The IAEA's Code of Conduct on the Safety and Security of Radioactive Sources: Moving Toward Implementation Within the United States

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ABSTRACT

The Code of Conduct for the Safety and Security of Radioactive Sources (the Code) was published in final form by the International Atomic Energy Agency (IAEA) in January 2004. The effort to produce the Code began in 1998, and focused on sealed source management and control from a safety perspective. The terrorist events of September 11, 2001 caused the scope of the Code to be broadened to include a focus on source security. The Code prescribes threshold quantities for 26 radionuclides. Of the 26 listed, 16 are noted as being normally used in quantities which could cause harm to individuals if not managed appropriately. Threshold quantities for the 16 higher risk radionuclides range from 0.03 TBq (0.8 Ci) for Co-60 to 20 TBq (500 Ci) for Tm-170. The Code prescribes legislative frameworks, regulatory programs, and import/export provisions for IAEA Member States. Following the IAEA General Conference in September 2003 where the Code was formally adopted by Member States, the U.S. Government (via the State Department) indicated that it would implement the Code's provisions, albeit not legally binding on IAEA Member States. Because of the mature state of the regulatory program for commercial uses of radioactive material within the U.S., most of the Code provisions either have already been met or only relatively minor programmatic adjustments are needed to meet it. In some areas, however, programs will need to be developed or additional attention given to existing programs. Areas of development include a national source registry and modification of import/export controls, both of which are applied to source quantities which are 10 times the threshold quantities noted earlier. Development of the National Source Tracking System (NSTS), which will serve as the source registry, has begun. The effort to populate the NSTS is expected to be initiated by late 2006. The NRC has developed an interim database (updated annually) as a precursor to the NSTS. The effort to modify import/export controls is also underway. These efforts will require rulemaking. Areas of additional attention include the proper management of disused sources (to minimize their becoming orphaned) and the reuse/recycling of sources. If the source user community is not mindful of these management issues, waste management problems can result.

Introduction

Although its official title is "Code of Conduct for the Safety and Security of Radioactive Sources," it is often referred to as the "Code of Conduct,"or simply "The Code." It was published in January 2004 [1] by the International Atomic Energy Agency (IAEA). The scope of the Code applies to all radioactive sources that may pose a significant risk to individuals, society, and the environment when not safely managed or securely protected. "Significant risk," as used in the Code of Conduct, refers to severe deterministic health effects, including permanent injury and death.

A short history of its development

The IAEA sponsored the first *International Conference on the Safety of Radiation Sources and the Security of Radioactive Materials* in Dijon, France in September 1998. The Action Plan which followed this conference [2] led to the publication of IAEA-TECDOC-1191, *Categorization of Radioactive Sources* [3]. Subsequent IAEA Technical Meetings and Conferences were held to further develop the international framework and posture for the safe and secure management of sources. Key activities included the Buenos Aires Conference in December 2000 and a Technical Meeting in Vienna in July 2003. The Buenos Aires Conference led to a revised Action Plan [4] At the time of the July 2003 Technical Meeting, the IAEA published TECDOC-1344, *Categorization of Radioactive Sources* [5]. Following 9/11/01 terrorist events, the source security aspect of these efforts was strengthened. The centerpiece of these efforts became known as the "Code of Conduct for the Safety and Security of Radioactive Sources." The July 2003 Technical Meeting produced the final draft of the Code. This draft was presented at the Agency's General Conference and Board of Governors Meeting in September 2003. The Code was officially adopted as a result of these meetings. Although the Code has not been enacted via IAEA Convention (and is therefore not legally binding on Member States), many countries have formally indicated their willingness to implement the spirit and letter of the Code. The United States has provided such a commitment via letter from the Department of State to the IAEA.

Scope of the Code and Provisions of TECDOC-1344

The Code applies to all radioactive sources that may pose a significant risk to individuals, society, and the environment. The IAEA has defined five categories of sources in terms of a 'D' value. As defined in Reference 5, a D value is that quantity of radioactive material which has a significant potential to cause severe deterministic health effects if not managed in a safe and secure manner. Annex I of the Code states that it applies to the top three source categories (the highest risk sources) defined by TECDOC-1344, that is: D, 10D, and 1000D. These D values are shown in Table 1. The Code's scope is further limited to Categories 1 and 2 for the national source registry and to import/export provisions.

