Study of the Nuclear Security Centres of Excellence for the Carnegie Corporation of New York

Dr Alan Heyes OBE
Senior Visiting Research Fellow
Centre for Science and Security Studies,
King’s College London

Final report of 4th April 2012
Executive summary

One of the key outcomes of the April 2010 Washington Nuclear Security Summit (NSS) was the renewed commitment placed on enhancing the security of nuclear materials and expertise. The summit communiqué acknowledged the need for capacity building for nuclear security and cooperation at bilateral, regional and multilateral levels to promote nuclear security culture through technology development, human resource development, education and training. It also placed an emphasis on optimizing international cooperation and the coordination of assistance. As their contribution to enhancing nuclear security, a number of states at the summit announced they were establishing “national centres of excellence” for nuclear security and other various regional support centres embracing nuclear security training and advice, with some also embracing training related to safeguards or integrating all nuclear training at one centre.

Before the various “Centres of Excellence” (COE) become too entrenched the Centre for Science and Security Studies, King’s College London, sought to undertake an assessment of the concept, to identify ways in which international coordination in this area can be enhanced and to examine linkages with initiatives related to nuclear security education. It was felt that any assessment also needed to determine the prospects for the long-term sustainability of the Centres, to consider how they might be strengthened to ensure sustainability, and to identify the wider benefits of, and lessons learned from, the various approaches.

This study was informed by research interviews with dozens of senior officials with responsibility for the various centres, nuclear regulators and policy makers with responsibility for CBRN risk mitigation related programmes from some 20 governments, the European Commission (EC), the International Atomic Energy Agency (IAEA) and senior nuclear industry personnel, along with NGO analysts and technical experts.

The results demonstrate that, while most believe the COE concept has great potential in terms of raising awareness within the nuclear community of the importance of nuclear security alongside safety and safeguards, many felt it became a popular idea before ‘it was ready for primetime’ because it had been pushed forward to meet a political deadline associated with the 2010 NSS. Five different COE models are identified which, to different degrees, seek to provide training and education in nuclear security including raising awareness within a wide range of interest groups. The report also highlights that the IAEA’s model for nuclear security support centres had been successfully rolled out before the NSS in six countries with some seven to follow.

Based on the interviews with key stakeholders, information made available by the centres themselves and the IAEA, as well as research of sources available in the public domain, the report makes 10 recommendations in the context of enhancing the coordination of the centres and boosting their effectiveness.

---

1 This quote neatly sums up the views of many of those interviewed for the project. Interview P, 29 November 2011.
Contents

Introduction p.4
Methodology, Scope and Findings p.9
Conclusions and Recommendations p.25
Annex A – List of organisations and individuals consulted during the research process p.35
Annex B – The Centres p.38
Annex C – The Instrument for Stability p.61
Annex D – US Threat Reduction Programmes p.62
Introduction

One of the key outcomes of the April 2010 NSS was the renewed commitment placed on enhancing the security of nuclear materials and expertise. The summit communiqué acknowledged the need for capacity building for nuclear security and cooperation at bilateral, regional and multilateral levels to promote nuclear security culture through technology development, human resource development, education and training. It also emphasised the importance of optimizing international cooperation and the coordination of assistance. The communiqué further emphasised that maintaining effective nuclear security will require sustained national efforts undertaken on a voluntary basis and facilitated through international cooperation. While the summit focused primarily on fissile materials, many states in attendance highlighted the importance of keeping safe and secure radiological materials. Consequently, the final communiqué noted that radiological materials required similar security measures because of their potential use in “dirty bombs”.

Centres of Excellence

As their contribution to enhancing nuclear security, a number of states at the summit announced they were establishing “national centres of excellence” for nuclear security, regional support centres embracing nuclear security training and advice, or organisations that would integrate training on safeguards, safety and security.

- China announced it would cooperate with the US on a nuclear centre of excellence (COE)
- Japan launched a regional support centre for nuclear security
- Italy announced a school for nuclear security
- Kazakhstan announced it was considering the establishment of an international training centre for nuclear security
- India announced the creation of a nuclear energy centre with a nuclear security component

These new ventures supplemented existing COE with a strong nuclear security component that had been established before the 2010 NSS. For example:

- the US had worked with Brazil to establish a nuclear security COE and had also pursued numerous engagement programmes across the globe to develop capacity
- the UK had announced a nuclear COE announced in 2009
- the IAEA had its portfolio of nuclear security support centres
- the EC’s had been developing its CBRN COEs

---

2 Nuclear security: The prevention and detection of and response to theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances, or their associated facilities (IAEA definition - Office of Nuclear Security)
• the nuclear industry and educational establishments had also established initiatives

Confusion and coordination

Anecdotal evidence from senior policymakers, and a number of recipients of support offered by the existing COE, has suggested there has been a great deal of confusion about the role of some of the centres, and that more needs to be done to better coordinate their work in order to avoid duplication of effort and to address the specific needs of partners.

An example of the confusion that currently exists involves the work being undertaken by the EC to establish a global portfolio of COE to deliver a range of CBRN initiatives addressing illicit nuclear trafficking, export controls for dual-use goods and scientist engagement. Despite numerous presentations by EC officials about the COE framework -- for which some €200 million has already been budgeted with some €300 million in total likely to be sought from the EU budget to support these centres beyond 2013 -- many stakeholders, including those planning similar initiatives in regions of interest to the EC, remain unclear about the structure and sustainability of the Commission’s plans and are concerned about duplication with their own initiatives. Some potential recipients have also reportedly found the EC approach to be unrealistic in its expectations that developing countries will be able to find the resources -- both specialist manpower and finance -- to support the establishment of COE in target regions. Moreover, in some cases the EC was planning to establish COE in countries where the US was also actively engaged in developing centres to embrace CBRN issues. This suggests that a more effective framework for coordination at the operational level is required to ensure that the development of the COE concept and its implementation does not duplicate the efforts of others, particularly when there are limited resources available within target regions to underpin such initiatives over the long term to ensure sustainability.

Over the past 12 months the IAEA has also grown increasingly concerned about the need to establish a greater level of coordination and transparency in the operations of these centres. The Agency has already hosted two meetings, in July 2011 and February 2012, to encourage collaboration and coordination both between the centres and with its own nuclear security support centres initiative.

The study

Given the plethora of nuclear COE -- or less grandly titled regional support or training centres -- currently being established across the globe, in addition to the World Institute for Nuclear Security (WINS) established in September 2008, several questions arise:

5 For reports on the progress and activities of the EC CBRN Centres of Excellence see: http://www.cbrn-coe.eu/
6 WINS was established during the General Conference of the IAEA in 2008 to provide an international forum in which nuclear security professionals can discuss and exchange best security practices and learn from each other. WINS itself is rapidly being seen by many as the premier Centre of Excellence on nuclear security providing a comprehensive range of best practice guidance and advice. WINS now has over 400 individual and corporate members from 52 countries drawn from private industry, police, government agencies, state regulators and national laboratories. See: http://www.wins.org/
• Are the activities of the centres being coordinated or have they been established with little thought to avoiding duplication of effort or without recognizing where the key priorities lie?
• Is the training being offered by these centres being moderated to ensure consistency at the international level?
• Are the centres likely to be short-term political initiatives or sustainable long-term ventures designed to support nuclear renaissance countries establish robust nuclear security cultures?
• Does the remit of the centres duplicate that of WINS?
• Are wider nuclear industry interests associated with the establishment of the centres? Is the nuclear security agenda being used as a cover for commercial opportunity?

To address these questions the study assesses the COE concept, identifies ways in which international coordination in this area can be enhanced and examines linkages with initiatives related to nuclear security education. It also considers the prospects for the long-term sustainability of the centres, how they might be strengthened to ensure sustainability, and the wider benefits of and lessons learned from the various approaches.

The objectives of the study are:

• To identify the various models being proposed for COE and the extent to which their networks interact with each other
• To determine the effectiveness of current COE models and the extent to which they are strengthening, or are likely to strengthen, nuclear security culture
• To identify the lessons learned from establishing COE
• To make recommendations to enhance the future development and sustainability of COE

After this introduction the following section sets out the research methodology for, and the results of, the study. It describes the various COE models and related activities which together comprise a global network of expertise.

The final section examines the core challenges and issues facing the long term sustainability of the centres and provides a number of recommendations for enhancing their impact, improving their coordination and collaboration in order to strengthen the sustainability of their activities. The recommendations include:

• the importance of linking the work of the centres with educational frameworks
• providing international accredited courses
• establishing a coordinating body at an operational rather than policy level to ensure compatibility of training activities and sharing lessons learned
• avoiding duplication of effort where regional approaches are being pursued

This section also sets out a model for an ideal nuclear security centre bringing together those key areas that need to be addressed. A long-term vision to use the centres to promote some of the wider threat reduction initiatives of the Global Partnership is also explored.
The study is informed by research interviews with dozens of senior officials with responsibility for the COE, nuclear regulators and policy makers with responsibility for CBRN risk mitigation related programmes from nearly 20 governments, the EC, the IAEA and senior nuclear industry personnel, along with NGO specialists and technical experts.

The study is not intended to be an assessment of the impact and effectiveness of each individual centre referred to in the report. Only a few of these centres have started to implement their programmes of training and research and there are very limited measurable impacts and specific lessons learned to make worthwhile statements about their individual influence and impact. Indeed, the key centres announced at the NSS – China and India – are still in the early developmental stage. However, the research findings do make it possible to derive a number of conclusions and recommendations that may be helpful in shaping the direction and work programmes of the centres, especially those still at the design stage. Nevertheless, where it did prove possible to make observations about the impact of individual centres these are included in the report.

It should also be noted that the term “centre of excellence” is misleading and should be considered primarily as a political sound bite. Indeed, some observers have questioned the validity of the concept in the nuclear security field because it implies recognition by others that a proven track record of success and achievement is already in place, whereas in reality these initiatives are still at the formative stage. Moreover, in a broad sense the concept assumes a variety of different forms with a range of different objectives. For example, NATO alone is linked to some 17 security-related COEs. One of these, the NATO Joint CBRN Defence Centre of Excellence, provides opportunities to enhance education and training in the same way that many nuclear centres of excellence envision.

The label COE assumes a high level of acceptance of the quality of the research, training and education offered by the institution by its scientific and technical peers and usually only after a very long period of operation to develop a sustainable culture of excellence. None of the initiatives currently labelled nuclear centres of excellence have a lengthy track record along the lines, for example, of the Oakridge National Nuclear Laboratory, the UK National Nuclear Laboratory, the IAEA or the EU Joint Research Laboratory’s Nuclear Security Unit, all of which have good reason to be referred to as COE. All the nuclear security centres highlighted at the summit certainly ‘aspire to excellence’, or aim to have a ‘commitment to excellence’, but to call them a COE from day one is decidedly premature.

---

7 NATO-related COEs include the following: Center for Analysis & Simulation for the Preparation of Air Operations (CASPOA); Civil - Military Cooperation (CIMIC) COE (The Netherlands); Cold Weather Operations (CWO) COE (Norway); Combined Joint Operations from the Sea (CJOS) COE (U.S.); Command & Control (C2) COE (The Netherlands); Confined and Shallow Waters (CSW) COE (Germany); Cooperative Cyber Defense (CCD) COE (Estonia); Counter Improvised Explosive Devices (CIED) COE (Spain); Defense Against Terrorism (DAT) COE (Turkey); Explosive Ordnance Disposal (EOD) COE (Slovakia); Human Intelligence (HUMINT) COE (Romania); Joint Air Power Competence Center (JAPCC) COE (Germany); Military Engineering (MILENG) COE (Germany); Military Medical (MILMED) COE (Hungary); Modelling and Simulation (M&S) COE (Italy); Mountain Warfare (MW) COE (Slovenia); and the Naval Mine Warefare (EGUERMIN) COE (Belgium) Collated list prepared for ‘Securing Dual Use Expertise:The Role of Centres of Excellence’. Unpublished working paper prepared by the International Working Group (IWG) for a Global Partnership Workshop in Autumn 2010.
The IAEA’s centres are modestly described as nuclear security support centres as are the centres established by Pakistan and Japan. The term ‘nuclear security support centres’ is a clear statement of what they are offering to their customers whether nationally or internationally focused. In time, some of these may well come to be seen as COE in some, or all aspects, of nuclear security whether this is based on the quality of the training and education, R&D on nuclear security and safeguards, or both. For the purpose of this report and for ease of reference, the term “centre” will be used when referring to the various organisations undertaking training, education, research and awareness raising related to nuclear security.

The research was made possible by a generous grant from the Carnegie Corporation of New York and the willingness of a number of nuclear security specialists, and government officials with responsibility for policy and regulation, to provide information and candid views about the COE.
Methodology, Scope and Findings

This section outlines the scope of the project, the methodology used to assess the various COE, and findings of the research.

Scope

Originally, the centres to be included in the analysis included the following:

- The initiatives announced at the 2010 Nuclear Security summit (Brazil, Japan, China, India, Kazakhstan, Italy);
- The European Commission’s COE framework embracing the Middle East, South East Asia and so on;
- The UK Nuclear Centre of Excellence (now essentially merged in part into the work of the National Nuclear Laboratory);
- The nuclear security support centres established by the IAEA;
- WINS;
- Selected nuclear industry centres of excellence

During the course of the research it became apparent there were important comparable initiatives underway which also merited inclusion:

- A number of nuclear security centres which were undertaking somewhat similar awareness raising, training and engagement activities (e.g. Jordan’s Middle East Scientific Institute for Security and the Abu Dhabi Gulf Nuclear Energy Infrastructure Institute)
- A number of educational centres with nuclear security focused activities;
- The International Nuclear Security Education Network (INSEN) established by the IAEA in 2010

Methodology

The methodology involved two core activities: documentary analysis and research interviewing/questionnaires.

First, documents provided by stakeholders about the COE as well as related reports on non-proliferation and nuclear security was reviewed. This included material from the IAEA, the EC and the GP and presentations on the centres delivered at international meetings. There is a very limited amount of primary source documentary material available primarily because the concept of nuclear security COE is comparatively new with a number of the centres yet to progress much beyond the drawing board.

Second, research interviews and questionnaires were used to gain insights from key COE stakeholders. Annex A includes a list of the individuals with their organisational affiliations that were interviewed either in person or via e-mail/telephone. In order to ensure an effective and meaningful response from stakeholders to the research questions, all contributions were made on a non-attributable basis with comments collated and referenced in such a way that they could not be assigned to any one individual or organisation. Where comments merited direct attribution, or participants wanted their comments to be attributed, written approval was sought to use the data
Most stakeholders welcomed the opportunity to contribute their views and the response rate to the questionnaires, and requests for interviews, was over 90%. The interviews were based around a standardised set of questions targeted at three distinct groups of stakeholders:

- Those responsible for the centres, their design and implementation
- Those with wider security and non-proliferation interests (e.g. policymakers and diplomats responsible for threat reduction programmes, nuclear regulators, nuclear industry officials, NGOs interested in threat reduction and representatives of partner countries which some centres plan to offer their services to)
- EC member states (the EU CBRN COE initiative has a global reach and is effectively supported by all EU states via the Instrument for Stability)

The questions were designed to draw out the views and comments of stakeholders both about the concept behind the centres and in terms of their wider views of the contribution the network of centres are likely to make with respect to:

- Impact on addressing the risk mitigation objectives of the international community
- Lessons learned from establishing COE which could help improve the development of future centres and enhance the sustainability of existing ones
- Coordination needs between centres to enhance networks and the sharing of best practice and training moderation, as well as with states operating CBRN risk mitigation programmes
- Lessons learned regarding identifying the needs of countries without their own centres of expertise

The research questions were as follows:

**Questions for Centres**

- How has the COE been implemented?
- What are the centre’s key objectives?
- To what extent has the centre been developed in association with other COE frameworks or other existing wider networks in the region/country?
- How effective have been the means of implementing the COE in reaching the intended audiences for the provision of specialist expertise?
- What challenges do you feel you face in establishing the Centre and is it reliant on external expertise to develop sustainable programmes?
- What are the likely wider impacts of the activities associated with the Centre? (e.g. providing commercial benefits to stakeholders)
- Has establishing the centre(s) enhanced collaboration with international stakeholders in the region and beyond?

---

8 Citations of specific interview material in the footnotes provide a code letter and a date.
Questions for wider stakeholders

- Do you think establishing the centres are a positive development? If so, why?
- To what extent has there been duplication of effort?
- Does the IAEA have a role in coordinating activities of the centres?
- Is your organization working with any centre and if so what is the nature of the collaboration and its objectives?
- Are there any gaps in the areas covered by the centres?
- Are COE likely to be a means of ensuring sustainability in terms of enhancing nuclear security?
- Based on your experiences what practical comments do you have with regard to the coordination of the work of multiple actors in setting up and maintaining such centres?
- Do you have any recommendations for future work and/or proposals for future coordination frameworks?
- What are your views on the priorities for the centres?
- Are you aware of any institutional or political issues that may restrict their development?
- Are the various activities of these centres being coordinated in some way or are they being established with little thought to avoiding duplication of effort or recognizing where the key priorities lie?
- Do the centres duplicate the WINS initiative?
- Are there wider nuclear industry interests associated with the establishment of some of the centres?
- Is the nuclear security agenda being used as a cover to push commercial opportunities?

