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RADIOACTIVE SOURCE SECURITY: WHY DO WE NOT YET HAVE A GLOBAL PROTECTION SYSTEM?

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Security of radioactive sources has been an issue since the earliest days of safety regulation of such materials. Since the events of September 11 2001, some governments and regulatory bodies have been much more focussed on these issues and have introduced extensive and enhanced security arrangements. International organisations like the IAEA and WINS have worked hard to help States in this regard. However, only a minority of States have implemented statutory security systems for radioactive source security.

Why have so many States still to take action? What can be done to encourage and support these changes? This paper will offer some possible explanations for the lack of action in so many States and some potential answers to these questions.

KEYWORDS : Radioactive Source; Security; Improving; Global Protection System

1. INTRODUCTION

This paper is intended to provide a global perspective on a global issue: the protection of radioactive sources from theft from the premises where they are normally kept, or from sabotage *in situ* or from their malicious use at some other location that meets the objectives of an adversary. It is not a commentary on the situation in any single State; it is more an attempt to describe what the term "radioactive source security" means and to highlight the fact that relatively few States have taken action to provide what I would argue is adequate security for these items.

Since the terrible events of 11 September 2001, the prospect of potential "dirty bombs" has been looming over society. Dirty bombs are a significant threat because although they are relatively simple to create and transport, the consequences of their deployment (clean-up of contamination, denial of use of the affected area etc) create strong propaganda images that engender the fear that gives the adversary political influence. In addition, recovery costs are disproportionately large compared to the value and technological level of the weaponry involved (1).

Some governments see their nations as "target States" so they are more concerned about these issues than others. As a result, they have put in place a series of security measures to protect radioactive sources from theft and misuse as weapons. But in Europe the number of States that have taken these steps is actually very low, perhaps only 20 per cent of the total number of States in the European Union (2).

Obtaining the data from which this conclusion was made was not straightforward, and it has proved even more difficult to obtain it for the wider world. Professional judgement (based on business intelligence gleaned from international meetings, journals and electronic media) suggests that if anything, the proportion of States who have taken positive steps to secure radioactive sources is even lower in other continents than in Europe. This raises the question: why? That is, why have not more States taken precautions to minimise the probability of a successful diversion of a radioactive source to malicious uses? This question is discussed in this paper.

1.1 The Meaning of the Term "Security of Radioactive Sources"?

Before going further, it is appropriate to say a word about the terms used in this paper. "Safety" and "security" have been defined and discussed at some length elsewhere (3). A convenient summary (with new emphases) is:

"***Safety*** *is about protecting people from radioactive sources;*
Security *is about protecting radioactive sources from people.*"

To make this even clearer, the following table (Table 1) lists some elements of radioactive source security so as to show how administrative safety measures shade into

Table 1. The Distinction between Some Safety Measures Some-times Presented as Security Measures and Some Measures that More Convincingly Represent the Effective Implementation of Radioactive Source Security in a State

Component	Safety Relevant	Security Relevant
Sign up to the IAEA CoC	√	√
Sign up to the Import/ Export Guidance	√	√
Implement a national registry of sources	√	√
Undertake a Design Basis Threat Assessment		√
Adopt IAEA NSS & especially RS-G-1-9		√
Define national standards on physical protection		√
Implement legislation requiring operators to keep sources secure		√
Use trained Inspectors to assess security compliance of operators		√

tangible security measures including physical protection and effective regulation.

The intention of this table is to try to define what is meant by the term "security" in real life practical terms. This is necessary because there exists a spectrum of measures from the administrative to the use of hardware and other recognised security measures and it is essential to understand this. It is possible to claim that radioactive source security is in place in a State which has only signed up to the IAEA Code of Conduct or created a national inventory of radioactive sources. These measures are worthwhile, but are only a part of the story – they are only the first steps towards establishing an effective and comprehensive system to ensure the security of radioactive sources.