TECDOC-1344 ranks sources in terms of potential risk associated with malevolent use, considering the normal quantity used in various applications:

- Category 1: RTGs, irradiators, teletherapy....
- Category 2: industrial radiography, high dose rate brachytherapy....

- Category 3: fixed industrial gauges, well logging....

Malevolent use considers Radiological Dispersal Devices (RDD) and Radiological Exposure Devices (RED). The top three categories can result in severe deterministic effects, including permanent injury (Category 3 sources) and even death (Category 1 & 2)

Principal Features of the Code

The Code of Conduct prescribes an infrastructure in terms of legislative elements and regulatory programs to be developed and promulgated by regulatory agencies within all Member States, ranging from developing countries to those with mature programs. The Code is divided into 23 general principles, 13 principles for legislation and regulations, 36 principles which apply to the regulatory body, and 7 principles for the import and export of radioactive sources. All principles are directed toward ensuring that an adequate legislative program exists to support a regulatory program which ensures that sealed sources are managed and controlled in a manner to minimize the potential for unsafe management and malevolent use.

The Challenge of Code Implementation: World-Wide

The Code was developed with the goal of increasing the safety and security of the management and control of radioactive source usage on a world-wide basis. Some developing countries may lack the enabling legislation and/or regulatory infrastructure needed to fully implement the Code. This presents a challenge to developed countries who desire to export sources to nations who lack many of the elements of policy and programmatic controls for the safe/secure management of sealed sources. The Code provides for a consideration of special situations (primarily based on humanitarian need) where a facility in a developing country (e.g., a hospital) which has historically possessed radioactive sources and has satisfactorily controlled them. Such facilities could continue to receive certain radioactive sources based on a defined need, despite their country's lack of a fully developed regulatory infrastructure.

The Challenge of Code Implementation: Within the U.S.

Although the NRC's and 33 Agreement States' programs are reasonably mature, additional attention is needed, primarily from a security perspective, to assure that provisions of the Code will be met. Areas needing the most attention include the following:

- Development of a national source registry.
- Modifying import/export programs to ensure that additional measures prescribed by the Code are in place.
- Gaining control over orphan sources, including promoting awareness of orphan source issues amongst external stakeholders.
- Management of disused sources, including the establishment, where applicable, of agreements for the return of such sources to the manufacturer.

- Continue promulgating Additional Security Measures to licensees possessing sealed sources in quantities of interest (irradiators and manufacturer/distributors have been completed to date).

Regarding the development of a **national source registry**, the NRC, in cooperation with the 33 Agreement States, developed an interim database of licensees possessing IAEA Category 1 and 2 sources as of mid-2004. This database was intended to be a "snap shot" of material actually possessed at the time compared with licensed authorizations. The data base is being updated during 2005 and 2006. It will serve to meet the U.S. commitment for a national source registry until the web-based National Source Tracking System (NSTS) is operable, beginning in late 2006 to early 2007. The NSTS will include individual Category 1 and 2 sources possessed by each licensee and will be required to be updated following the acquisition, transfer, or disposal of a source.
The regulatory infrastructure for source **imports and exports** is being codified through a rulemaking to 10 CFR Part 110. This rule will require specific licenses (currently, a general license is sufficient in most cases) for the import or export of IAEA Category 1 and 2 sources. Notification of the receiving country will be required for movement of such sources. In addition, the prior consent of the receiving country will be required for Category 1 sources. The Part 110 rule was published in the *Federal Register* for public comment on September 16, 2004. It is scheduled to be published in final form December 2005.

The NRC's efforts to gain control of **orphan sources** and manage **disused sources** has two principal components: (1) keep sources from being orphaned by maintaining control; and (2) recover sources that become orphaned. The NRC's efforts in the control of sources has several facets. First, the General License Tracking System was initiated in 2002. This increased tracking and licensee awareness of generally licensed sources. Second, the final rule on portable gauges (under development) should increase control of portable gauges in field situations. Third, as previously mentioned, the National Source Tracking System, which will be operational in late 2006, will increase tracking and NRC awareness of materials of concern. Finally, the NRC's
Lost Source Enforcement Policy (2001) provides incentive to ensure proper control, transfer, and disposal of sources by ensuring that civil penalties outweigh costs of direct disposition. Civil penalties are assessed at three times the cost of authorized disposal in order to encourage proper management.