Additional questions for EC Member States

- What involvement have you had in establishing the CBRN Centres of Excellence under the Instrument for Stability Programme, and what views do you have on their implementation and focus?
- Do you intend to make use of the EC Centre of Excellence model to deliver your CBRN threat reduction programmes?

Findings

Most of the comments provided by stakeholders addressed the issues associated with the centres in broad terms because most are at the early stages of development. Comments primarily focused on issues related to coordination, collaboration, duplication of effort, accreditation of training courses and the role of the IAEA.

An account of each of the centres and their activities referred to in this report is included in Annex B. The level of detail provided inevitably varied across the centres because of their differing states of implementation. Some centres, such as the ones established by Japan and Pakistan, are well established and are already engaged in delivering training on a wide range of nuclear security topics. Both Japan and Pakistan have a decent
selection of publicly available literature on their centres\(^{10}\) and extensive material was provided to assist with the study. Others, such as the South Korean initiative, are only about to enter the development phase in the run up to the Seoul NSS in late March 2012, while others in China and India have also yet to become fully operational and will not be until well after the summit. Both the Chinese and Indian centres have to progress through the development and implementation stages before becoming fully operational.

Some centres, like those proposed by Kazakhstan and Brazil, are still at the evaluation stage. The UK Nuclear Centre of Excellence fell at the first hurdle after a change of government in 2010\(^{11}\) and demonstrates very well the fragility of establishing new initiatives in this area if centres do not have sufficient time to secure and present a track record of competence to secure future funding.\(^{12}\)

Annex B also presents details of other comparable centres not mentioned at the 2010 NSS but which have similar objectives focusing on enhancing best practice on a range of nuclear security topics. These include centres with a technical and educational focus and which emphasise the importance of developing effective networks on all aspects of nuclear security education and training. Taken together these examples display the range of centres being developed to enhance nuclear security on a global basis.

The term COE was used in a very broad sense at the 2010 NSS\(^{13}\) and in subsequent press and policy articles. However, the term actually embraces a range of organisations and related activities which are often quite diverse from one another. The portfolio of centres listed and described in Annex B comprise some 20 examples if the individual IAEA nuclear security support centres are included as well as those proposed to be launched over the next few years to enhance nuclear security training, education and awareness. Some of these were highlighted at the 2010 NSS but many already existed in some form well before the summit. Some of these deserve much greater recognition than they currently attract. For example, the work the IAEA to help establish nuclear security support centres\(^{14}\) in Morocco, Columbia, Ghana, Pakistan, Tanzania and Malaysia was underplayed before, during and after the summit. Seven more such support centres are planned over the next few years in Chile, Cuba, Turkey, Kazakhstan, South Africa, the Philippines and Jordan. The objective of the IAEA is to assist states to establish centres by providing:

- a methodology on how best to establish and maintain the centres
- a methodology on how to assess training needs
- assistance in developing a tailored nuclear security training programme to match the country’s needs
- certification of instructors
- facilitation of training for technical and scientific support
- provision of a limited amount of equipment

\(^{10}\) Japan has recently launched a website to promote its activities. See http://www.jaea.go.jp/04/iscn/index_en.html


\(^{12}\) A number of those responsible for the centres interviewed noted the fragility of funding with one commenting that, ‘budgetary and political considerations are always important issues in sustaining the momentum of our centre’. Interview S, 18 November 2011.

\(^{13}\) And also at the 2012 Seoul NSS

\(^{14}\) See Annex B for a detailed account of the IAEA Nuclear Support Centres
In many ways the Office of Nuclear Security at the IAEA road tested the COE concept through its development of nuclear security support centres and this probably provided a number of states with confidence in offering to establish similar initiatives at the 2010 NSS with the help of US funding and technical support. The long term sustainability of these initiatives will depend on the development of human resources through IAEA tailored training programmes, the development of expert networks and the provision of appropriate technical and scientific support. Further information on the IAEA centres and the methodology behind their establishment is contained in Annex B.

Categorising the centres

Based on an assessment of the currently active centres, and those planned for implementation over the next few years, it is possible to identify five broad categories:

A. Centres where the core activities are essentially technical and scientific in nature with a focus on providing training on the use of equipment, its calibration and maintenance (essentially the IAEA nuclear support centre model);

B. Centres where the core activities are essentially educational in nature offering course(s) which, although these may have a technical content, are primarily designed to provide a broad perspective of nuclear security and an awareness of relevant issues;

C. Centres where the core activities encompass a wider range topics than just nuclear security, or even wider than nuclear security, safety and safeguards;

D. Centres where the core activity is focused on nuclear research and development or which are characterised by strong commercially driven objectives;

E. Centres where the core activities are focused on raising awareness of nuclear security issues within the nuclear industry and beyond

The table below places the centres described in detail in Annex B within the broad categories above. With the exception of Group A some of the centres do not neatly fall into one category. For example, the French Institute is in part linked to France’s effort to promote its own nuclear technologies and therefore has a strong commercially driven objective in promoting perceptions of excellence of its nuclear industry.
<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
<th>Group E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan Nuclear Security Training Center (NSTC)***</td>
<td>Italy’s School of Nuclear Security</td>
<td>EU CBRN Centres of Excellence</td>
<td>UK Nuclear Centre of Excellence**</td>
<td>WINS</td>
</tr>
<tr>
<td>Japan’s Integrated Support Center for Nuclear Non-Proliferation and nuclear security (ISCN)</td>
<td></td>
<td>Gulf Nuclear Energy Infrastructure Institute to Promote Nuclear Safety and Security (GNEII)</td>
<td>Science Centres: ISTC STCU</td>
<td>Middle East Scientific Institute for Security (MESIS)*</td>
</tr>
<tr>
<td>South Korea Nuclear Security Centre</td>
<td>INSEN and its associated educational facilities offering nuclear security education courses</td>
<td>The International Institute of Nuclear Energy (12EN) – France</td>
<td>India’s Global Centre for Nuclear Energy Partnership</td>
<td></td>
</tr>
<tr>
<td>IAEA nuclear security support centres – some 13 operating or planned</td>
<td>UCLan (UK)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China’s Centre of Excellence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil’s centre?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kazakhstan International Nuclear Security Training Centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*MESIS is an example of an awareness raising organisation which is in part dependent on the support of partners to provide funding for a range of nuclear security and scientist engagement activities to promote professional responsibility

** The UK Nuclear Centre of Excellence is now defunct but is included for completeness as there are lessons associated with this initiative that are applicable to other centres

*** The Pakistan centre is one of the first IAEA nuclear security centres but is included separately because it provides a model example of what a centre is and should be undertaking in terms of nuclear security training, provision of technical advice and education to a state’s nuclear security ‘competent authorities’.

Group A

Group A currently comprises the majority of the centres and their core activities are largely technical in nature providing a range of training courses for personnel working in...
nuclear power plants, users of radiation sources, border officials and emergency first responders. Awareness courses are also offered to policy makers, regulators and other public officials with an interest in nuclear security matters. Facilities include both technical laboratories for undertaking experiments on equipment and its maintenance, and education facilities for teaching a wide range of courses. One centre – Pakistan nuclear security training centre -- has also developed a link with an educational establishment (see Annex B for further details).

The type of courses offered include:

- Physical protection of nuclear material and nuclear facilities
- Safeguards, accountancy and control aspects
- Use of radiation detection equipment by government officials
- Safety and security associated with radioactive sources
- Radiation detection equipment and maintenance
- Combating illicit trafficking of nuclear and radiological materials
- Search and recovery of orphan sources
- Nuclear forensics
- International legal instruments on nuclear security,
- Wider management skills and development of a nuclear security culture
- Awareness raising to policy makers and other public officials whose job requires an appropriate knowledge of nuclear security

Courses are offered to both national and international audiences and have strong connections with the IAEA for training. Some also have wider international links. For example, the US is providing funding and equipment to help establish the COE in China and India.

Also included in Group A are the IAEA nuclear security support centres which have served as models for the development of other initiatives with the IAEA providing essential consistency of approach with regard to training course design and moderation/certification of trainers (see Annex B).

Group B

Group B primarily comprises centres that are educational in nature. If access is required to nuclear facilities to demonstrate the practical side of nuclear security, these centres are usually reliant on other organisations to provide approval for visits. Although the Italian School was the only education centre to be offered as a ‘house gift’ at the 2010 NSS, the IAEA established INSEN in in April 2010 which is a partnership between the IAEA and several academic institutions and other relevant stakeholders with the aim of promoting and supporting the growth in education programmes/courses in nuclear security (see Annex B). Over 50 educational institutions are now part of INSEN. The UK “UCLan Nuclear” is an example of one of these institutions which is committed to integrating nuclear security with nuclear safety as part of its nuclear education curricula. A particular focus of INSEN is how to best support the development of faculty members capable of delivering an academic course in nuclear security. In this respect lessons will be drawn from a series of pilot professional development courses based on the IAEA’s Nuclear Security Series No. 12: Educational Programme in Nuclear Security. The first of these was organised by King’s College London over two weeks in September 2011 and
January 2012, and which involved 13 faculty members from nine countries.

The Fukushima nuclear accident vividly illustrated what a successful nuclear terrorist attack against a nuclear facility might look like and its potential impact on the nuclear power industry. Despite this accident the nuclear renaissance seems set to continue, albeit it at a slower pace, with 160 reactors planned in 16 countries worldwide and a number of countries examining the potential of nuclear power to meet future energy needs. This expansion of nuclear power will not only require officials in many countries to have a better understanding of the technical, policy and regulatory issues associated with nuclear security well in advance of developments in the sector, but also the education of a new generation of highly qualified experts able to prevent, detect and respond to criminal or unauthorized acts involving nuclear or other radioactive material. Consequently, Group B centres are likely to become some of the most important of the COE over the next few years. The development of INSEN is already beginning to show the significant educational resources that are required to deliver a range of appropriate nuclear security education courses from the Masters level down to a basic introduction to nuclear security course of the type currently being road tested at King’s College London. The latter has the potential to be introduced into a range of nuclear education curricula at undergraduate and postgraduate levels, and as part of induction courses across the nuclear industry, relevant government departments and some of the nuclear security support centres.

Group C

Group C centres have some element of nuclear security training as part of a wider initiative. An example is the Gulf Nuclear Energy Infrastructure Institute (GNEII) which was established to strengthen nuclear energy security, safeguards and safety infrastructure development throughout the Gulf region. Another example is the French International Institute of Nuclear Energy which has been established to facilitate access to nuclear training in general for foreign students. In the case of the EU COE the focus is on Chemical, Biological, Radiological and Nuclear (CBRN) issues. Effectively implemented and managed such integrated approaches would appear to offer considerable benefits in terms of learning lessons from other sectors, identifying synergies across the sectors, and capitalising on best practice in terms of developing human resources and the professional responsibility elements associated with developing a robust nuclear security culture. However, this approach does mean than nuclear security is tackled as part of a much larger set of activities and may therefore take second place if resources are or become limited.

Group D

Group D centres have a strong research, development and technical element with the aim of developing commercial products and services. Examples of these type of centres include:

- The Indian Global Centre for Nuclear Energy Partnership
- The UK Nuclear Centre of Excellence
- The Science Centres: STCU and ISTC

15 World Nuclear Association- See ”World Nuclear Power Reactors &Uranium Requirements as at February 2012”: http://www.world-nuclear.org/info/reactors.html
The Indian Global Centre for Nuclear Energy Partnership was one of the main COE announced at the 2010 NSS. It is currently under construction and is primarily a research centre focused on research and development of secure and proliferation resistant reactor systems. Activities are to be undertaken within five schools one of which will embrace nuclear security studies.\textsuperscript{16}

The UK Nuclear Centre of Excellence was launched in April 2009, part of the then UK government’s new nuclear policy to both support the development of the UK’s nuclear industry and to set out its strategy on nuclear security and non-proliferation.\textsuperscript{17} Some £20 million was committed over five years to get the centre up and running. Its work was originally planned to focus on the development of an economic, low carbon, proliferation-resistant fuel cycle. Over the longer term the centre would have offered opportunities to provide advice on a range of non-proliferation and technical security issues to international audiences. With a change of government in May 2010 the funding for the centre was withdrawn. The UK National Nuclear Laboratory (NNL) now fulfils some of the activities planned for the centre and offers a wide breadth of technical products and services to its customers across the whole nuclear industry. NNL covers the complete nuclear fuel cycle from fuel manufacture and power generation, through to reprocessing, waste treatment and disposal and including defence, new nuclear build and homeland security aspects. NNL provides services in these areas supported by a range of links with international research organisations, academia and other national laboratories. Similar national nuclear laboratories can be found in all countries with a long history of nuclear power (For example, Oakridge National Laboratory in the US and those operated by the Commission Energie Atomique (CEA) in France).

The Science Centres\textsuperscript{18} - the International Science and Technology Centre (ISTC) based in Moscow and established in 1992, and the Science and Technology Centre Ukraine (STCU) established in 1993 -- were designed to counter the threat posed by the proliferation of sensitive knowledge and experience through the emigration of former weapon scientists and engineers to countries of concern following the dissolution of the Soviet Union. The ISTC is an intergovernmental organization connecting scientists from Russia, and other countries of the Commonwealth of Independent States (CIS) and Georgia with their peers and research organizations in Canada, EU, Japan, Republic of Korea, Norway and the United States. ISTC facilitates international science projects and assists the global scientific and business community to source and engage with Russian and CIS institutes that develop or possess an excellence of scientific know-how. The science centres, while established as a non-proliferation initiative to deal with a Cold War legacy, are well established organisations with a strong network of contracts and familiarity with the countries and regions that would not need to be developed for a new centre of excellence in that region. They have been included in this analysis because either or both of the centres could actually serve the role of an intended nuclear security centre embracing a range of training and educational activities. One senior official interviewed for the study argued that this approach would possibly save time, money and effort in establishing a

\textsuperscript{16} See Annex B for full details
\textsuperscript{17} The Road to 2010: Addressing the nuclear question in the twenty first century, Cabinet Office, July 2009.
\textsuperscript{18} See Annex B for full details
new centre. The official also believed that, ‘more scrutiny of the centres is warranted, particularly in regions of the world where cooperative centres and secretariats such as exists for the science centres, are already established’. This point might well apply to the proposed nuclear security centre in Kazakhstan which is still to get off the ground. This issue is discussed in greater detail in the final chapter.

Group E

Group E comprises centres that have no aspirations to provide a technical or research and development angle to their activities nor to have laboratory assets. They are primarily concerned with raising awareness about the importance of nuclear security and promoting professional responsibility and best practice at all levels. For example, the World Institute of Nuclear Security (WINS) was established in 2008 to help improve the 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. Its mission is to provide an international forum for those accountable for nuclear security to share and promote the implementation of best security practices. Some 20 best practice guides have been published to date by WINS on a comprehensive range of issues related to nuclear security.

While WINS is becoming the main international centre for raising awareness of nuclear security there are a myriad of smaller organisations with a remit to promote best practice on nuclear security issues. Many of these receive support from major donors -- such as the US National Nuclear Security Administration (NNSA), the US Department of Defense, the US State Department and the EU programmes -- to host and facilitate courses and workshops in south east Asia, north Africa, the Middle East and elsewhere. These organisations fulfil an important niche roll in awareness raising. Some offer “neutral territory” to facilitate training where political unrest and security concerns in target countries make it difficult to offer training opportunities there. For example, the Middle East Science Institute for Security (MESIS) based in Jordan is one such example offering a neutral base for nuclear security training for personnel from across the Middle East region.

The various categories of COE clearly demonstrate that, while the current and planned centres are multifaceted in their approach and make-up, they all seek to support and facilitate the spread of best practice and professional responsibility in nuclear security across all organisations that use nuclear and radiological materials. The categorisations also highlight the importance of ensuring effective collaboration, coordination and networking between the disparate groups. These points are discussed further in the next chapter. The various models also indicate that there “is no one size that fits all” approach and that the national centres have been established first and foremost to meet

---

19 Interview P, 29 November 2011
20 See Annex B
21 Another good example of this was the use of a Ukraine laboratory which worked on Chernobyl related issues to provide retraining to Iraqi nuclear scientists on decommissioning techniques under the UK threat reduction programme in 2007.
country specific requirements as part of national commitments to achieve sustainable nuclear security.\textsuperscript{22}

\textbf{Role of the IAEA}

Most interviewees believe the IAEA has a very important if not crucial role to play in coordinating the activities of the various centres particularly because the Agency was instrumental in initiating its nuclear security support centres work well before the 2010 NSS.\textsuperscript{23} According to one senior policy maker, the IAEA ‘should be seen as a primary point of contact’.\textsuperscript{24} A different interviewee commented that the Agency had a key role to play in coordinating nuclear security by developing consensus guidelines, curricula, and so on, as well as providing detailed technical advice on equipment.\textsuperscript{25} Another respondent argued that, the IAEA should play ‘a strong coordinating role early on with the use of their nuclear security portal for networking and sharing best practice, especially to see who is being trained as well as the training being undertaken’.\textsuperscript{26}

Several interviewees complemented the IAEA on facilitating the creation of a new network for Nuclear Security Support Centres (NSSC) developed with the assistance of experts from member states. This initiative is part of the 2010-2013 Nuclear Security Work Plan\textsuperscript{27} approved by the IAEA Board of Governors. A number of those interviewed believe the IAEA ‘needed to have adequate resources to provide assistance to the centres to ensure there was a common set of standards being applied\textsuperscript{28} during the developmental stages.