Table 2 is an attempt to provide an "at a glance" summary of a more meaningful definition of the term security, in order to help distinguish these things from actions taken for the purposes of safety. The lightly shaded area of the body of the table highlights what constitute security measures rather than safety measures. It should be noted that the intellectual distinction between safety and security of radioactive sources is difficult to explain. Simple demonstrations like Table 2 that convey the ideas that are involved in "security" as distinct from "safety" should not be dismissed. Instead, every effort should be made to clarify the possible threat, the consequent needs and the practical implementation of radioactive source security, to those for whom it is not familiar.

2. THE IMPORTANCE OF A GLOBAL PROTECTION SYSTEM

There are two complementary strands of thought about why radioactive source security matters. The first strand concerns the potential consequences of radioactive materials by an adversary. It is not proposed to provide a summary of the potential consequences of such an attack here, but IAEA reports on radiological accident response (4,5,6) demonstrate some of the consequences of accidents. Such accidents may be used as analogues of deliberate attacks. This is because, although the causes may be different, the consequences will be very similar. It is reasonable to expect that deliberate and well thought-through use of radioactivity as a weapon will have similar radiological, social, psychological and economic consequences. If the scenarios in these reports are unfamiliar, it should be emphasised that the consequences are very significant: a few deaths, very many other casualties of differing degrees of severity and other long-lasting consequences (including disproportionately large recovery costs and radioactive

Table 2. An Attempt to Describe the Scope of Radioactive Source Security in Terms of Some of its Safety and Security Components

	Main subject	Component subjects	Detailed composition of components
Nuclear Security	Commitment to global policies on radioactive source security	Code of Conduct on Safety & Security of Radioactive Sources	Guidance on the Import & Export of Radioactive Sources , IAEA Documents
			Establish & maintain a national inventory of radioactive sources
	Understanding threat	Threat Assessment	Design Basis Threat – security services role
	Security of regulated materials	Physical Protection	Physical Measures – "gates, guards, guns"
			Administrative Measures – vetting, access controls
			Insider threats - 2 person rule
		Information Security	Information about physical protection
			Information about T,L,Q,V (*)
			Information about modes of malicious use
		Security Management	Local Inventory, Security Plan, Security procedures, source musters.
		Import / Export Controls	Import
			Export
			EURATOM/1493/93 (Europe only; this relates to internal movements between EU Member States)
		Effective regulation	Defined standards for physical protection; trained inspectors, compliance assessments at intervals
	Protecting against materials outside regulatory control	Orphan Sources Strategy	Detection and Interdiction at ports and other borders

*T,L,Q,V = Type, Location, Quantity and Vulnerability of radioactive sources at a specific site. The proposition here (and adopted in the UK) is that where location information (address, building number etc) is combined with information about the type of material (radionuclides) or quantity (activity) or vulnerability of the inventory (due to inadequate or failed security measures), then this information is sensitive. In the UK it is now protectively marked as "OFFICIAL" and protected accordingly.

waste management challenges) that have the potential to harm and greatly distress large numbers of people and or bring down a government. Despite the sceptical views sometimes expressed by those more concerned about nuclear weapons of mass *destruction*, radiological weapons do cause mass *disruption*. Neither are they simply (as sometimes popularly described) weapons of "mass *distraction*" that only cause authorities to take their concentration off the nuclear material threat. It can be asserted that radiological weapons are sufficiently significant, in terms of their potential consequences, not to be disregarded. Furthermore, the probability that they are accessible to an adversary is so much greater since they are more numerous, less well protected and more widely distributed than nuclear materials. It may be concluded therefore that the overall risk from diversion of radioactive materials to malicious uses could be as high as for the nuclear materials threat.

The second strand of thought is based on the concept of deterrence. Deterrence theory has been used to examine radiological terrorism (7). As a concept, deterrence has been applied in criminology and also in military studies. Extended deterrence is a military term which describes the effect whereby one State deters third party States from attacking other allied States. There are points of finer detail within deterrence theory that can't be considered here, but the two main forms of deterrence are: punishment and denial.