Sources that become orphaned are handled in one or more of several approaches. First, there is a Trilateral Initiative between the U.S., Mexico, and Canada which was signed in 2002. This initiative provides notification when sources are lost or stolen near a common border. Second, the Department of Energy's Offsite Source Recovery Program, which has been effect since 1990, provides for the recovery of unwanted sources with no disposal pathway (primarily greater than Class C - 10 CFR 61.55 - or near those values). During 2002-2004, DOE recovered 5000 sources at the request of NRC. Such requests are facilitated via a Memorandum of Understanding with DOE on Management of Sources (June 1999). Third, the NRC provides financial support to the Conference of Radiation Control Program Directors in their National Orphan Radioactive Material

Disposition Program. Finally, the NRC fosters an open forum for individuals who find a source to come forward. The Commission believes that "Non-licensees who find themselves to be in possession of radioactive source that they did not seek to possess should not be expected or asked to assume responsibility and cost for exercising control or arranging for their disposal."

Additional Security Measures (ASM) have been promulgated by NRC Orders issued to panoramic irradiator licensees (June 2003) and source manufacturer/distributor licensees (January 2004). These ASM require background investigations, protecting sensitive information, license verification, shipments and transfers (domestic), and establishing means for intrusion detection and response. They also require the establishment of a security zone(s), means for access control, coordinating with local law enforcement authorities to ensure a timely response when needed, conducting background investigations for certain employees, and protecting sensitive unclassified information. Similar security measures are being developed for medium priority materials licensees.

Table 1. IAEA Radionuclide Threshold Quantities

Radionuclide	Category 1 (1000 D)		Category 2 (10 D)		Category 3 (D)	
	(TBq)	(Ci)	(TBq)	(Ci)	(TBq)	(Ci)
Am-241	6.E+01	2.E+03	6.E-01	2.E+01	6.E-02	2.E+00
Am-241/Be	6.E+01	2.E+03	6.E-01	2.E+01	6.E-02	2.E+00
Cf-252	2.E+01	5.E+02	2.E-01	5.E+00	2.E-02	5.E-01
Cm-244	5.E+01	1.E+03	5.E-01	1.E+01	5.E-02	1.E+00
Co-60	3.E+01	8.E+02	3.E-01	8.E+00	3.E-02	8.E-01
Cs-137	1.E+02	3.E+03	1.E+00	3.E+01	1.E-01	3.E+00
Gd-153	1.E+03	3.E+04	1.E+01	3.E+02	1.E+00	3.E+01
Ir-192	8.E+01	2.E+03	8.E-01	2.E+01	8.E-02	2.E+00
Pm-147	4.E+04	1.E+06	4.E+02	1.E+04	4.E+01	1.E+03
Pu-238	6.E+01	2.E+03	6.E-01	2.E+01	6.E-02	2.E+00
Pu-239/Be	6.E+01	2.E+03	6.E-01	2.E+01	6.E-02	2.E+00
Se-75	2.E+02	5.E+03	2.E+00	5.E+01	2.E-01	5.E+00
Sr-90 (Y-90)	1.E+03	3.E+04	1.E+01	3.E+02	1.E+00	3.E+01
Tm-170	2.E+04	5.E+05	2.E+02	5.E+03	2.E+01	5.E+02
Yb-169	3.E+02	8.E+03	3.E+00	8.E+01	3.E-01	8.E+00

References

1. International Atomic Energy Agency. *Code of Conduct on the Safety and Security of Radioactive Sources*. Vienna, 2004.

2. International Atomic Energy Agency. Proposed *Action Plan for the Safety of Radiation Sources and the Security of Radioactive Materials*, in Attachment 2 to GOV/1999/46-GC(43)/10. Vienna, 1999.

3. International Atomic Energy Agency. *Categorization of Radioactive Sources*, TECDOC-1191. Vienna, 2000.

4. International Atomic Energy Agency. Revised *Action Plan on the Safety and Security of Radiation Sources*, GOV/2001/29-GC(45)/12.

5. International Atomic Energy Agency. *Categorization of Radioactive Sources*, TECDOC-1344. Vienna, 2003.