However, a few observers argued that the IAEA took a limited approach with respect to nuclear security and suggested the Agency felt threatened by the expansion in the number and type of centres because this brought with it the potential to dilute its influence. Moreover, they commented that ‘a number of countries were fed up in hearing there was only one approach on nuclear security’.\textsuperscript{29} Others believe the IAEA’s project and resource management needed improving in order to meet current and future requirements, and that the Agency was missing the opportunity to promote lessons learned from its Physical Protection Advisory Service missions (IPASS).\textsuperscript{30} While it was realised that the details of these missions might be sensitive, it was felt that scope existed to distil ‘many lessons learnt’ which were not sensitive and could prove invaluable to others.

One interviewee argued that the facilitating work of the IAEA related to the centres was done at too high a level and insufficient attention was given to coordinating technical activities with only around one meeting a year to ensure effective coordination in this

\textsuperscript{22} Sustainability refers to the commitment of resources at the site and national levels to ensure security regimes are effectively operated and reliably maintained now and in the long term. See: ‘Sustaining Nuclear Security Upgrades: Analytic Framework’, draft for discussion, Vienna, 2009.

\textsuperscript{23} See Annex B.

\textsuperscript{24} Interview I, 19 October 2011

\textsuperscript{25} Interview J, 19 December 2011

\textsuperscript{26} Interview A, 1 November 2011


\textsuperscript{28} For example: Interview E, 9 November 2011.

\textsuperscript{29} Interview F, 7 November 2011.

\textsuperscript{30} Interview U, 19 December 2011.
context. In this respect it was recommended that the centres themselves take ownership and form an operating level group similar to the Border Monitoring Group established by the NNSA, JRC and IAEA for second line of defence border monitoring equipment and training – or even explore the scope for widening BMG membership to include the centres. Some of the centres felt that the IAEA had an important role to play in coordinating their training courses to avoid redundancy in training and continuing to develop guidelines. One interview proposed that the IAEA could provide member states with advisory services using experts from the various nuclear security support centres.

Collaboration and coordination

It became apparent from the interviews that, at a government policy and programme level, a number of attempts are being made to enhance collaboration and coordination between the various centres in recognition of concerns that had been expressed about failings in these areas.

In the US the State Department and the NNSA already have strong programme and policy ties with most of the centres. The US works closely with the majority to provide assistance in getting them established and expertise in connection with training and, in some cases, equipment. Recent press announcements from the NNSA indicate that US-Kazakhstan cooperation on nuclear safeguards and security is being strengthened which should help Kazakhstan get its own centre off the ground. The NNSA is also helping China to establish its centre through the provision of equipment and assistance to develop nuclear security training programmes.

Few of those interviewed could identify significant gaps in the issues and priorities covered by the centres, although one interviewee highlighted the absence of any centres in South America but at the same time acknowledging that they were not needed in every country or even region. One interviewee highlighted the difficulties often faced by centres established as a result of bilateral or multilateral initiatives in terms of identifying the needs, priorities and goals of the so-called ‘beneficiary’ parties/partners. He argued that, ‘as new centres are established it was important to establish the cooperative framework, programme objectives and associated metrics and practical relationships between the participants’. Another respondent believed there were insufficient industry links with the centres and in some case there were gaps associated with job related professional development opportunities. In terms of gap analysis it was argued by many that it was premature to identify gaps at this early stage, although one interviewee did highlight the fact that under the EU CBRN centres framework only a limited percentage of the budget was set aside for equipment and this

---

31 Interview M, 18 January 2012.
32 Interview S, 18 November 2011.
33 Interview E2, 14 December 2011.
34 Interview C, 8 November 2011; Interview D, 7 November 2011.
36 ‘US, China Sign Agreement to establish Center of Excellence on Nuclear Security’: http://nnsa.energy.gov/mediaroom/pressreleases/chinacentereofoxcellence01.19.11
37 Interview E, 9 November 2011.
38 Interview P, 29 November 2011.
39 Interview U, 9 December 2011.
may limit the scope for ‘train the trainers type programmes’ now seen to be a key feature of many support programmes.  

One interviewee argued that one of the main problems was that, while there were a range of national, regional and international models for developing a centre, not enough time goes into planning them and this has had an impact on their coordination. It was further argued that, ‘if more planning went into them there would likely be less “centre of excellence initiatives”’.  

Another interviewee noted that, ‘with few exceptions, there was not much of a strategic vision of what they were going to do’ beyond some training on the effective use and maintenance of radiological monitoring equipment. The need to avoid a donor-recipient mentality setting in for those centres dependent on support from international agencies, and to have all participants committed to providing long term political, programme and financial support, was seen by many respondents to be crucial to their sustainability and effectiveness. 

A number of interviewees believed the centres had been created with little thought to what already existed in terms of sources of advice and training. One respondent, with extensive experience of directing threat reduction programmes and managing a CBRN centre, argued that many of the centres -- nuclear security centres and the EU centres -- are being rushed into existence with no apparent regard for coordination of purpose or objectives. He noted that the rush to establish the centres risked missing opportunities to leverage existing organisations and expertise. This interviewee further commented that, ‘already existing centres of cooperation – the International Science and Technology Centre (ISTC) in Moscow, the Science and Technology Centre Ukraine (STCU) in Kiev, and the US Civilian Research and Development Foundation (CRDF) and its regional cooperation centres -- provided not only ready-made organisational infrastructures, but also processes, networks of contacts, and familiarity with the countries and regions that would not need to be developed for a new centre of excellence in that region’.  

A consistent theme from the interviews, then, was the apparent lack of coordination amongst the various centres. A number of those interviewed also strongly believed that the coordination with stakeholders was less than optimal and a lot more effort needed to be placed on how they will be measuring the quality, impact and success of the training being offered via the centres. Many interviewees felt that in some cases insufficient time had been spent to develop clear objectives, desired outcomes, metrics or a strategic plan to enhance the sustainability of the organisation. Some took the view that it was important for the centres to focus on national priorities first to get the centre properly established before offering training to an international audience. One nuclear security specialist working for the nuclear regulator in his country argued that if these

---

40 Interview M, 18 January 2012.  
41 Interview J2, 1 February 2012.  
42 Interview F, 7 November 2011.  
43 Interview P, 29 November 2011.  
44 Interview H, 19 October 2011.  
45 This issue of measuring the success of threat reduction activities is an area of increasing interest given the financial pressures on budgets. A recent report by the US National Academies attempted to provide a better framework for measuring the impact of US Department of Defense threat reduction capacity building programmes which offer a useful basis for application to the activities of nuclear security support centres. See: ‘Improving Metrics for the Department of Defense Cooperative Threat Reduction Program’: http://www.nap.edu/catalog.php?record_id=13289  
46 Interview T, 3 November 2011.
centres where providing training to an international audience there needed to be an appraisal-accreditation process in place. In this respect the specialist favoured an exam based training structure to aid monitoring and to provide tangible metrics to measure the effectiveness of the training; ideally the organisation offering training should have some form of charter status and gained a certificate of competence from an appropriate body.  

Not surprisingly a number of the centres themselves provided extensive comments and views about the need to improve coordination, particularly within the Asian region where a number of national and bilateral centres are being established. Most recognised that, with the growth of the centres over the next few years and based on currently announced plans, a coordination mechanism between the centres was required. A senior official from one of the Asian centres argued that such a mechanism was needed to:

- Share information on our respective activities
- Encourage proactive and constructive exchanges of opinion on how to enhance nuclear security
- Promote the understanding of best practices in nuclear security
- Cooperate to achieve nuclear security goals
- Coordinate our respective initiatives in accordance with each centre’s priorities to achieve the best possible results in enhancing nuclear security

A senior official from another Asian centre commented that because the centre was being developed to focus on national nuclear security issues not much consideration of coordination and collaboration had been taken at the planning stage. However, the centre ‘had now taken actions to coordinate their activities with other training centres in the region to prevent duplication and to create the synergy effect through better communications’.

With respect to WINS, which was launched in 2008, most interviewees believed it did not duplicate what the centres were doing and that WINS helped to broaden the range of nuclear security training options offered by the centres through joint activities. According to a respondent, one centre in Asia was already cooperating with WINS and holding workshops to promote its goals. Moreover, a senior official involved in establishing WINS said that, ‘WINS would never have a footprint in countries where most of the centres were being established but its products would provide invaluable guidance to help to strengthen the nuclear security culture of these countries’.

A number of interviewees believed that a major role for the centres in the future could be to provide a platform for WINS to deliver its planned portfolio of accredited training; specific courses aimed at the various nuclear security positions in nuclear facilities. Such an approach would mirror the training and accreditation regime for nuclear safety and its regulation. WINS was seen to be working well with nuclear operators and supported a range of nuclear regulator interests including a strong security and safety

---

48 Interview S, 18 November 2011.
49 Interview E2, 14 December 2011.
50 Interview S, 18 November 2011.
51 Interview A, 1 November 2011.
culture.\textsuperscript{52} The interview with the Executive Director of WINS confirmed the organisation’s desire to use some of the centres as a focus for delivery of its future courses related to the accreditation of courses for specific positions in the nuclear industry.

One interviewee highlighted that WINS is also being used to lead various initiatives on scientist engagement for GP programmes in at least two countries.\textsuperscript{53} While this may to some appear like an overlap with the aspirations of some of the centres, time will tell if some of the wider non-proliferation work funded under the GP Programme can be delivered by the centres as well as WINS. At a GP workshop held on 23 January 2012 in Washington, DC, some senior US officials certainly believed they could\textsuperscript{54} and such an approach it was suggested could help incentivise states to take greater ownership of a wider portfolio of non-proliferation and security initiatives in their own country or region using the centres as hubs for a range of initiatives. Certainly, the strong US support being provided to the new centres is designed to enhance nuclear security expertise and to create sustainable security frameworks that the countries themselves own and operate.

**Wider nuclear interests**

Few interviewees commented on whether wider nuclear interests are associated with the establishment of some of the centres and whether the nuclear security agenda is being used as a cover to further commercial opportunities. One senior official from an Asian centre established by its national government emphasised that, ‘rising awareness of the importance of nuclear security has driven the establishment of the centres’, adding that the ‘increasing interest in developing nuclear security capability will encourage private companies in developing and improving technology, for example, instruments and sensors’.\textsuperscript{55} Another senior industry official argued that industry itself could be doing more to promote nuclear security with many companies well aware of the importance of security, safety and safeguards for the well-being of their business. It was also suggested that the plethora of centres may demonstrate a weakness in regulation because they would not be needed if the industry was properly regulated and capable of providing efficient and well run training programmes.\textsuperscript{56}

**The EU centres**

With the exception of the EU CBRN Centres of Excellence, now being rolled out globally as part of a ~\texteuro{}300 million programme under the Instrument for Stability\textsuperscript{57}, few stakeholders made substantive comments about any specific model. Most of the interviewees welcomed the initiative of the EC to establish its centres in key countries and regions to contribute to the international effort to reduce the risks posed by CBRN materials and know-how. Many US interviewees were complementary about the Instrument for Stability programmes on illicit trafficking of nuclear materials, dual-use export controls and the support the EC had provided to the Science Centres since the early 1990s. Some interviewees with a deep knowledge of the EC programmes also

\begin{footnotesize}
\begin{itemize}
  \item \textsuperscript{52} Interview E, 9 November 2011.
  \item \textsuperscript{53} Interview J2, 1 February 2012.
  \item \textsuperscript{54} Observation by an NNSA official.
  \item \textsuperscript{55} Interview S, 18 November 2011.
  \item \textsuperscript{56} Interview X, 30 November 2011.
  \item \textsuperscript{57} See Annex C.
\end{itemize}
\end{footnotesize}
emphasised the good working relations they had with, and the competence of, the EC JRC nuclear security unit which worked closely with the IAEA and NNSA via the border control monitoring group and had a key role in advising the EC on establishing its centres.\textsuperscript{58}

However, a number of interviewees felt the EC had not done enough to both road test their own concept of how the CBRN centres would operate nor explained well enough how they would be coordinated with other centres and threat reduction activities in relevant countries and regions.\textsuperscript{59} Some interviewees also felt the EC had not fully understood the complexities of establishing and implementing the centres and, on balance, had focused too much on the process and methodology of creating the CBRN centres than the practicalities of implementing them.\textsuperscript{60} While some of those interviewed believed a pilot project might have helped to resolve some of the teething problems experienced by the EC centres, most notably related to implementation of projects, others felt more effective coordination with EU Member States’ own programmes at an early stage might have been helpful.\textsuperscript{61} One very senior official from a EU state highlighted one of the difficulties: ‘The fact that the EC has charged the UN Interregional Crime and Research Institute (UNICRI) to develop the terms of reference of 19 projects to be implemented in 2012-2013 under the Centre of Excellence initiative (16 million Euros) creates confusion in the developing countries, that see a UN international organization taking charge of the EU initiative, as if it was its own. The persons identified to deal with the regional secretariat have been employed by UNICRI with the EU funds. This aspect is very confusing and needs to be tackled and discussed at the Instrument of Stability management committee’.\textsuperscript{62} Another interviewee neatly summed up the views of many by stating that, ‘the information provided to us was not very clear, seemed very ambitious and the approach not likely to be sustainable for the long term’.\textsuperscript{63}

\textsuperscript{58} Interview D, 7 November 2011.
\textsuperscript{59} Interview H, 19 October 2011; Interview C, 8 November 2011; Interview R, 20 December 2011.
\textsuperscript{60} Interview H, 19 October 2011; Interview T, 3 November 2011.
\textsuperscript{61} Interview H, 19 October 2011.
\textsuperscript{62} Interview A2, 10 February 2012.
\textsuperscript{63} Interview T2, 3 November 2011.
Conclusions and recommendations

Nearly all of those interviewed for this study were strong supporters of the “centres” providing a comprehensive approach to the prevention, detection of and response to nuclear security incidents. Most interviewees believed the establishment of additional national and regional centres, as announced at the 2010 NSS, would help to raise further awareness of the importance of addressing nuclear security issues to a level previously afforded only to nuclear safety. It was also generally felt that the centres would provide an invaluable future resource network for nuclear renaissance countries seeking to access advice and training opportunities as they begin to develop their own nuclear power infrastructures over the coming decades.

The few exceptions to this general position believed the centres were unnecessary if industry and nuclear regulators were doing their job properly. But this ignores the fact that many countries are just starting to build up their competencies in all things nuclear as part of their work to examine the potential for nuclear to contribute to future energy mixes. Moreover, many countries in regions such as South America, Africa, the Middle East and southeast Asia recognise that they need to do more to keep safe and secure their radiological sources, as well as maintaining and using monitoring equipment operated by border guards, whether they aspire to having nuclear power as part of their future energy mix or otherwise. Many countries also recognise that they can gain access to a wide range of skills and expertise by participating in a range of IAEA nuclear security initiatives ranging from education schemes such as INSEN to training opportunities provided by the nuclear security support centres.

The following paragraphs highlight the main conclusions of the study and associated recommendations.

Avoiding silos

There is a real danger that by creating centres with a specific focus on nuclear security, opportunities will be lost to learn lessons and to share best practice from the nuclear safety sector which may be just as applicable to addressing security issues. The approach of the Indian Global Centre for Nuclear Energy Partnership, the Gulf Nuclear Energy Infrastructure Institute and the French initiative to include nuclear security courses at the European Nuclear Safety Training and Tutoring Institute\(^6\), highlights that some country’s attach importance to having an integrated approach to security, safety and safeguards in the design of their centres in order to avoid this happening.\(^6\) Such an approach makes the survival of the centres much more sustainable over the longer term. However, most of the other centres either currently operating or planned are not adopting an integrated or holistic approach to all things nuclear. While some nuclear safety issues have no security implications (for example, reactor pressure vessel operating conditions) and some security issues have no safety implications (for example, theft of Intellectual Property), many of the safety and security issues affecting the nuclear industry (and industries using radiological sources) are not mutually exclusive. As WINS notes, ‘Nuclear Security and Nuclear Safety have common

\(^6\) However the nuclear security element in the new curricula is very modest with only 2 days out of 20 days devoted to nuclear security issues in the Introduction to Nuclear Safety course. See: ‘Introduction to nuclear safety – 2012’ at http://www.enstti.eu/Pages/Training.aspx

\(^6\) See the descriptions of these centres at Annex B.
objectives – the protection of people and the environment. More effective protection of the people and the environment can be achieved through the integration of both nuclear safety and nuclear security.\textsuperscript{66}

Although some 90\% of the centres are likely to be dealing with radiological material\textsuperscript{67} a core of centres will need to consider the security issues associated with a sizeable civil nuclear power programme and associated nuclear materials. A flexible, balanced and integrated approach -- rather than one that creates and perpetuates a silo culture -- ensures that solutions for nuclear security do not adversely influence the effectiveness delivering nuclear safety and vice versa. The WINS guide best practice guide on an integrated approach to nuclear safety and nuclear security lists a number of advantages of an integrated approach. Many of these would be applicable to the efficient operation of the centres and include:

- Introducing security considerations into initial R&D programmes can identify potential vulnerabilities and potential value of continuing with the work
- Carrying out a joint analysis of safety and security characteristics of a site can optimise site selection and avoid expensive back fitting to compensate for security vulnerabilities
- When security and safety teams work together, facilities can be designed that deliver both safety and security
- An integrated approach helps organisations avoid costly modifications to meet nuclear safety requirements
- A coordinated approach to facility design helps to insure optimal arrangements for both security and safety
- An integrated approach to emergency response exercises helps an organisation maintain its capability and can potentially reduce the overall number of exercises, This results in cost and staff availability advantages\textsuperscript{68}

A silo approach could be avoided in a number of ways:

- Ensuring training, education and induction courses highlight the value and benefits of an integrated approach to nuclear security, safeguards and safety
- Ensuring an integrated approach to the preparation of nuclear threat assessment exercises run by the centres take account of both security and safety performance needs
- Sharing lessons learned and best practice on human resource development

Recommendation 1: The centres should develop appropriate links and collaborations with nuclear safety organisations to foster closer working relations and the sharing of best practices and lessons learned especially as these relate to human resource development and threat assessment exercises.