Recognition of deterrence by punishment has its roots in 17th century Western philosophy such as Thomas Hobbes (1588–1678) and Jeremy Bentham (1748–1832) and can be summarised by the notion that one of the reasons that criminals are jailed is that the consequences of their crime exceed the benefits they acquired by committing the crime. As a result, they are not so inclined to do it again. And others who are aware or witness the punishment are also deterred from repeating the crime.

But we are concerned with deterrence "by denial". Deterrence by denial means persuading the adversary not to attack by convincing him that his attack will be defeated - that is, that he will not be able to achieve his operational objectives. At the local level, an obviously well protected establishment that holds radioactive sources will have highly visible security measures. These might include: CCTV systems, access control systems, visible security staff and obvious physical protection measures such as hardened doors and windows. The adversary may recognise that these measures are going to be difficult to defeat without a significant risk of detection and interdiction. As a consequence he may be influenced to try another premises where security measures are obviously absent, less robust or allowed to fall into disuse.

The same ideas can be extended to the national level. If country A is obviously well protected, then an adversary may turn to country B where there are no security arrangements in place. Denying the adversary the choice of radiological weaponry is really only achieved if all States take adequate precautions to protect their radioactive sources. A global protection system for radiological source security is therefore a form of extended deterrence with the aim of denying the adversary access to this form of weaponry. (Transporting a radioactive source internationally is not a difficult challenge, so importing it into a target country is a very credible option).

Clearly, denying the use of radioactive sources in a "dirty bomb" may result in "encouraging" the adversary to use some other (perhaps more conventional) technology maliciously. This option may be relatively more accessible to the adversary and (crucially from the States' perspective), more familiar to the defensive forces of the state and hence more manageable. At the least, radiological recovery and clean-up will be averted, even if these are replaced by other consequences.

3. REASONS WHY A GLOBAL PROTECTION SYSTEM HAS NOT BEEN ACHIEVED

Those who move in the higher orbits of national and international politics will argue that the only reason why a global protection system has not been achieved is because of a lack of a political will at the national level. Governments do not see a need, or see too many barriers to implementing such a system. This may be true, but it does not explain why these problems are perceived as insurmountable, nor does it help inform us how they might be overcome. So instead, it is useful to consider some of the things that could be done to overcome inertia at the political level. This entails equipping the influencers of national governments with enough information for them really to understand the issues: to change their minds so that they can in turn, influence the minds of their political superiors. The potential outcome is a greater national political awareness of a potential radiological terrorism threat, its relevance to all States and the need for political support for a global protection system. This is the reason for this and other papers (1, 2, 3, 8).

A guiding principle of implementation of radioactive source security should be the recognition that security measures are being put into place to enable practitioners to use radioactive sources despite the security climate; they are not to stop legitimate practitioners from using radioactive sources because of the security climate. This is where the technical challenges lie: to balance the security measure that could be used to protect radioactive sources from an adversary against the continuing need to be able to use them for their justified beneficial uses.

Consideration has been given elsewhere to technical cultural issues that may have caused apathy and delays in implementing an effective source security regime in most countries. (8). Are there perhaps other reasons that can be identified?

One possibility is that it all appears to be too difficult. On encountering for the first time the idea of protecting radioactive sources held in a hospital, university or similar institution with high levels of public access and/or high staff turnover, the challenge seems to be daunting. How do you secure a hospital that may have 100 entrances / exits? How do you protect radioactive sources in a university that may have 1500+ physical sciences and medical undergraduate and post-graduate students who may need to use radiation during their studies? While neither of these challenges are easy, they and others are both manageable if they are approached with a prepared mind (9). A key step to achieving the correct mindset is to liaise with international colleagues who have been through the process and learned the lessons about how to overcome difficult logistical and management barriers. Good use should be made of IAEA, WINS and bilateral relationships to enable sharing of these lessons. It is probably the most significant factor in solving these problems: being able to call on the advice of an experienced practitioner in this field.

