of students/professionals attending each of the courses – as well as the countries from which they originate – is not generally available through open sources. Therefore, it was assumed that every university/training centre/institute in the study covers all of the needs for nuclear security training of the target groups in its region. In addition, it was assumed that all centres of excellence and universities that are just establishing new training courses will completely cover their entire target group as well.

The study also made specific assumptions about individual regions in order not to exaggerate the training demand. For example, in Europe, the assumption was made that the recently established training centre for security guards in Lithuania will also train security guards in Denmark, Estonia and Latvia. The company AREVA was assumed to be training managers in France and Spain as well as in China. The UAE was assumed to be training all of the country's off-site staff, Mexico's new Nuclear Security Support Center was assumed to be training all of the country's emergency response services, Canada was assumed to be training 90% of all of its off-site nuclear professionals, Brazil was assumed to be training all of its regulators, and Australia was assumed to be training all of its staff at research reactors, as well as all border guards. All of these broad assumptions about supply of nuclear security training led to a very conservative estimation of the gap.

Findings regarding the gap

The study found that if all available courses are taken into consideration – and a conservative assumption is made that the courses cover all professionals within their target group and region – a worldwide gap exists of approximately **100,000 professionals** who need professional development training in nuclear security.

CONCLUSION

The supply and demand of professional development programmes is constantly in flux. Some power plants will be shut down soon, some are in the planning stages, and some are currently being built. Furthermore, some companies are planning to stop using radioactive sources, and some are just beginning to use them. Professional development in nuclear security is also fluid and growing rapidly. In other words, this study is a living analysis that will change continually going forward.

Nevertheless, it is clear that more than half of the entire demand for nuclear security training of professionals at the management level is not being met—either by established training centres or by those currently being planned.

We welcome feedback on the study and any further information that helps refine the data. Please contact **Dan.johnson@wins.org**.

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THE FULL ASSESSMENT

The complete, comprehensive version of this paper is available only to WINS members. The assessment includes numerous tables and appendices that detail the study's data and findings. For information about WINS membership, go to **www.wins.org**.

OUR VISION

To help improve security of nuclear and high hazard radioactive materials so that they are secure from unauthorised access, theft, sabotage and diversion and cannot be utilised for terrorist or other nefarious purposes.

OUR MISSION

To provide an international forum for those accountable for nuclear security to share and promote the implementation of best security practices.

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