Coordination and collaboration by the key sponsoring groups

A consistent message from the research is the concern about the apparent lack of effective coordination and collaboration between the centres including the potential for

\textsuperscript{66} An Integrated Approach to Nuclear Safety and Nuclear Security, WINS Best Practice Guide, 2010
\textsuperscript{67} Interview T, 3 November 2011.
\textsuperscript{68} An Integrated Approach to Nuclear Safety and Nuclear Security, WINS Best Practice Guide, 2010
duplication of effort. The establishment of the various centres irrespective of whether they have primarily a technical focus (Group A) an educational focus (Group B), a mixture (Group C), primarily a research, commercial focus Group D) or awareness raising (Group E), has come about due to the programme initiatives of largely three powerful and influential players: the IAEA, the EC and the US government (State, DoD and NNSA). The US has been instrumental in encouraging China, India, Brazil and Kazakhstan to consider establishing COE and allocating significant funding, including some $30 million and technical support to China and India as inducements. The US programmes via State and NNSA are also funding a substantial programme of training, education and the provision of equipment to a number of countries to enhance their nuclear security provisions.69

The EC CBRN COE programme is being rolled out to over 50 countries via eight regional secretariats, many of which are also the focus of US initiatives. The IAEA is supporting an influential and impressive programme of training and education as well encouraging a growing portfolio of nuclear security support centres in some 13 countries.

It is clear that until fairly recently these three players have spent more time setting up their individual centres than thinking about how best to ensure effective coordination and collaboration with each other. To quote one senior official from the US, ‘it appears that many of the centres - nuclear security support centres and the EU centres - are being rushed into existence with no apparent regard for coordination of purpose and objectives’.71 There is clearly a very important lesson to be learned here and that is a lot more can and should be done in future by these three influential players before rolling out global programmes to coordinate and plan their work. A similar message came out of an evaluation of the GP programme in 2011.72

Recommendation 2: The three key players -- the US, the EU and the IAEA -- should make a concerted effort to ensure that earlier, meaningful discussions on coordinating their programmes take place as they encourage nuclear security centres to be established by providing funding and technical support.

Coordination of major threat reduction programmes is greatly assisted not just by regular meetings but by ensuring there is an effective information system in place where basic data about programmes and projects is available. For many of the policy meetings (GP, IAEA, etc) where the centres and wider programmes are discussed, representation from interested states does not necessarily include those at the sharp end of programme development. While the three main players do share information and have informative websites, the way the information is collated and used is clearly not optimal and improvements in this respect could help improve coordination. At present the GP does produce an annual compendium of key programmes and projects73 which embraces much of the work undertaken on CBRN threat reduction including nuclear

70 The State Department’s Partnership for Nuclear Security is one such programme.
71 Interview P, 29 November 2011.
72 See: Heyes, Bowen and Chalmers.
security projects. However, this information is not presented in a user friendly way, nor is it organised so it is easy to see the level of activity in particular countries or key programme areas such as scientist engagement, nuclear security capacity building, training and so on. This makes it difficult to identify potential gaps and duplication of effort. Presenting basic data in a user friendly way may well assist the centres to identify areas where they can add value, avoid duplication and identify other players in their country or region who may be worthwhile collaborating with.

**Recommendation 3:** Present GP collated information in a more user friendly way.

**Coordination between the centres**

In July 2011 the IAEA hosted the first meeting to discuss coordination of the current and planned efforts of states and the EU to establish and maintain COE. The aim was to identify the criteria for the centres, coordinate their activities to ensure the effective use of resources and promote coherent approaches to exchanging information and best practices. The meeting made some progress in raising awareness of the range of work underway to establish the centres and the importance of establishing a collaborative network for nuclear security training and the other COE activities. A further meeting took place in early February 2012. Under the US chair of the GP in 2012, a number of technical working groups have been established to drive forward some key priorities. These include a working group on the COE which will meet in March 2012 and be chaired by a senior official from the UK Foreign and Commonwealth Office. While these high level, largely policy focused discussions are to be welcomed, and should at least ensure increased awareness of what the centres are doing and help to identify opportunities for collaboration, they do not go far enough to ensure there is consistency of approach in terms of the technical and educational aspects which will determine the long term sustainability of the centres.

A similar state of affairs existed with the respective border monitoring equipment programmes of the NNSA, the EC and the IAEA before the establishment of the Border Monitoring Working Group (BMWG) in 2006. The BMWG is a small and informal group that seeks to maximize resources, avoid duplicate installation and training activities, and promote long-term, sustained enhancements in border security. The objective of the BMWG is to promote co-operation between the IAEA, the US, the EC and the Council of the European Union (CEU). The BMWG serves as a forum for discussion and exchange of information on plans and programs to be implemented with the objective to optimise the use of resources, and with the view of coordinating specific projects in the field carried out by contributors in cooperation with the recipient countries. The BMWG also promotes collaboration at borders between countries and at international level. As a coordination group, the BMWG may also issue non-binding recommendations to avoid overlapping of programmes implemented by its members. The experience of the BMWG has shown that at the technical working level some of the most effective coordination and collaboration can be achieved. Similar technical coordination can be seen by another working group the IAEA is involved in – the Contact Expert Group

---

74 Such meetings rarely involve the majority of the key players leading the work to establish the centres with some of the meetings having no representation from key players. The recent IAEA meeting to discuss centres of excellence had no one from China present.

75 Interview M, 18 January 2012
(CEG)\textsuperscript{76} which has coordinated and fostered collaboration on GP projects in NW Russia, including exchanges of information and best practice for some 15 years involving some 13 countries, the EC and the ISTC.

In the early stages in the development of the centres there is a need for strong policy oversight of the type currently fostered by the IAEA/GP Working Group. However, now that some of these centres are being established and starting to implement training courses, there is a need for a more technical, operationally based framework along the lines established by the BMWG and the CEG. These can be informal as is the case with the BMWG or have formal structures with a Secretariat as in the case of the CEG. Establishing such a group could:

- Incentivise the centres themselves to take ownership to coordinate their own activities and share best practices and lessons learned
- Provide a framework to discuss the technical and educational curricula of their centres and identify areas which can be enhanced to develop excellence in training and education through sharing best practice
- Provide a framework to share information and encourage collaboration on specialist courses and exercises
- Develop a standard set of metrics against which the effectiveness of the centres can be determined
- Better promote the activities of the centres through a dedicated website\textsuperscript{77}

\textit{Recommendation 4: Establish a technical coordinating group to foster coordination and collaboration between the centres.}

\textbf{Accreditation of training}

An important feature of the concept underlying the IAEA nuclear security support centres is the need to develop qualified nuclear security instructors to ensure their long term success and sustainability. Such personnel identify a state’s overall nuclear security training needs and the courses they are responsible for need to be subject to regular reviews to ensure quality and high standards. Some of the courses may also require certification/accreditation and moderation by training and education authorities. Where centres open training courses to an international audience, as many plan to do, it will be important to establish an accreditation process to ensure consistency in the quality of training so that employers from other states have a clear understanding of the training their staff will receive and the level of competence they will reach. There is little evidence yet that the centres have given much thought to developing an accreditation mechanism to ensure consistency in approach to nuclear security training. If the centres really aspire to become centres of excellence for nuclear security training then establishing a quality assurance methodology will be necessary in order to provide:

- A definitive standard for nuclear security training providers wanting to gain formal recognition for training which they deliver

\textsuperscript{76} See: IAEA Contact Expert Group website for details of objectives and work programme at http://www.iaea.org/OurWork/ST/NE/NEFW/CEG/index.html

\textsuperscript{77} The IAEA have suggested their Nuclear Security (NUSEC) portal could be used to develop the network of nuclear security support centres
- A framework for trainers wanting to design a professional practitioner training course for nuclear security to an internationally recognised standard
- A reference for prospective students seeking assurance about the quality of their future training
- A benchmark for employers when recruiting practitioners that need to be trained to a high professional standard

The task of establishing an appropriate accreditation scheme for those centres offering nuclear security training courses would be a suitable objective of the technical coordinating group recommended above with advice from the IAEA. Even those centres purely focused on meeting their national nuclear security training needs would benefit from involvement in the development of an accreditation process so that the quality of all training is raised. Coordination of these aspects of nuclear security training could also include agreement on appropriate metrics which would be useful for the centres to demonstrate successful performance to international donors.

**Recommendation 5:** To consider establishing an accreditation methodology so that there is an internationally recognised quality assurance standard for the training offered by the centres.

### Promoting WINS and making the centres more cost effective

WINS was established in 2008 to provide an international forum for those accountable for nuclear security to share and promote the implementation of best security practices. So far much of its effort has been focused on preparing a portfolio of best practice guides. At the Seoul summit WINS plans to establish a WINS Academy to develop a global accreditation mechanism focused on job task analysis.\(^{78}\) This will focus on providing what professional people need rather than a general education programme that would take them away from their workplace for significant periods of time. The scope of the Academy will essentially involve the development and provision of a suite of competency based training modules organised around specific roles for security related practitioners, including non-security personnel. WINS intends these to cover the obligations of operators and licensees as set out in INFCIRC/225 rev 5\(^{79}\) and cluster them around different roles and responsibilities such as:

- Board Members
- Senior Management
- Nuclear Security Directors
- Engineers and Scientists engaged in nuclear security related activities or with nuclear security interfaces
- Nuclear Safety and Emergency Planning Managers
- Off-site Response Force Management
- Guard Force Managers

The WINS suite of materials will provide a standard against which professional development can be assessed. As a formal quality management framework WINS plans

\(^{78}\) Information provided by WINS Executive Director, Roger Howsley.

to apply for ISO accreditation (ISO9001) in 2012. This initiative offers considerable opportunities for the centres to broaden their activities by partnering with WINS and to accommodate the WINS material in their curricula. For example, WINS has already agreed to provide modules on nuclear security management to the Gulf Nuclear Energy Infrastructure Institute (GNEII).

**Recommendation 6**: For the centres to partner with WINS and include its professional development material in their training curricula.

**Support for IAEA initiatives**

Most of the stakeholders that provided input to the project were very complementary about the work the IAEA Office of Nuclear Security is undertaking to provide a comprehensive portfolio of training and educational material, as well as experts to present at courses organised by the centres or *ad hoc* training workshops. Most recognised that the IAEA had limited funds and human resources but that the training and educational networks now being established such as INSEN offered further opportunities to access best practice and expertise. Establishing training and education networks via the nuclear security support centres and INSEN is at a comparatively early stage of development. It will be important that these networks are fostered and that training and education advice/guidance are given time to bed down and to become sustainable activities. Appropriate technical and financial resources will need to be made available to the Office of Nuclear Security so that it can continue to resource the roll-out of the nuclear security support centres and the development of the associated INSEN.

**Recommendation 7**: IAEA members should continue to provide sufficient contributions to the Nuclear Security Fund to enable the portfolio of nuclear security support centres to be established successfully and to support INSEN while it establishes itself as a key tool to help embed nuclear security into educational curricula.

**Build on what already exists: the Science Centres and CRDF**

The creation of the centres and the focus on ensuring their sustainable development may well risk missing opportunities to leverage existing organisations and expertise. Existing centres of cooperation, such as the Science Centres in Moscow and Kiev (see annex B) and the regional centres of CRDF Global, provide ready-made organisational infrastructures and processes, networks of contracts, and familiarity with specific countries and regions. Some of those interviewed emphasised that not all countries or even regions will need a centre and the delivery of training and best practice advice may just as easily, and more cost effectively, be provided from such existing networks or one of the IAEA nuclear security support centres. Unfortunately, there is not much political capital to be made for officials and bureaucrats promoting a “make do and mend policy” and new initiatives rarely consider whether other existing options might do the job just as well.

80 See: CRDF website for details of their objectives, where they work and projects etc, at http://www.crdfglobal.org/where-we-work
81 Interview E, 9 November 2011
82 The Tanzania nuclear security support centre is now offering its services to provide maintenance of equipment to neighbouring countries meaning these countries do not need to establish their own nuclear security support centre – information provided to the author by the IAEA Office of Nuclear Security
**Recommendation 8:** Before contemplating establishing further centres consideration should be given to whether nuclear security training and best practice advice might be more cost effectively delivered through existing centres of cooperation.

**Focus for GP projects and programmes**

Although it was not mentioned by any of stakeholder interviewed for the project, it is clear that a number of key donors involved in threat reduction, in the US in particular, plan on using the centres to deliver many of their initiatives embracing training and raising awareness of the importance of nuclear security. The centres are seen as neutral locations to deliver projects which meet US priorities on threat reduction, especially in terms of supporting and enhancing the second line of defence programmes managed by the NNSA. Good examples of these are some of the Japan Centre courses on regional training for physical protection involving 14 countries, and the international course on state systems of accounting for and control of nuclear material involving 13 countries.

The centres clearly offer considerable benefits to the US to help deliver its objective of enhancing global security, and this was presumably one the main political justifications for providing some $30 million of the CTR programme budget to China and India which have successful economies and are also nuclear weapon states. There would appear to be a considerable advantage for other countries with internationally focused threat reduction programmes to make similar use of the centres to support similar capacity building activities in the regions they have a political interest in. Key among these are likely to be the programmes of the GP. The sustainability and long term viability of the centres would be strengthened by their involvement. GP involvement might also improve coordination and encourage greater collaboration (for example, via twinning of the centres with organisations in GP countries undertaking nuclear security training).

Widening involvement away from strongly focused US support for the centres would also likely make the centres more attractive to those countries which may have political difficulties in being seen to depend on US support. From the point of view of the US, greater burden sharing would also help to attract continued Congressional support for US threat reduction programmes. Arguably more importantly, it would be invaluable to have as wide a source of lessons learned available to help strengthen the quality of training and wider participation in the work of the centres from GP centres of expertise, including nuclear regulators which in some countries, such as Norway and Sweden, already devote a good deal of effort to international outreach. As recommendation 2 highlighted, any proposals to use the centres to become involved in GP programmes would benefit from appropriate consultation and discussions with GP partners.

**Recommendation 9:** For the GP to consider using the centres as a focus for support and enabling a wider membership to participate in and partner with GP projects.

**Completing the circle: linking training with education**

The development of Pakistan’s nuclear security support centre was one of the first to be assisted by the IAEA. It now has strong links with the Pakistan Institute of Engineering and Applied Sciences (PIEAS) so that elements of nuclear security can be included in the curricula of its nuclear courses (see Annex B). The centre is also running more
general awareness courses for policy makers. Such an approach strengthens the development of nuclear security culture and ingrains the importance of the topic at an early stage in the development of nuclear professionals. While in the early stages of their development, the technical centres categorised as Group A should focus on establishing their technical and scientific credibility and building up a reputation of excellence. Widening their activities to include educational courses would appear to be a highly desirable approach. This should help make the centres more sustainable in the long term.

**Recommendation 10:** The technically focused centres (Group A) should develop partnerships with education establishments so that a holistic approach to nuclear security education and training can be developed.

### Summary of recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The centres should develop appropriate links and collaborations with nuclear safety organisations to foster closer working relations and the sharing of best practices and lessons learned especially as these relate to human resource development and threat assessment exercises.</td>
</tr>
<tr>
<td>2</td>
<td>The three key players -- the US, the EU and the IAEA -- should make a concerted effort to ensure that earlier, meaningful discussions on coordinating their programmes take place as they encourage nuclear security centres to be established by providing funding and technical support.</td>
</tr>
<tr>
<td>3</td>
<td>Present GP collated information in a more user friendly way.</td>
</tr>
<tr>
<td>4</td>
<td>Establish a technical coordinating group to foster coordination and collaboration between the centres.</td>
</tr>
<tr>
<td>5</td>
<td>To consider establishing an accreditation methodology so that there is an internationally recognised quality assurance standard for the training offered by the centres.</td>
</tr>
<tr>
<td>6</td>
<td>For the centres to partner with WINS and include its professional development material in their training curricula.</td>
</tr>
<tr>
<td>7</td>
<td>IAEA members should continue to provide sufficient contributions to the Nuclear Security Fund to enable the portfolio of nuclear security support centres to be established successfully and to support INSEN while it establishes itself as a key tool to help embed nuclear security into educational curricula.</td>
</tr>
<tr>
<td>8</td>
<td>Before contemplating establishing further centres consideration should be given to whether nuclear security training and best practice advice might be more cost effectively delivered through existing centres of cooperation.</td>
</tr>
<tr>
<td>9</td>
<td>For the GP to consider using the centres as a focus for support and enabling a wider membership to participate in and partner with GP projects.</td>
</tr>
<tr>
<td>10</td>
<td>The technically focused centres (Group A) should develop partnerships with education establishments so that a holistic approach to nuclear security education and training can be developed.</td>
</tr>
</tbody>
</table>

### Conclusion: a model centre

The various centres described in this study present an interesting typology. Some centres, like the EU CBRN centres are in reality a network embracing local, regional, European and international organisations. At present the way the Commission is seeking to meet many of the needs of involved countries is unlikely to create centres of expertise – similar to the IAEA nuclear support centres – because much of the work is
being contracted out. Others, like the French International Institute of Nuclear Energy, are in reality centres of entry for foreign access to national expertise in nuclear security education across the country, but it has agreed it will include elements of nuclear security in some of its education modules. Some, like WINS or the Middle East Scientific Institute for Security, have no technical, research or scientific pretensions but focus on raising awareness.