At the time of writing, these are relatively few in number. In the 28 countries of the European Union, research suggests that only about six States have implemented a security system for radioactive sources in a way that means that they will have really learned how to implement radioactive source security (2). It is likely that this proportion is no larger when averaged over all States in world, but data on this is far from complete. Bilateral arrangements to share information in these matters are not likely to be efficient as the resources that can provide the insights – that is, the number of "experts" in this field - are very limited. So some kind of knowledge transfer is probably the best way forward.

Three international organisations can be identified as having the resources and the potential to assist with knowledge transfer in this field.

The first of these is the International Atomic Energy Agency ("IAEA"). This Agency focuses primarily at governmental and regulatory body level. With a long established role in brokering international standards in nuclear safety and security, the IAEA has in recent years extended its contributions from the protection of nuclear power plants and other nuclear facilities to the protection of radioactive sources and their associated facilities. The IAEA provides a range of relevant services and documents. The protection of special nuclear materials is based on the Convention on Physical Protection of Nuclear Materials ("CPPNM") (10) and its international best practice recommendations document (11).

However, radioactive source security does not have a legally binding document. Despite this, some 120 States have made a political level commitment to the IAEA Code of Conduct (CoC) on the Safety and Security of Radioactive Sources (12). Though non-binding, if a government writes to the IAEA expressing commitment to the CoC and asserts that it is working towards following the guidance contained therein, then this is clearly positive and helpful. However, the actual achievement of what is described in the CoC is not necessarily what the State is reporting. And (as the IAEA Nuclear Security Series demonstrates well) there is a great deal more to achieving radioactive source security than those measures that are provided by the CoC. This Series provides detailed implementation guidance with a graded approach and a wider scope not only of radionuclides but also of ideas including (for example), the insider threat and sabotage. (The question of whether the CoC should be upgraded to a legally binding convention is beyond the scope of this paper. It seems likely that with the right motivation, funding and international support, many more States could achieve a high level of protection of their radioactive sources irrespective of whether they are legally bound to do so).

Underpinning the work of the IAEA and their CoC is a suite of documents (the Nuclear Security Series) (13) and a suite of services (14) to provide capacity building in Member States. While the latter services are still predominantly based on special nuclear materials, there is a growing capability within the IAEA itself to support and advise States on the security of radioactive sources.

Secondly, the World Institute for Nuclear Security ("WINS") provides a range of guidance documents on radioactive source security that are designed to be used by practitioners more than governments or regulatory bodies. These provide very clear practical guidance on measures that may be used to secure radioactive sources (15).

Finally, the third noteworthy organisation is the International Radiation Protection Association ("IRPA"). IRPA (16) has only recently started its work in this area, but it seems likely that within 12 months it will be providing its own platform to point practitioners to the resources of the IAEA and WINS. (It does not aspire to generate its own guidance documents but to assist in the dissemination of extant best practice information). But in addition, IRPA should be influential in encouraging the development of professionals in this field. The professional development of both safety and security specialists in the field of radioactive sources is an important aspect of capacity building.

4. CONCLUSIONS

There is a disappointingly low level of uptake of well developed national radioactive source security arrangements in Europe, and very probably around the rest of the world. The reasons for this are many, but to simply justify this as a "lack of political will at the national level" is to ignore the threat and the need to improve this state of affairs.

It is constructive to explore the underlying reasons for the lack of political will and to try to change this. One way is to provide education and support to those who can influence the people who operate at the political level. To do this, information and support is required. There are significant resources available to help in this endeavour, including the considerable resources of the IAEA and WINS, the support of experienced professionals via IRPA and also bilateral support arrangements.

In the relatively few States that have fully implemented radioactive source security, this inertia has been overcome and lessons have been learned about how to implement a national system of radioactive source security. This demonstrates that the challenges can be overcome. But actively sharing knowledge and whenever possible sharing experiences, will only improve the global situation.

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