All the types of centres have the potential to make a valuable contribution to ensuring a robust nuclear security culture is put in place globally, and professional responsibility is ingrained in those who work with nuclear and radiological materials. However, the immediate and medium term needs of most countries are likely to involve access to technical and scientific expertise related to nuclear material protection control and accountancy, together with enhancing their detection and response capabilities. This is certainly what the US government expects from the COE concept. Those states with aspirations to have nuclear as part of their future energy mix also want to build up a cadre of nuclear scientists and engineers so they can:

- Become an informed buyer of nuclear power plants
- Have the expertise to develop and manage safely and securely their nuclear research facilities
- Have suitably trained and educated human resources to advise on policy and regulatory issues
- Interact at an international level when nuclear issues are debated

These perfectly understandable needs suggest a ‘model centre’ would be very similar to the concept developed by the IAEA for its nuclear security support centres, but have the additional function of working closely with nuclear education faculties to ensure nuclear security is embedded into all nuclear education curricula. Work placements, sponsored research projects and the like would help to create strong and sustainable linkages between the centres and key academic institutions. Education and other scientific institutions could also assist the centres in developing appropriate metrics for their work and conduct joint research to enhance the effectiveness of equipment and so on. Establishing partnerships between the centres and the country’s scientific and education faculties would also provide the centres with access to additional skills and expertise to undertake GP projects on scientist engagement.

---

83 See latest lists of projects open for tender at: List of Approved Projects, Coordinating Committee Meetings, 8th July and 9th September 2011, Brussels: http://www.cbrn-coe.eu/docs/index_of_projects.pdf
Annex A:
List of organisations and individuals consulted during the research process

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Individuals interviewed face to face or who submitted a written response to the questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>US National Security Council</td>
<td>Laura Holgate – Senior Director, WMD Terrorism and Threat Reduction</td>
</tr>
<tr>
<td>US National Science Academies</td>
<td>Micah Lowenthal – Director, Committee on International Security and Arms Control</td>
</tr>
<tr>
<td>US State Department</td>
<td>Ambassador Bonnie Jenkins – Special Envoy and Coordinator for Threat Reduction Programs</td>
</tr>
<tr>
<td></td>
<td>Tom Wuchte – Senior Adviser US 1540 Coordinator</td>
</tr>
<tr>
<td>US Department of Energy – National Nuclear Administration</td>
<td>Anne Harrington – Deputy Administrator for Defense Nuclear Non-proliferation</td>
</tr>
<tr>
<td></td>
<td>Monte Mallin – Director, Office of Global Security Engagement and Cooperation</td>
</tr>
<tr>
<td></td>
<td>Regina Carter – Office of Non-proliferation and International Security</td>
</tr>
<tr>
<td></td>
<td>Janette Hill – Foreign Affairs Advisor for International Regimes and Agreements</td>
</tr>
<tr>
<td>US Nuclear Regulatory Commission</td>
<td>Margaret Doane, Director of International Programmes, Dr Karen Henderson, Senior Level Foreign Policy Advisor</td>
</tr>
<tr>
<td>US Nuclear Threat Initiative</td>
<td>Corey Hinderstein, Vice President International Program</td>
</tr>
<tr>
<td>UK Foreign and Commonwealth Office</td>
<td>Jason Tierney – CBRN team</td>
</tr>
<tr>
<td>UK Department of Energy and Climate Change</td>
<td>Rhydian Phillips - Head of non-proliferation and emergency response;</td>
</tr>
<tr>
<td></td>
<td>Fiona Harrison – programme director for Global Threat Reduction Programme</td>
</tr>
<tr>
<td>UK Office for Nuclear Regulation</td>
<td>Chris Price OBE – Deputy Director and Nuclear security expert</td>
</tr>
<tr>
<td>UK National Nuclear Laboratory</td>
<td>Norman Bird – Technical lead manager – Nuclear security, Assurance and GIS</td>
</tr>
<tr>
<td></td>
<td>Homeland Security and Non-Proliferation Team</td>
</tr>
<tr>
<td>UCLan</td>
<td>Professor Laurence Williams, Professor of Nuclear Safety, School of Computer, Engineering and Physical Sciences,</td>
</tr>
<tr>
<td>Organization</td>
<td>Representative(s)</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
Louis-Victor Bril – External Action Service  
Soren Klem – Project Manager |
| EC Joint Research Centre                          | Willem Janssens – head of Nuclear Security Unit, Institute for the Protection and Security of the Citizen plus his team:  
Dr Veronique Berthou  
Dr Hamid Tagziria  
Zdenka Palajova |
| United Nations Interregional Crime Research Institute | Francesco Marelli – Deputy Head, Security Governance/Counter-Terrorism Laboratory |
| Science and Technology Center Ukraine (STCU) Kiev | Andrew Hood – Executive Executive Director |
| International Science and Technology Center (ISTC) Moscow | Adrian van der Meer – Executive Director |
| Stockholm International Peace Research Institute (SIPRI) | Ian Anthony |
| Japanese Atomic Energy Agency                    | Naoki Kobayashi – General Manager, Planning and Coordination Office – Integrated Support Center for nuclear non proliferation and Nuclear Security |
| International Atomic Energy Agency (IAEA) – Office of Nuclear Security | Tim Andrews and Andrea Braunegger-Guelich |
| World Institute for Nuclear Security (WINS)      | Roger Howsley – Executive Director |
| Chinese Atomic Energy Authority                  | Liu Daming – Deputy Director, Department of Radiochemistry |
| World Nuclear Association                        | John Ritch – Director General  
Greg Kaser – Senior Project Manager |
<p>| Government of India, Bhabha Atomic Research Centre | G P Srivastava – Director, Electronics and Instrumentation Group |
| The Abdus Salam International Centre for Theoretical Physics | Prof. Claudio Tuniz |</p>
<table>
<thead>
<tr>
<th>Country</th>
<th>Name</th>
<th>Position/Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italian Foreign Ministry</td>
<td>Counsellor Andrea Cavallari</td>
<td>Ministry of Foreign Affairs, Italy</td>
</tr>
<tr>
<td>Middle East Scientific Institute for Security, Jordan</td>
<td>Al-Sharif Nasser Bin Nasser</td>
<td></td>
</tr>
<tr>
<td>League of Arab States</td>
<td>Mahmoud Nasreddine – Scientific Adviser</td>
<td>to the Secretary General</td>
</tr>
<tr>
<td>South Korea</td>
<td>Choong-hee Hahn – nuclear security</td>
<td>summit sous Sherpa and spokesman</td>
</tr>
<tr>
<td>Algeria</td>
<td>Linda Briza</td>
<td>Director</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Focal point for the EU-CBRN CoE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Algeria.</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Shazia Fayyaz</td>
<td>Pakistan Nuclear Regulatory Authority (PNRA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mr Majeed Tariq</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pakistan Institute of Engineering and Applied Sciences (PIEAS)</td>
</tr>
<tr>
<td>France</td>
<td>Paul Furia</td>
<td>Ministry of Foreign and European Affairs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Directorate for Strategic Affairs, Security and Disarmament</td>
</tr>
</tbody>
</table>
Annex B: The Centres

The following pages provides an account of each centre referred to in the report including: aims and objectives; what they are doing or planning to do; relationships with other centres; and so on.

Brazil

Brazil announced at the 2010 nuclear security summit its willingness to establish a regional centre of excellence to provide training and education for nuclear security officials. The latest information available for this report indicate that intergovernmental discussions are still taking place. No timetable is available for the establishment of the centre and its location.

China (Centre of Excellence on Nuclear Security) 84

At the Nuclear Security summit in 2010 China stated that it attached great importance to the issue of nuclear security and that it has endeavoured to promote security culture in its nuclear industry and taken effective steps to ensure the security of nuclear materials and facilities. It emphasised it supported the work of the IAEA on nuclear security, had taken an active part in international cooperation and stood ready to share experience with other countries on nuclear security. At the summit China’s President Hu agreed to establish a “Centre of Excellence” on nuclear security. The key aims of the centre are to:

- Establish a platform to promote international collaboration on nuclear security engagement throughout the Asia-Pacific region as well as nuclear security training involving a broader international audience
- Serve as a national and regional centre to develop training courses and implement the training on nuclear security and safeguards, nuclear material measurement, and nuclear detection and response technologies, etc
- Provide a forum to exchange technical information and the experience of best practices on nuclear security, and conduct technical demonstrations and field testing of Material Protection, Control and Accounting (MPC&A) and related nuclear security and safeguards technologies, concepts, and practices.

The scope of the centre aims to include regional and national training on nuclear security and safeguards, technology demonstrations, safeguards measurement control and standard development, safeguards and security educational programmes for next generation nuclear engineers, exercises and performance testing, and technical support to domestic regulators and inspectors. It will have the capability to train protective force personnel using scenario-driven response exercises and give hands-on training on international nuclear safeguards requirements. Once fully operational the centre will have the capacity to train protective force personnel using scenario driven response

84 Information derived from presentations by the China Institute of Atomic Energy, China Atomic Energy Authority and the US National Nuclear Security Administration
exercises and give hands on training on international safeguards requirements and inspection techniques.

China is working with the US National Nuclear Security Administration (NNSA) to construct and establish the centre with financial and technical support from the NNSA and US Department of Defense. The two storey building is being financed through a US-China cost sharing arrangement\(^\text{85}\) and is expected to be completed in 2012-2013. The NNSA cooperation is largely with the Chinese Atomic Energy Agency who run the Chinese civilian research facilities and have a role in the operation of China’s nuclear power plants. However the NNSA have expressed a hope that if US best practice on nuclear security gets into the Chinese civil nuclear sector the defence side of China’s nuclear sector will also benefit indirectly.\(^\text{86}\)

Although a key objective of establishing the centre was intended to help meet the training needs for China’s expanding nuclear sector.\(^\text{87}\) it will also be used to promote nuclear security best practices throughout the region. In particular the centre will also enable the training of nuclear site personnel on measurements and accounting of nuclear material and on the design and installation of nuclear material security systems and inspection techniques. In addition to providing equipment to enhance nuclear security training, NNSA will work through its MPC&A programme\(^\text{88}\) to assist in developing training programmes and facilitating the exchanges of best practices.

The development of the Chinese centre is part of an ongoing partnership between the US and Chinese governments under the “Peaceful Uses of Nuclear Technology Agreement (PUNT) signed in 1998. PUNT is a legally binding mechanism between the US and China that allows for bilateral technical cooperation in civil nuclear energy and non proliferation. The development of the new centre represents a significant expansion of the existing facilities used for US-China training since 2005 embracing a portfolio of nuclear security and safeguards workshops.

\(^{85}\) US funding for contributing to the centre is coming from the NNSA budget (International Materials Protection and Cooperation: Second Line of Defense programme: see \url{http://www.state.gov/documents/organization/183039.pdf}, page 85

\(^{86}\) See statement from a NNSA official of 28th January 2011 - \url{http://www.defense.gov/news/newsarticle.aspx?id=62619}

\(^{87}\) Mainland China has 14 nuclear power reactors in operation, more than 25 under construction, and more about to start construction soon. Additional reactors are planned, including some of the world's most advanced, to give a five- or six-fold increase in nuclear capacity to at least 60 GWe by 2020, then 200 GWe by 2030, and 400 GWe by 2050. Source: World Nuclear Association , January 2012 - \url{http://www.world-nuclear.org/info/inf63.html}

\(^{88}\) NNSA’s Material Protection, Control and Accounting Programmes work collaboratively with key partner countries to improve the security of nuclear weapons and materials at their source through material protection, control and accounting (MPC&A) upgrades at nuclear sites; exchange nuclear security best practices; and establish systematic nuclear security training programs and facilities.
France (The International Institute of Nuclear Energy)\textsuperscript{89}

In March 2010, France’s President Nicolas Sarkozy announced that his country would establish an International Institute of Nuclear Energy that would facilitate the access of international students to French nuclear training and education. At the 2010 summit France also committed to incorporating nuclear security into the curricula of the Institute and reaffirmed it in January 2011.\textsuperscript{90} The Institute was formerly opened in July 2011 and is based at the Paris-Saclay Campus.

A key aim of the Institute is to share best practices in safety and all the knowledge required for the responsible management of a sustainable nuclear industry. The Institute, also known as “12N” brings together all the key French experts from the leading universities and engineering schools, main research organisations and companies in the nuclear industry, and additionally from the French ministries (higher education and research, industry, environment, and foreign affairs). In France there are over twenty academic institutions that offer training in nuclear energy, covering the full range of subjects, including reactor physics, design and operation of reactors, the physics and chemistry of the nuclear fuel cycle, materials science, waste management, dismantling, radioprotection, and of course nuclear safety. Every year over 1,100 students complete a Master’s degree in nuclear energy, which almost meets the human resources needs of the nuclear organisations in France. Key elements of the work of the Institute involve:

- The Institute receiving and analysing training requests from foreign countries via government or industry channels. It then prepares a proposal based on the specific needs identified. For individuals who are interested in pursuing their nuclear training in France, the Institute website maintains an updated and complete register of the nuclear training courses in France including covered skills and requirements, clocking towards dedicated websites.

- The Institute assesses for the Ministry of Higher Education the standard of nuclear training courses in France with respect to international standards.

- The Institute operates a centre of excellence as part of an international network, animating seminars and forums for professionals on all subjects - scientific or sociological - related to the sustainable development of nuclear energy.

The French system covers a broad range of training and skills preparation, from the needs of state institutions to those relating to the design and operation of nuclear facilities. It covers the entire spectrum of jobs from design and implementation to operation, waste management and decommissioning. The training takes into account

\textsuperscript{89} Information summarised from the Institute’s website at: http://www.i2en.fr/en/institute
\textsuperscript{90} See: Materials Working Group survey response from France’s Nuclear Disarmament and Non-proliferation Unit in the Ministry of Foreign and European Affairs in Paris, January 4, 2011 cited in http://www.armscontrol.org/system/files/Status_Report_April_11_2011_WEB.pdf; and personal communication with the author in January 2012 by Claude Guet, Director for International Affairs of the International Institute of Nuclear Energy (he was one of the 13 international participants in the ‘pilot nuclear security professional development course – Introduction to nuclear security’ King’s is leading on on behalf of the IAEA Office of Nuclear Security. It is not clear when nuclear security will be included in the curricula. A major training course for nuclear industry executives in March 2012 does not appear to include nuclear security in its agenda.
the requirement of maximum safety for the population and the environment of a nuclear reactor and its auxiliaries, as well as for the facilities for the entire fuel cycle (mining, conversion, enrichment, fuel, spent fuel recycling, waste management up to disposal, decommissioning).

**EU CBRN Centres of Excellence**

The creation of the CBRN Centres of Excellence (CoE) aims at implementing a coordinated strategy for CBRN risk mitigation at the international, regional and national levels. The origin of the risk can be criminal (proliferation, theft, sabotage and illicit trafficking), accidental (industrial catastrophes, in particular chemical or nuclear, waste treatment and transport) or natural (mainly pandemics). The CBRN CoE initiative supports, at national and regional levels, the reinforcement of the institutional capacity needed to fight against this risk. It is important to note that the EU is not creating centres of excellence in the style of the China, Pakistan and Indian models etc, but a network of teams who will work together and address the CBRN needs of a country or region. Five EU centres of Excellence have been established to date:

- In Bangkok, Thailand to cover the SE Asia Region
- Amman, Jordan to cover the Middle East
- Tbilisi, Georgia to cover SE Europe, Ukraine and South Caucasus
- Rabat, Morocco to cover West Africa
- Algiers, Algeria to cover North Africa

Three more should be operational in 2012 covering Central Asia, Gulf Cooperation countries, Sub-Saharan Africa.

**Structure of a CBRN Centre of Excellence**

A CBRN Centre of Excellence is a network for promoting CBRN risk mitigation. This goal is being achieved through identification and prioritisation of CBRN-related problems in a region leading to allocation EU funded resources in terms of expertise, training, technical assistance or equipment. Actions are implemented as national and regional projects in close coordination with other international initiatives.

A CBRN Centre of Excellence in a region is composed of national teams of CBRN experts working in networks coordinated through a regional secretariat located. The EU various funded actions/projects are developed by an Implementing Body (IB) which coordinates in the region and ensures the access to the required expertise from the region, the Member States and other stakeholders e.g. International Organizations. The Implementing Body will be constituted by UN Interregional Crime Research Institute (UNICRI) and the Joint Research Centre (JRC)

The IB is supporting the planning, implementation and maintenance of the overall CoE and of each Regional Centre. In particular, the IB will develop technical tools such as CBRN guidelines and best practices for the needs assessment and the formulation of

---

91 Information in part provided by EuropeAid and personal communication with the author. Also: http://www.cbrn-coe.eu/
92 Text provided by Jean Paul Joulia, EuropeAid
methodologies and standards for quality control\textsuperscript{93}. The IB will carry out the analysis of the needs identified by the countries and regional entities and will make appropriate proposals, including the course of action and expected cost, to EuropeAid. Following approval by the EuropeAid of these proposals, the work will be put into practice by the IB.

\textit{Roles of the various elements}

A \textit{Regional Secretariat} is composed of seconded national experts from the countries in a region, headed by a chairman and a deputy. The secretariat is being provided with the necessary resources, (equipment, and training and regional network specific software). The Regional Centres will facilitate technical support to help the National Teams achieve their role, namely collect and analyse the information delivered by the National Teams; communicate the request for financial and technical support to the Implementing Body, ensure the deployment of available local expertise complemented, where necessary, by international experts (from the EU and other stakeholders). \textit{National Teams} are being set-up around National Focal Points appointed by the partner countries to assess countries needs and supporting national strategies in the area of CBRN safety and security. The Teams will rely on existing national structure(s) rather than setting up new and parallel structures and should be composed of experts from all relevant bodies such as the Ministry of Home Affairs, the Ministry of Foreign Affairs, the Ministry of Health, the Ministry of Justice and the Ministry of Industry and Trade, depending on the country’s own arrangement. The National Teams will also be responsible and directly involved in the deployment of the supporting activities in their country in close collaboration with Regional secretariat.

Existing capacities within \textit{EU Member States} and the Commission, including the JRC, in the field of mitigating CBRN risks will be leveraged by the CBRN CoE initiative. The CoE network will be used to disseminate best practices among partner countries. In close coordination with the Implementing Body, EU Member States will provide thematic support based on their capabilities and the needs of the partner countries. The JRC should facilitate the mobilisation of such capabilities within the EU.

An effective strategy to deal with the CBRN threats requires a high level of collaboration among various potential \textit{other stakeholders}. As an international initiative, the CBRN CoE will benefit from the cooperation of many International Organizations (i.e. IAEA, WHO, OPCW, WCO, BWC ISU and INTERPOL), Regional Organizations (i.e. in the EU: EUROPOL, European Biosafety Association [EBSA]; or Non-EU: SECI Centre, OSCE, League of Arab States, African Union and ASEAN). Other potential actors are non-EU States organizations (e.g. US Agencies, Russia and Japan [for South-East Asia]), NGOs, think-tanks, the private sector and academia (in order to improve coordination and efficacy of actions and to avoid duplication of efforts).

\textit{Strategy}

To build a solid foundation for the Centres of Excellence infrastructure, four essential objectives should be aimed at: a comprehensive approach, the existence national policies, the need for ownership and the promotion of a decentralized network.

\textsuperscript{93} In reality some of this work is being contracted out as UNICRI has not got the resources to do it
**Comprehensive approach:** Knowledge and expertise needed to mitigate CBRN risks are available at national, regional and international level, however in a fragmented way - each area addressed in isolation. No single organization possesses all necessary resource, therefore an holistic approach is needed so that all stakeholders, while operating autonomously, can establish common goals for identifying and manage resources necessary to achieve improve CBRN risk mitigation capacities.

**National CBRN Policies:** To improve national technical expertise it is crucial that technical and financial support is combined with policy development. The Centres of Excellence will provide comprehensive strategic options and technical tools that CBRN security planners and policy-makers should take into consideration to develop a comprehensive CBRN Policy.

**Ownership:** The primary responsibility for preventing CBRN trafficking and mitigating the CBRN risk lay on partner countries which should act as owners of the CBRN Centres of Excellence initiative from the very outset of the project for the medium and long-term sustainability of the initiative.

**Decentralized network:** Coordination with national experts working in a regional scale and key actors at international and regional level will ensure that projects are carried out in an optimized way.

**Status of Implementation**

The CBRN Centres of Excellence initiative has been launched by the European Commission with the support of UNICRI and Joint Research Centre through a contracting arrangement. Projects are being implemented or in development in the eight regions described above.

While concrete activities are in development, a policy dialogue has been initiated in the various regions to agree on the building of the Regional Secretariats. These processes require in-depth negotiations and issues to be settled notably the building of the national teams and ensuring the overall sustainability of the project. The European Commission has granted € 26 million over 2008–2010 and increased this amount to some € 15 million in 2011. During the period 2012-2013, a sustained effort is expected to keep the momentum and make the Centres of Excellence initiative a proper tool to raise the capacities to fight CBRN risks.

The network of Centres of Excellence will be the major instrument for implementing the EU policy for CBRN risk mitigation in the framework of the Instrument for Stability.

**Abu Dhabi (Gulf Nuclear Energy Infrastructure Institute)**

The Gulf Nuclear Energy Infrastructure Institute (GNEII) is another example of a “nuclear centre” established to enhance nuclear security education in an integrated way with nuclear energy safety, safeguards and non proliferation for the UAE’s civil nuclear

---

94 Includes Information provided to the author by the Director of the Institute, Dr Byung Koo Kim, Khalifa University during a presentation at a nuclear security workshop in Morocco, 29th February 2012
programme. GNEII was launched in February 2011 by the US NNSA and Department of State after some two years planning and preparation.\(^95\)

**Mission**: To institutionalise key safety, safeguards, security, and non-proliferation norms in the future decision-makers of Middle East region nuclear energy programs through professional development and training.

GNEII is designed to

- Promote international interests in developing a nuclear energy security and safety culture,
- Increase collaboration between the nuclear energy security and safety communities,
- Help to enhance global standards for nuclear energy technology in the Middle East.

This education focused activity is associated with Khalifa University of Science, Technology and Research with support from the Emirates Nuclear Energy Corporation and the UAE Federal Authority for Nuclear Regulation\(^96\). The US organisations implementing the project are Sandia National Laboratories and the Nuclear Security Science and Policy Institute at Texas A&M University. GNEII was developed and supported by the NNSA’s Office of Non-proliferation and International Security’s “International Nuclear Safeguards and Engagement programme,” and the Department of States “Partnership for Nuclear Security Programme”.

The Sandia National Laboratory and Texas A&M University are developing the institute’s curriculum, establishing its physical facilities in Abu Dhabi, provide guest lecturers, and prepare the institutes staff and GNEII programme graduates to help GNEII become, within five years after its inauguration, a self sustaining source of nuclear safety, security, and non proliferation education consistent with international standards.

Note: While GNEII is classified for the purposes of this study as a “Group C” centre, it could equally fall within “Group B” as a most of its activities are education based. It was however classified as Group C because it embraces wider topics than just nuclear security.

**United Kingdom (UCLan Nuclear)**\(^97\)

UCLan Nuclear is another example of a “nuclear centre” that has been set up to provide nuclear education in the “3 S’s”. The University of Central Lancashire (UCLan) based in Preston in the North West of England has a centre for nuclear studies “UCLan Nuclear” that incorporates nuclear security in its education programmes. UCLan has a Memorandum of Understanding (MOU) with the National Nuclear Laboratory (NNL).

---

\(^{95}\) See: ‘NNSA Launches Gulf Nuclear Energy Infrastructure Institute to Promote Nuclear Safety and http://nnsa.energy.gov/mediaroom/pressreleases/gneii02.22.11


\(^{97}\) Information provided by Professor Laurence Williams, Professor of Nuclear Safety, uclan
Through this MOU UCLan is the NNL’s strategic partner for Nuclear Safety, Nuclear Security and Nuclear Regulation. UCLan.

Nuclear has pioneered the teaching of an integrated approach to nuclear safety, nuclear security and safeguards. It has supported WINS in the production of its guide on the integration of nuclear safety and security and the IAEA INSEN programme. In January 2012 UCLan Nuclear launched the world’s first Master of Science in Nuclear Safety, Security and Safeguards. This is part of a programme that enables students to study for not only an MSc in the 3S’s but also Postgraduate Certificates in Nuclear Safety or Nuclear Security; or a Postgraduate Diploma in Nuclear Safety and Nuclear Security.

UCLan Nuclear also delivers undergraduate programmes in nuclear science and engineering to support the nuclear industry and the intention is to introduce nuclear safety and nuclear security into these programmes. To further support the nuclear community UCLan Nuclear offers a range of Continuing Professional Development Courses (CPD) through the “Atkins Academy and UCLan”. Atkins is a large UK based international consulting company that has teamed up with UCLan to develop and provide postgraduate level training programmes for the nuclear industry. The UCLan CPD programme currently includes two nuclear security related courses: a one week course on the “Regulation and Management of Nuclear Security and Safeguards”, and a one week course on the “Delivery of Nuclear Security and Safeguards”. In addition to these two courses UCLan Nuclear is developing a new CPD course, “Introduction to Nuclear Security”, in conjunction with Kings College London. This course will be 5 days and is based upon the IAEA NS1 course.

UCLan Nuclear has been set up without external funding. Its creation is a statement by the University’s dedication to the enhancement of nuclear safety and security not only in the UK but globally. The UCLan Nuclear team is a mix of senior ex-nuclear regulators, nuclear policy makers, and nuclear industry people, and University academics. UCLan plans to become the UK’s leading university for the delivery of nuclear security education and provide, in conjunction with the NNL, a nuclear security support capability to policy makers, regulators and industry.

India (Global Centre for Nuclear Energy Partnership) 98

At the 2010 Nuclear security summit India announced that it would be creating a Nuclear Energy Centre with a nuclear security component. As with the China centre of excellence, the US agreed via the NNSA budget to make a $7 million financial contribution to its establishment embracing the provision of equipment and technical

98 Information from the the centres website at: http://www.gcnep.gov.in/ and from information provided by face to face interview Y, 3rd November 2011
support. The centre has now reached the construction stage with significant delays occurring due to problems acquiring the land for the site.\textsuperscript{99}

The centre has been through a number of name changes since its inception at the summit and is now formerly called the “Global Centre for Nuclear Energy Partnership” (GCNEP). The centre is being constructed at Kheri Jasaur, near Bahadurgarh, Haryana, India. It is not primarily a centre for nuclear security but will also carry out research and development of secure and proliferation resistant reactor systems. Cooperation agreements for assistance and collaboration have been signed with the US\textsuperscript{100}, Russia\textsuperscript{101} and France\textsuperscript{102}.

The Centre will facilitate deliberation and discussions of international experts on various issues including innovation in nuclear reactors and the nuclear fuel cycle, development of proliferation-resistant reactors, security technologies and the effects of radiation exposure. It is also planned that the Centre would host short-term training courses for international nuclear experts in the field of nuclear security. International cooperation will be an important dimension of the Centre which will focus not only on training programmes, also in cooperation with the IAEA, but on new and innovative technological responses to meet the challenges of safety and security.

The centre will consist of five schools for advance research, study and training of nuclear systems and facilities:

School of Advanced Nuclear Energy System Studies

Mission: To pursue design studies and analysis of advanced nuclear energy systems with features to achieve intrinsically enhanced safety, security, proliferation resistance and sustainability.

School of Nuclear Security Studies

Mission: To impart training to security forces on application of physical protection systems an response procedures, to enhance physical security of nuclear facilities by developing and deploying most modern technological tools including information security, and to provide facilities for test and evaluation of sensors and systems used for physical security.

School of Radiological Safety Studies

---

\textsuperscript{99} In September 2011 the US Senate Appropriations Committee was getting so concerned about the delays in establishing the centre it said that ”If by the end of third quarter of fiscal year 2012, NNSA, India, and other relevant international counterparts have not finalized an agreement that, among other things, specifies the overall cost estimate for the center, details how NNSA funding will be utilized to develop and support the center, and spells out Indian and other international cost-sharing arrangements in support of the center, the Committee directs NNSA to reprogram the $7,000,000 for the Indian center to the Global Threat Reduction Initiative’s Nuclear and Radiological Material Removal program and notify the Committee as to how these funds have been reprogrammed”. See: \url{http://thomas.loc.gov/cgi-bin/cpsqry/?&sid=cp112ncvda&r_n=sr075.112&dbname=cp112&sel=TOC_434478&}

\textsuperscript{100} See - \url{http://www.ndtv.com/article/india/full-text-india-us-joint-statement-65134}

\textsuperscript{101} See - \url{http://www.npcil.nic.in/pdf/press_22jun2011.pdf}

\textsuperscript{102} See - \url{http://www.dae.gov.in/parlqa/2011/monsoon2011/rsus1861_180811.pdf}
Mission: to carry out research and development in radiation monitoring including the development of detectors and systems, to develop decision support systems for nuclear emergency management, to conduct radiation transport, shielding, dispersion modelling and impact assessment studies, to impart training to and certification of personnel in radiation protection principles and safety practices, and to maintain and update radiation protection standards.

School of Studies on Application of Radioisotopes

Mission: To provide state of the art research, development, demonstration and training facilities in this field.

School of Nuclear Material Characterisation Studies

Mission: To act as an international centre for teaching the nuclear material accounting and control and safeguard practices and include:

- To promote the R&D activities for evolving new methodologies to detect and ascertain the causes for unaccounted losses of nuclear materials on a timely basis
- To establish teaching and training facilities for the effective implementation of safeguards including nuclear material accounting and control and its practices at national as well as international level
- To establish an advanced infrastructure and demonstration Facility for human resource development in the practices of NMA&C
- To create a versatile secured data management system for NMA&C

India remains firmly committed to its indigenous nuclear programme despite Fukushima and is planning a major expansion of nuclear installed capacity to 20,000 MWe by 2020 and to reach about 60,000 MWe during the early 2030s. The installed nuclear power capacity in the country has now reached 4780 MWe. The total number of operating reactors is 20 including three new 220 MWe PHWRs, recently connected to the electricity grid. The establishment of the centre will assist India promote best practice across its nuclear sector and contribute to future developments in reactor design.

The targeting of India (and China) by the NNSA to encourage India to establish the centre is in part an attempt to get India involved in wider international G8 threat reduction activities and contribute to nuclear security and other global issues; and part wishing to see India as nuclear weapons state and with a growing nuclear civil sector, increase its focus on nuclear and radiological security.

The Indian centre of excellence arguably does not meet the original US NNSA vision intended for the China and Indian centres with a primary focus on nuclear security and safeguards. It would appear to be more of a think tank for new technologies to serve the wider needs of the country. As such it is arguably likely to be more sustainable than if it just had a focus on nuclear security and safeguards.

International Nuclear Security Education Network (INSEN)

The International Nuclear Security Education Network (INSEN) was established in 2010 during an IAEA workshop by a group of experts from academia, international
organizations, and professional nuclear material management associations. The INSEN mission is to promote excellence in nuclear security education in pursuit of the identified need for highly qualified nuclear security professionals. INSEN objectives are to promote among universities and other educational institutions worldwide the recently-developed IAEA Nuclear Security Series No 12 – Educational Programme in Nuclear Security setting out a model of a Nuclear Security Master of Science curriculum. This will be achieved by:

- Developing comprehensive and up-to-date educational materials;
- Assisting in the development of faculty members in the area of nuclear security; and
- Promoting professional careers in nuclear security as the means of attracting the best and the brightest into the discipline.

INSEN is similar to the EU CBRN Centres of Excellence in that is not an actual centre, but a Network of education faculties who are centres of expertise in nuclear education with many providing specialist courses on nuclear security and non-proliferation up to Master's and Doctorate level. Some run Introductory courses in nuclear security.

INSEN is best defined as a partnership between the IAEA, educational and research institutions, and competent nuclear authorities. The mission of INSEN is to enhance global nuclear security by developing, sharing and promoting excellence in nuclear security education. This mission is being accomplished by achieving the following main objectives through collaboration in the following areas/activities:

- Development of peer-reviewed textbooks, computer based teaching tools and instructional material, including exercises and materials for laboratory work;
- Faculty assignment and development in the different areas of nuclear security through mutual faculty exchanges and/or joint development and implementation of in-depth nuclear security training programmes or schools;
- Joint research and development activities to share scientific knowledge and infrastructure;
- Student exchange programmes to foster international cooperation and exchange of information;
- Quality assurance: consistency with IAEA defined terminology described in the IAEA Nuclear Security Glossary, the Fundamentals and the Recommendation documents;
- Theses evaluation, coordination and improvement;
- Performance of surveys on the effectiveness of nuclear security education among students and faculty.

Membership of INSEN is informal and open to any educational and research institution already involved, or that plans to be involved in nuclear security education in the future. The INSEN membership is also open to any competent authority, organization, institution interested or involved in nuclear security education.

**International Atomic Energy Agency (Nuclear Security Support Centres)**

103

103 Information derived from a number of IAEA documents including: “Establishment and Maintenance of a Nuclear Security Support Centre (NSSC)” – unpublished draft of 3rd November 2011 made available to the author by the Office of Nuclear Security
Very much underplayed at the summit, before, and subsequently, is the work the IAEA has done to help establish nuclear security support centres across the globe with centres established in Morocco, Columbia, Ghana, Pakistan, Tanzania and Malaysia. Seven more are planned over the next few years in Chile, Cuba, Turkey, Kazakhstan, South Africa, the Philippines and Jordan. The IAEA’s objective is to assist states themselves to establish these centres by helping them build up capacity by:

- providing a methodology on how best to establish and maintain the centres
- providing a methodology on how to assess training needs
- assistance in developing a tailoring nuclear security training programme to match the country’s needs
- certification of instructors
- facilitation of training for technical and scientific support
- provision of a limited amount of equipment to help set them up

The primary objectives of these centres are to:

- Develop human resources through implementation of a tailored training programme
- Develop a network of experts
- Provide technical support for lifecycle equipment management and scientific support for the detection and response to nuclear security events

The IAEA supports States that wish to develop a “Nuclear Security Support Centre” (NSSC) based on a concept developed by the IAEA Secretariat. A NSSC aims at supporting and facilitating the systematic development of sustainable human resources through the implementation of a tailored National Nuclear Security Training Programme based on the assessed needs. Such a centre, which could be a virtual centre, will ensure long-term sustainability of nuclear security capabilities in individual States. In addition to the human resource development function, a NSSC can be geared to provide technical support services for lifecycle equipment management and scientific support services for the detection of and response to nuclear security events that could also be provided to neighbouring countries. This concept and the self-training needs assessment methodology is provided to States, upon request, through national workshops. In addition, the IAEA supports countries in this effort by assisting in the design of a NSSC, in the development of a tailored national training programme, in the training of nuclear security instructors and in providing appropriate teaching material. In this context, the IAEA also facilitates on-the-Job Training for technicians or mobile expert support team members.

The creation of these nuclear security support centres offers considerable opportunities to foster a strong nuclear security culture, enhance national coordination and collaboration among the nuclear security competent authorities, and at the same time supports the development of a nuclear security network of exports. Creating such a network provides efficient access to relevant scientific and technical knowledge to the nuclear security competent authorities in a State.

The concept of these centres was initiated some years before the nuclear security centre of excellence announced at the 2010 summit. The concept developed is based around:

**National commitment** – in order to ensure sustainable nuclear security in the country it is crucial the state makes a national commitment to adhere to international instruments, such as the “Convention on the Physical Protection of Nuclear Material” and “the Code of Conduct on the Safety and Security of Radioactive Sources”. To meet such a commitment states would need to implement a number of elements for ensuring nuclear security at a national level including:

- Enactment of legislation addressing nuclear security
- Performance of a national threat assessment
- Establishment and empowerment of a regulatory authority
- Enforcement of nuclear security requirements through licensing, regulations, guidelines etc
- Monitoring that legal requirements are met and that systems are operating as designed, through inspections and enforcement
- Development of a Designed Based Threat specifying what operators’ security systems must protect against
- Establishment of a national tracking system for nuclear and radiological material
- Establishment of a national detection strategy for the detection of illicit trafficking in nuclear and radiological material that meets international guidelines
- Development of a response plan and procedures for responding to a criminal or an unauthorised act involving nuclear or other nuclear material out of regulatory control
- Development of human resources to carry out the nuclear security functions in a State
- Provision of technical and scientific support services to ensure equipment management and to support front line officers to detect and respond to nuclear security events

**Appoint a leading organisation** – As a first step in establishing a nuclear security support centre the competent authorities and other organisations for nuclear security in a State should agree on one leading organisation that will be in charge of managing, and coordinating the functions of the centre. This lead organisation would act as the focal point of contact with the IAEA Office of Nuclear Security.

**Needs Analysis** – The State is advised to conduct an exercise (called a Framework Analysis) that aims at describing the legal, human and economic environment in which the centre will be operating. It should validate that there is a genuine need in the State for the centre’s services and that the need for the centre is sufficient to ensure sustainability for the long term. A user analysis should also be undertaken aimed at identifying the user groups for the centre, e.g. which competent authorities and other organisations responsible for nuclear security in the State the centre will serve. Finally a competition analysis needs to be discussed – both direct and indirect competitors. With the growth in “nuclear security centres of excellence” this analysis will be important to establish who is offering training and services in the area of nuclear security at the regional and international level? What exactly does the competition offer – quality of courses and are they certified or accredited? How
relevant are these training and services for the State? What is the cost? What are
the strength and weaknesses of the competitor?

Implementation – If after the analytical process a decision is taken by the Lead
organisation in discussion with the various organisations responsible for nuclear
security, to proceed with establishing a centre, the IAEA plan recommends
implementation takes place in two stages

- Phase 1 Human resource development
- Phase 2 – Technical and Scientific Support Services.

A fundamental part of Phase 1 is the development of a tailored National Nuclear
Security Training Programme. Another is development of a cadre of qualified nuclear
security instructors to ensure the long term success and sustainability of the centre.
Other important issues include participating in the related train the trainers
programmes of the IAEA, ensuring continuous improvement and monitoring of
courses and availability of specific equipment to provide hand on training in the use
of radiation detection equipment etc.

The effective performance of activities related to detection of, and response to
criminal and unauthorised acts involving nuclear and radiological material out of
regulatory control require the use of a range of sophisticated equipment and
associated software. A key function of the nuclear support centres is to ensure the
sustainability and long-term use of this equipment – as well as advice on its
procurement, installation, testing and acceptance, and appropriate training on its
use.

Other functions might also include provision of scientific expert support to play a key
role in the characterisation of suspected or seized nuclear or radiological material,
development of mobile expert support teams for field activities away from the
centre, and R&D to provide support for specific problems and troubleshooting. Once
a centre becomes fully established it may also find value in linking its training
activities with wider educational centres in the State to raise awareness of nuclear
security issues in a range of undergraduate, postgraduate and industry induction
courses – including closer working with nuclear safety personnel to share best
practice on training and awareness raising.

Italy (International School on Nuclear Security)\textsuperscript{105}

A key aim of the school is develop an international nuclear security culture and its
courses are targeted at professionals in the early stages of their career from developing
countries.

The 'International School on Nuclear Security' brings together IAEA expertise and the
Abdus Salam International Centre for Theoretical Physics (ICTP) international network
of researchers in developing countries. The School's aim is to provide participants with
the knowledge they need to meet obligations under the international nuclear security
legal framework, to identify and remedy threats against nuclear security by using
radiation detection strategies, and to respond to incidents involving nuclear and other

\textsuperscript{105} Information derived in part from the School’s website at:
radioactive material. The first two week school was held in Trieste from 11 to 22 April 2011. A second course will be held in May 2012 at the same location. Participants who attended the first school came from regulatory authorities, universities, research institutes, different national ministries, and law enforcement agencies.

The Italian government initially proposed the School at the 2010 Nuclear Summit in Washington, where a number of nations pledged their support to strengthen global nuclear security. Italy (via the Italian Ministry of Foreign Affairs), ICTP’s chief sponsor, included the Trieste school amongst its nuclear security action plans.

ICTP actively supports a number of joint educational activities with the IAEA geared towards building competence in developing countries, including the School of Nuclear Knowledge Management, which has been successfully conducted at ICTP for the past six years.

The two week school is addressed to professionals from developing countries, who should ideally have 1-3 year professional experience working at an institution within their respective country with responsibilities for ensuring some aspects of nuclear security. Candidates should have a specific interest in pursuing careers which would benefit from knowledge of nuclear security. Although academic backgrounds may vary, candidates with an educational background in scientific or technical discipline of relevance to nuclear security such as nuclear physics, nuclear engineering, or in similar fields are especially encouraged to apply.

The topics include:

- Targets, consequences, risks
- Nuclear Security threats and potential consequences
- Scope of nuclear security events
- Basic Elements of Nuclear Security
- Interrelationships between safety, security and safeguards
- Overview of the legal framework for nuclear security
- The IAEA and its role in nuclear security
- Physical Protection of nuclear and material and nuclear facilities
- Security of radioactive sources
- Nuclear material accounting and radioactive material inventory control
- Transport Security
- Detection of Nuclear Security Events - material out of control
- Response to Nuclear Security Events - material out of control
- Information Security
- IT/Cyber security
- Ensuring effective communication of nuclear security information
- Capacity building and sustainability planning

Participation in the course assumes successful completion of the IAEA eLearning programme: Use of Radiation Detection Equipment (includes a session on basics of radiation and radiation protection). Scientists and students from all countries which are members of the United Nations, UNESCO or IAEA may attend the School. The School is co-sponsored by the Central European Initiative and the Kuwait Foundation for the Advancement of Science.
Japan (The Integrated Support Centre for Nuclear Nonproliferation and Nuclear Security (ISCN))

ISCN was established in the Japan Atomic Energy Agency (JAEA) in December 2010 in order to implement Japan’s National Statement at the Washington Nuclear Security Summit and is aimed at strengthening nuclear non-proliferation and security mainly in Asian nuclear emerging countries. The key objectives of the centre is making use of Japan’s knowledge and expertises in peaceful uses of energy and ISCN intends to contribute to strengthening nuclear non-proliferation and nuclear security in Asian countries through supporting human resources development, institutional infrastructure development, and technical development.

By supporting emerging nuclear states to establish regulations and implementation mechanisms to meet international standards on safeguards and nuclear security, ISCN aims to strengthen international security related to safeguards and nuclear security.

The training courses offered by ISCN include:

- Courses on nuclear security embracing design and evaluation for physical protection systems for facilities using nuclear and radiological materials; design and evaluation process for physical protection systems for the transport of nuclear and radiological material; and the detection of and response to illegal acts related to nuclear and radiological material
- Courses for safeguards and state systems of accounting for and control of nuclear material embracing IAEA safeguards, national systems and material accounting systems
- Courses on the international nuclear non-proliferation framework

The centre is also developing a “Virtual Reality System” and a mock up training field to assist in the delivery of the practical focused training programmes. While ISCN is planning to develop its own experts for most of the major tasks to be undertaken at the centre it would welcome cooperation with internationally recognised experts in some areas. Currently the key collaborators is the IAEA and US via Sandia National Laboratory.

So far ISCN has developed cooperation with a number of agencies including:

- Cooperation with US DOE/NNSA and Sandia National Laboratory that have experience in providing training courses on nuclear security in the area of “train the trainers”, course development and technical development
- Cooperation with the IAEA on holding training courses
- Cooperation with WINS on offering workshops
- Information exchange with the planned centres in China and South Korea
- Leading the discussions in the Asia-Pacific Safeguards Network (APSN), and working groups on safeguards and nuclear security of the Forum for Nuclear Cooperation in Asia (FNCA)

As well as the above training programmes, the centre is also supporting the development of the domestic systems necessary for the implementation of legal

106 Summary of written Information provided by ISCN to the author
instruments relevant to nuclear safeguards and nuclear security. Training in the use of monitoring equipment is also being provided as is the technical development and demonstration of new measurement and detection equipment. The technical assistance programme of the centre also includes a nuclear forensics technologies element. Alongside a capability to undertake a range of nuclear forensics tasks, the centre aims to create a domestic database and develop a wider database in cooperation with overseas partners.

The centre is at an early stage of development and has had strong support from the IAEA and US in terms of participation of their trainers and experts. The key tasks for the next few years will be to develop its own staff of experts and secure financial support. Recently held courses on the physical protection of nuclear material and nuclear facilities attracted some 28 participants from 14 countries (Bangladesh, Cambodia, China, Indonesia, Jordan, Laos, Malaysia, Mongolia, Myanmar, Philippines, South Korea, Thailand, United Arab Emirates and Vietnam. Another course on state systems of accounting for and control of nuclear material (in cooperation with the IAEA) attracted 22 participants from 13 countries (Australia, Bangladesh, Cambodia, China, Indonesia, Japan, Kazakhstan, Laos, Malaysia, Mongolia, Thailand, Turkey and Vietnam). On the face of it this is an impressive range of countries, with a number well away from the region the centre is aiming to focus on. This reflects in part the influence of the sponsors for these particular courses held at the end of 2011. It also neatly demonstrates the opportunities to use the centres to promote awareness of a range of nuclear security topics.

**Jordan (Middle East Scientific Institute for Security)**

The Middle East Scientific Institute for Security (MESIS) is an example of a number of small centres scattered around the world which aim to provide training on a range of capacity building projects included nuclear security. MESIS is an independent, Jordanian non-governmental organisation based in Amman, Jordan and is associated with the Royal Scientific Society. It prime function is to raise awareness capacity relating to security issues within the scientific community within Jordan and the region. They aim to be the experts and driving force for regional cooperation in the areas of border, environmental and energy security by offering training and promoting awareness on critical issues and technical applications to support long-term viability. The institute’s work on nuclear security is a joint collaboration with the US Sandia National Laboratories and the Royal Scientific Society in Jordan.

**Kazakhstan’s International Nuclear Security Training Centre**

Kazakhstan announced at the 2010 Nuclear security summit that it was considering hosting an international nuclear security centre. The centre has yet to be formerly approved but available information indicates it will be at the Institute of Nuclear Physics site at Alatau, Kazakhstan. Indications are that the Kazakhstan authorities want the centre to be a counter smuggling training centre as well as focus on materials

---

107 Summary of written information provide by the Institute to the author
109 The planned Director of the Centre, Mr Bozymbay Sadykov is willing to provide information about the centre but the translation not provided by 4th April 2012 when this report was finalised
110 See the Nuclear Threat Initiative website for details about the centre at [http://www.nti.org/facilities/729/](http://www.nti.org/facilities/729/)
protection, control and accounting (MPC&A) and therefore embrace detection and response. A final decision on the centre is expected to be announced at the Seoul nuclear summit in March. As with the China and Indian centre the US NNSA is expected to play an important supporting role in working with the Kazak authorities on the establishment of the centre.

The US NNSA have had a long history of working with Kazakhstan on MPC&A issues as part of their Second Line of Defense programme stretching back to 1993. This collaboration was reinforced in November 2011 by the signing of a new implementing agreement\textsuperscript{111} to increase cooperation in nuclear safeguards and security. The Implementing Arrangement will provide a framework for expanded technical cooperation in nuclear material safeguards and security, containment and surveillance of nuclear materials, nuclear safety and waste management, nuclear forensics, and information management. The arrangement will also provide the framework for enhanced coordination of training and outreach to other countries (presumably using the planned centre for provision of this training).

**Pakistan – Nuclear Security Training Centre\textsuperscript{112}**

Pakistan’s Nuclear Security Training Centre is playing a key role in strengthening the nuclear security regime at national level through the mandate given by the government of Pakistan in its Nuclear Security Action Plan (NSAP) in 2006. The centre is promoting nuclear security through a portfolio of training programmes, education and technical support to various national organisations including designers and users of physical protection systems, front line officers, first responders and emergency response personnel, intelligence and law enforcement authorities, and trainers, nuclear regulators and policy makers in various areas of nuclear security. The centre has also supported customs in terms of provision of hand held nuclear security equipment, training on operation and maintenance of the equipment.

Its mission is the promotion of nuclear security through education, training and awareness and it has a wide scope providing training and education in nuclear security to all relevant organisations at national level. Its key objective is to develop a national “sustainable” system of human resources development, training and education including research in nuclear security and technical support (i.e. to add value to knowledge) with a comprehensive approach of prevention, detection of and response to incidents related with nuclear security.

The centre is run by the Pakistan Nuclear Regulatory Authority (PNRA) which has developed a direct working relationship with relevant organizations and is continuously providing training to them. For the sustainability of the centre for the long term it is developing its own capabilities – experts, in terms of human resource and equipment operability and maintenance with the support of IAEA. The centre has lecture halls, laboratories for practical demonstration purposes for specialised training and for its outreach programme, it has access to, and support through videoconferences, mobile training units, e-learning programmes, refresher courses for stakeholder training units.

\textsuperscript{111} See: http://nnsa.energy.gov/mediaroom/pressreleases/uskazcoop113011
\textsuperscript{112} This note is a summary of the information provided by the Pakistan Nuclear Regulatory Authority
The centre was established from a zero base following approval of the Nuclear Security Action plan in 2006. The key challenges were to develop home grown experts in nuclear security, establish the necessary laboratory facilities and provide for equipment maintenance etc. The programme managed by the centre is reliant on international expertise as the country itself is not the manufacturer of nuclear security equipment.

By establishing the centre the country aims to

- Develop and strengthen the nuclear security culture of all organisations that use nuclear and radiological materials and are involved in its security
- Aims to minimise its dependence on external expertise
- Minimise the maintenance cost of equipment by using home grown expertise
- Support research to advance nuclear security knowledge
- Provide expert support for countries in the region who do not have easy access to nuclear security expertise
- Establishment of a network of expertise and hub of knowledge in the field of nuclear security.

The main focus of the centre is on building up a robust nuclear security culture in Pakistan rather than meet an international demand for its activities. The main activities of the centre focus around:

- The development and further improvement of training and education curriculum/modules at national levels;
- Provision of reference materials, computer based teaching tools and instructional material, including exercises and materials for laboratory work;
- Undertaking basic, advanced and refresher training courses and seminars, together with workshops in nuclear security areas for relevant national organisations;
- Training needs assessment programme;
- Liaison with professional training academies/staff colleges of national authorities for revision of their existing curricula and further incorporation of appropriate nuclear security material;
- Provide technical assistance to the relevant organisations on nuclear security;
- Faculty development in nuclear security at educational and research institutions through national and international cooperation;
- Quality Assurance, consistency of the training material with IAEA defined terminology, and various IAEA recommendation documents and other international standards;
- Self assessment on the effectiveness of nuclear security training and education among students and faculty.

The centre is providing training to various government organisations and as a professional training institute is offering certificate courses in the areas of nuclear security. Its certified professional courses are designed for the nuclear security professional of the Pakistan Nuclear Regulatory Authority (PNRA). So far more than 1700 officials have been trained form the relevant organisations through national and international training courses, seminars, workshops and tabletop exercises. Currently the centre is providing training in the following areas:

- International legal instruments on nuclear security
- Physical protection of nuclear material and nuclear facilities
- Safety and security of sealed radioactive sources
- Radiation detection techniques
- Nuclear security equipment and its maintenance
- Combating illicit trafficking of nuclear and other radioactive materials
- Preparedness and response on case of nuclear security emergencies
- Search and recovery of orphan sources
- Management skills

The training modules for these courses have been developed based on the experience gained from working with the IAEA on the initial establishment of the centre.

The centre’s main training partners are the IAEA, Pakistan Institute of Engineering and Applied Sciences (PIEAS) and the South Asian Strategic Stability Institute (SASSI). IAEA is providing assistance to PNRA for self assessment and “train the trainers” programme on different aspects of nuclear security. More than one hundred officials from PNRA and different national organizations have been trained through IAEA at international level in the areas of physical protection, emergency response, combating illicit trafficking and radiation detection equipment. PNRA officers are also participating in IAEA sponsored activities as experts nationally and at international level.

As an essential element of the training and educational infrastructure, the centre has two technical training laboratories for the practical demonstration of the nuclear security equipment and to support research in the field of nuclear security. The laboratories are:

The Detection equipment laboratory has technical expertise in search, detection, identification and expert analysis of nuclear and other radioactive materials. The laboratory is equipment with a wide range of detector equipment and monitors.

The Physical Protection laboratory comprises an “Interior” physical protection laboratory and “Exterior Physical Protection laboratory. The Interior laboratory serves as a means of training and demonstration in different tools and systems such as CCTV, intruder detection systems, access control systems, and mock up models relevant to physical
protection. The laboratory has technical expertise in designing physical protection systems at nuclear and radiological facilities, effective implementation of physical protection measures and sustainable operation of the measures installed at facilities. The Exterior laboratory is designed as a demonstration facility on the basis of international standards and includes:

- Design of different type of fences, their testing against possible attempts to circumvent barriers and their various configurations
- Orientation of vehicle gates and driveways
- Integrated with detection sensors
- Demonstration control room
- Demonstration isolation zone

Each of the facilities are fully equipped with state of the art equipment and supporting materials. A separate facility has been established to provide repair and maintenance services. This also serves as a centre of expertise for testing and calibrating equipment together with maintenance and troubleshooting of radiation detection equipment used across the centre. Besides these technical facilities the centre has a lecture hall for up to 250 participants and another for up to 35 participants for delivering the training courses, seminars and workshops.

The Technical Support Unit of the centre was established to provide technical assistance to various Pakistan agencies. It has the expertise to design, provide guidance on the technical specification of nuclear security equipment for these agencies as well as assist them in testing, verification of operation of the equipment and way forward for deployment.

**Education programme on nuclear security**

Unlike other technical nuclear security support centres the Pakistan centre has initiated an education programme with a specialisation in nuclear security with the Pakistan Institute of Engineering and Applied Sciences (PIEAS). The aim of this educational programme established in 2009, is to provide knowledge of nuclear security and physical protection concepts and develop research capabilities in the related areas. Under this Masters programme all core courses of nuclear engineering are offered during the first two semesters. The optional courses related to nuclear security, introduction to nuclear security and physical protection systems are offered in the third and fourth semesters respectively. The centre also offers comprehensive thesis based research work in various areas of nuclear security. More courses related to nuclear security will be introduced gradually after developing the infrastructure comprising the training faculty and fully equipped laboratories with nuclear equipment at both the centre and PIEAS. PNRA is also in collaboration with international universities for faculty development in the subject areas.

**The Science Centres**

---

113 This note is a summary of the information in an unpublished report prepared by the author for EuropeAid in 2010 on an assessment of the Instrument for Stability (IFS) Programme, IFS provides funding for the Science Centres.
The International Science and Technology Centre (ISTC) based in Moscow, was established in 1992, and the Science and Technology Centre Ukraine (STCU) in 1993, to counter the threat posed by the proliferation of sensitive knowledge and experience through the emigration of scientists and engineers to countries of concern following the dissolution of the Soviet Union. The ISTC is an intergovernmental organization connecting scientists from Russia, and other countries of the Commonwealth of Independent States (CIS) and Georgia with their peers and research organizations in Canada, EU, Japan, Republic of Korea, Norway and the United States. ISTC facilitates international science projects and assists the global scientific and business community to source and engage with Russian and CIS institutes that develop or possess an excellence of scientific know-how.

The primary objective of the Science Centres remains to give weapons scientists and engineers, particularly those who possess knowledge and skills related to weapons of mass destruction or missile delivery systems, in the Russian Federation and, if interested, in other states of the CIS and Georgia, opportunities to redirect their talents to peaceful activities.

There are essentially two aspects to this objective: (1) at the structural level, to help research and development institutions that were in the past dependent on funding from offensive weapons programmes to develop alternative funding sources and mechanisms outside of weapons programmes, and (2) at the individual level, to create conditions that prevent and discourage scientists who have in the past worked in weapons programmes to leave their institutions/countries and sell their specific expertise to State or non-state proliferators.

The Centres contribute to solving national and international technical problems; support the transition to market-based economies; support basic and applied research; and help to integrate those scientists into the international scientific community.

The two centres see themselves as centres of expertise in nuclear science and technology development. The funded research areas have included areas with a nuclear security content particularly related to nuclear materials accounting and control, and the physical protection of nuclear materials.

The Governing Parties of ISTC are Canada, EU, Japan, Russia and the US; other Parties are Norway and Republic of Korea; Switzerland is in the process of joining. ISTC currently operates in Russia, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan and Tajikistan. The Governing Board of STCU comprises Canada, EU, Ukraine and US. STCU is currently active in Ukraine, Azerbaijan, Georgia, Moldova and Uzbekistan. However, as a result of a dispute between STCU and Uzbekistan, the Uzbek Ministry of Foreign Affairs will no longer allow any new projects to be supported through STCU. The Science Centres have legal status under their Founding Statutes. Science Centre projects are funded in one of two ways: the Science Centres themselves directly fund Regular Projects at FSU institutes, with Western entities acting as technical collaborators; in addition, Western governments and other entities which have the status of “Partners” can directly fund projects i.e. Partner Projects in FSU institutes, using the mechanisms of the Science Centres.

In addition to providing grant support for ‘Regular’ or ‘Partner’ projects, both Science Centres have assisted with a range of support programmes covering technical
assistance and advice on innovation, commercialisation of research and development, intellectual property rights, and competency building, and have provided financial support for travel costs and communication. Over time, the Science Centres have recognised the need to move away from outdated strategies for tackling expertise proliferation and from a focus on R&D to developing a civilian-oriented research structure aimed at the public good, and where possible aim at commercialisation of the research results, in order to provide a more sustainable future for scientific institutes.

South Korea (Nuclear Security Centre) 114

The Design process for the centre has been completed and its construction is planned to take place over the period February 2012 to October 2013. The portfolio of training programmes and plans for their implementation are currently under development. The key objectives of the centre have a national and international dimension:

<table>
<thead>
<tr>
<th>Domestic</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td>- To provide Education Facilities for Hands-On exercise and Evolved Test-Bed for various experiments</td>
<td></td>
</tr>
<tr>
<td>- To provide Designated Organization for Human Resource Development with regard to mandatory education legislation</td>
<td></td>
</tr>
<tr>
<td>- To promote Nuclear Security Culture</td>
<td></td>
</tr>
<tr>
<td>- To share its unique experience of becoming an advanced country in nuclear field from one of the poorest countries in Asia</td>
<td></td>
</tr>
<tr>
<td>- To provide a well equipped training facilities and high quality lectures for nuclear newcomers</td>
<td></td>
</tr>
</tbody>
</table>

The centre has recognised that it is important to work in partnership with other centres in the Asian region and trilateral meetings have already taken place with Japan and China on the work of the three training centres to prevent duplication and identify areas where they can work together.

Specific training programmes, including web-based E-Learning systems for domestic audiences. The conceptual design for outdoor test field zones have also been finalised. These zones are aimed at conducting comprehensive tests on physical protection and nuclear security situations. While they centre has no current plans to involve commercial organisations, the test field zones may be utilised for tests of commercial sensors. A number of countries which utilise Republic of Korea technology have indicated a willingness to collaborate on future training programmes.

World Institute for Nuclear Security (WINS)

WINS was launched at the 2008 IAEA General Conference with the aim of “providing an international forum in which nuclear security professionals can discuss and exchange best security practices and learn from each other”115. WINS has been designed not to

114 Information provided by Korean Institute of Nuclear Non-proliferation and Control (KINAC) via the South Korean Nuclear Security Summit Sous Sherpa.
115 WINS Fact Sheet Q3 2011.
duplicate the core activities of the IAEA but works closely with, and complements the IAEA’s work. Nuclear security best practice in the nuclear industry is promoted via a growing portfolio of best practice guides embracing a range of strategic and operational issues that have a direct bearing on security performance. The current portfolio of 24 guides include:

- Nuclear Security Culture
- An Integrated Approach to Nuclear Safety and Nuclear Security
- Security Governance
- Managing Internal Threats
- Material Control and Accountancy in Support of Nuclear Security
- Nuclear security for Scientists and Engineers

As an important next stage in promoting excellence in nuclear security, WINS is “establishing a WINS Academy which will develop and provide a suite of competency-based training modules that are organised around specific roles amongst security related practitioners, including non security personnel” 116 These accredited competency modules based on job task analysis could be delivered by the nuclear security support centres alongside their other training and educational courses in partnership with WINS. The WINS Academy was launched at the Seoul Nuclear Security Summit in March and included the WINS International Best Practice Guide to Nuclear Security Management117.

On the 22 February 2012 WINS and the World Association of Nuclear Operators (WANO) announced that they were collaborating to examine the interface between nuclear safety and security. This review will include a range of subjects but will include existing professional development opportunities and requirements for nuclear safety related competencies, and how they could be broadened to include nuclear security.

**United Kingdom (Nuclear Centre of Excellence)**

On the 16th July 2009 the UK published “The Road to 2010”118 which set out a detailed plan of action by the UK – in partnership with other countries – to review the Nuclear Non-Proliferation Treaty (NPT). One of the key features of the announcement was the establishment of a new Nuclear Centre of Excellence in the UK to promote wider access to civil nuclear power across the world, to make a reality of the right of all countries - enshrined in the NPT - to the peaceful use of nuclear power. It aimed to promote the development of cost-effective civil nuclear technology which would be much harder for terrorists and states with hostile intent to divert for use in weapons programmes. The Centre, to be developed in partnership with industry, academia, the National Nuclear Laboratory and other countries, was established with a initial funding of £20million from the Government.

---

116 Information from WINS Executive Director, Roger Howsley  
117 Information from WINS Executive Director, Roger Howsley  
The centre was seen by the UK nuclear industry as a very positive initiative and a major boost to the promotion of proliferation resistant safe nuclear power around the world as well as helping to lead research to further reduce the environmental impact of the technology. However on 20th October 2010 government funding for the centre was withdrawn following a review of priorities by the new government administration.

The UK experience in trying to establish a nuclear centre of excellence highlights the fragility of the early stages in their development if resources are withdrawn before a sustainable framework can be development. The short lived UK centre did not have a nuclear security focus and UK expertise in nuclear security rests within the Office for Nuclear Regulation (ONR) as well as in the UK nuclear industry, and the education area in universities such as Uan and King’s College, London. This was established on 1 April 2011 as an agency of the Health and Safety Executive (HSE). ONR can be regarded as the UK’s centre of nuclear security expertise and works closely with the IAEA’s Office of Nuclear Security.

Annex C: EC Instrument for Stability\textsuperscript{122}

The EU Security Strategy adopted by the European Council in December 2003 identified the key threats as terrorism, the proliferation of weapons of mass destruction, regional conflicts, state failure and organised crime. In its conclusions of November 2004\textsuperscript{123}, the European Council subsequently recognised the importance of taking into account the links between security and development for the effectiveness of the EU external action. The Instrument for Stability (IfS)\textsuperscript{124} was later created in 2006 as part of the reform of the EU’s external financing instruments to provide the EU with a strategic tool to address a number of global security challenges that are, in addition to sources of insecurity for states and their citizens, in many instances impediments to development.

Priority 1 actions in the area of risk mitigation and preparedness relate to CBRN materials or agents as well as associated knowledge. Some €266 million of the Instrument for Stability’s budget for 2007-2013 has been dedicated to the non-proliferation of CBRN weapons. Priority 1 actions now form one of the key means to support the European Security Strategy.\textsuperscript{125} A number of countries both within and outside the EU, as well as international/ intergovernmental agencies and non-governmental actors, are implementing or financially supporting programmes which are effectively complementary programmes to the IfS. Priority 1 actions therefore contribute to wider international security and risk mitigation initiatives such as the GP, 1540\textsuperscript{126}, the Global Initiative to Combat Nuclear Terrorism, the global regimes (in notably the NPT, CWC and BWC) and other initiatives designed to combat CBRN proliferation to non-state actors.

\textsuperscript{122} Annex from “The Global Partnership against WMD: Success and Shortcomings of G8 Threat Reduction since 9/11 (Whitehall Paper 76, Royal United Services Institute, 2011), Alan Heyes, Wyn Q Bowen and Hugh Chalmers,


Annex D: US Threat Reduction Programmes

The US threat reduction programmes focus around three government Departments: Defense, Energy and State) with the State Department leading on GP policy matters. Since 2002 these programmes have committed some $10 billion per annum to a substantial global portfolio of CBRN threat reduction work.

**US Department of Energy**

The US Department of Energy supports a comprehensive portfolio of threat reduction activities through its National Nuclear Security Administration (NNSA). Key programmes include:

*The Global Threat Reduction Initiative (GTRI)* whose projects reduce and protect vulnerable nuclear and radiological materials located at civilian sites worldwide. The current GTRI programme has involved the recovery of orphan radiological sources and the development of LWU fuel to allow conversion of Russian and Russian supplied research reactors using HEU fuel.

*International Material Protection and Cooperation: Second Line of Defense.* Projects here include risk and vulnerability assessments of nuclear facilities; the installation of modern equipment to correct vulnerabilities; training and equipment to support installed upgrades and installation of radiation detection equipment to detect illicit smuggling of nuclear and radiological materials.

The *Nonproliferation and International Security* programme covers a wide range of non-proliferation and security related initiatives. Projects include work on export control to improve licensing regimes for dual-use goods, scientist redirection, warhead dismantlement and civil nuclear power reactor security upgrades. The programme also embraces responsibility for the Elimination of Weapons Grade Plutonium Production (EWGPP), Plutonium Disposition, the International Nuclear Cooperation programme (INCP) – the cooperative effort to improve the safety at Soviet designed nuclear power plants -- and the monitoring of the conversion of 500 metric tonnes of Russian HEU from dismantled nuclear weapons to LEU for use in US nuclear power reactors.

**Department of Defense (DoD)**

---

127 Annex from “The Global Partnership against WMD: Success and Shortcomings of G8 Threat Reduction since 9/11 (Whitehall Paper 76, Royal United Services Institute, 2011), Alan Heyes, Wyn Q Bowen and Hugh Chalmers,


The Cooperative Threat Reduction programmes of the DoD\textsuperscript{132} encompass a comprehensive portfolio of CBRN threat reduction projects including strategic nuclear arms elimination, enhancement of security, safety and control of weapons in storage, biological threat reduction initiatives to consolidate and secure dangerous pathogen collections, construction of the chemical weapons destruction facility at Shchuch'ye, and projects to detect illicit trafficking of WMD materials.

The DoD also manages the International Counterproliferation Program (ICP) which was created by Congress in 1995 to counter the spread of weapons of mass destruction, materials and components across borders and through the territories of participating countries. It is an interagency program consisting of subject matter expert instructors and course materials drawn from the DoD, the Federal Bureau of Investigation (FBI), and Department for Homeland Security (DHS).

\textbf{Department of State and other agencies}

Department of State’s threat reduction activities\textsuperscript{133} encompass a comprehensive portfolio of projects focused on export control and related border security assistance across the globe as well as FSU countries; a range of scientist redirection and engagement initiatives embracing CBRN facilities globally, as well as funding for the Science Centres in Moscow and Kiev; and the Preventing Nuclear Smuggling Program (PNSP) which seeks to address critical gaps in the capabilities of partner countries to combat smuggling in nuclear and radiological materials.

The State Department is also responsible for the Nonproliferation and Disarmament Fund (NDF).\textsuperscript{134} Established in 1994, the NDF allows the US to rapidly respond to unanticipated or unusually difficult, high priority non-proliferation and disarmament opportunities, circumstances or conditions.

The Nuclear Regulatory Commission\textsuperscript{135} provides support to nuclear safety and security regulators in the FSU for a range of projects to enhance nuclear safety and security at civil nuclear power plants, and to regulators to implement key provisions of the IAEA Code of Conduct on the Safety and Security of Radioactive Sources.

The US Agency for International Development (USAID)\textsuperscript{136} provides the US contributions to the Chernobyl Shelter project managed by EBRD

\textsuperscript{132} For a detailed description of these programmes see: Amy F Woolf, op.cit.
\textsuperscript{133} See: Office of Cooperative Threat Reduction (ISN/CTR), State Department, <http://www.state.gov/t/isn/58381.htm>
\textsuperscript{134} See: ‘Nonproliferation and Disarmament Fund’, <http://www.state.gov/t/isn/ndf/>