Operation of the Register on High Activity Sealed Radioactive Sources in Germany - four years of experience

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Introduction

Against the background of several terrorists attacks the problem of malicious use of sealed radioactive sources came into focus and a set of measures were discussed in order to enhance the safety and security of radioactive material. Among other things expert groups considered a national source tracking system and a central source registration appropriate, especially in order to regain control over orphaned sources. However, in modern industrial and medical applications thousands of radioactive sources are used and an entire tracking system would therefore make a huge effort. But only sources with a higher activity represent a significant radiological hazard, so that it would be practicable and sufficient to register only sources above a certain activity level. These recommendations are laid down in international documents such as the Code of Conduct [4] by the International Atomic Energy Agency (IAEA) and the European Council Directive 2003/122/EURATOM [1] (HASS-Directive). Meanwhile, most European Countries incorporated the HASS-Directive into their national legislation and maintain a source register on a national level.

German Regulations

With the Act on the Control of high-activity sealed radioactive sources (HASS) of 12.08.2005 Germany has set into force several regulations to comply with the international recommendations. All conditions are integrated into two basic German provisions: the Atomic Energy Act (Atomgesetz [2]) and the Radiation Protection Ordinance (Strahlenschutzverordnung [3]). Although most of the requirements were already fulfilled by the existing provisions some regulations had to be added or specified. Explicitly, regulations for the identification and documentation of HASS, an obligation for manufacturers to recycle or dispose sources, specific regulations for the leakage test of HASS and financial precautions for orphaned sources have been incorporated. The standard record sheet of the European HASS-Directive has been adopted in detail by the German Radiation Protection Ordinance. Moreover, the regulatory background for a central national register of high-activity sealed radioactive sources (HASS register) at the Federal Office for Radiation Protection (Bundesamt für Strahlenschutz - BfS) has been laid down. Because there is traditionally a federal organizational structure of the radiation protection offices in Germany, some responsibilities had to be reorganized. Thus, the HASS register is authorized to record receipt and transfer of a HASS, to provide information for security agencies (i. e. Federal and State Police, Secret service) and to cooperate with local authorities to verify the information supplied by licensees. If HASS are going to be im- or exported, the Federal Office for Economics and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle) will be involved.

Operation of the German HASS Register

The HASS register is realized as a communication system via encrypted internet connection between licensees, state authorities and the BfS. All data are recorded in a database (ORACLE) that can be accessed by authorities only. Thus, because of security reasons licensees do not have direct access to the database. To notify the register in case of receipt, transfer or control of a HASS the licensee uses an internet browser and his network login. He can report all relevant data using an input mask, that adopted all fields of the standard record sheet of the HASS-Directive. All notifications are stored into the database and will be verified by the local state authority, who had issued the concerned radiation license. In case an error was detected, the licensee is obliged to send revised data. The entire information exchange between register, authorities and licensees is performed via email communication. Additional read access to the register is authorized for security agencies (Federal and State Police, Secret services, …).
In order to prevent unauthorized access and malicious use of data about high-activity sealed sources several security measures have to be considered. The following essential measures have been implemented with the German HASS register:

- Licensees have access only to a communication client via SSL to login with username and password, they don't have direct access to the HASS database.
- Authorities can access the database directly via SSL using a private key certificate, which is send to them personally, they login with username and password too. Local state authorities and the BfS have read and write access, security agencies have only read access.
- Staff at BfS working with the database is sworn to secrecy and all computers at the BfS to be used for the HASS database have restricted access.

The German HASS register currently (October 2009) manages data of approx. 43,000 notifications about 16,000 sources. 580 licensees and 100 authorities are authorized to work with the database. Since initial operation no lost or found HASS have been announced to the register. Further statistical data are shown in figure 1 and 2.

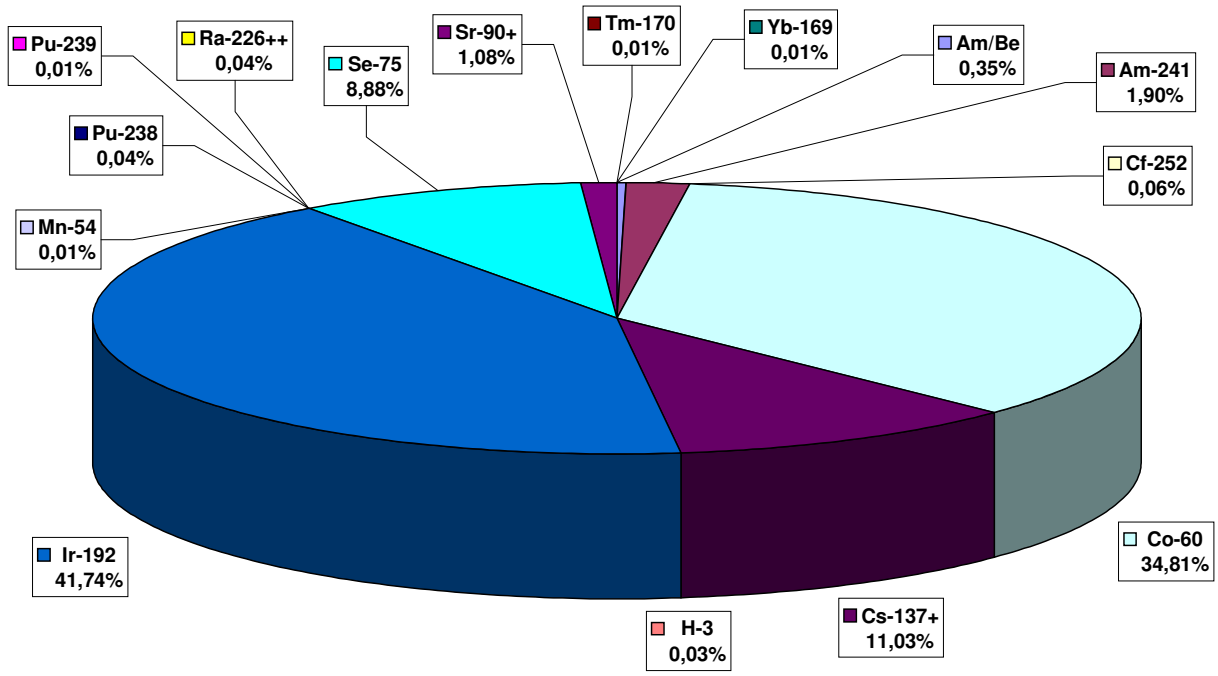

Figure 1: Nuclides of sources in the HASS database

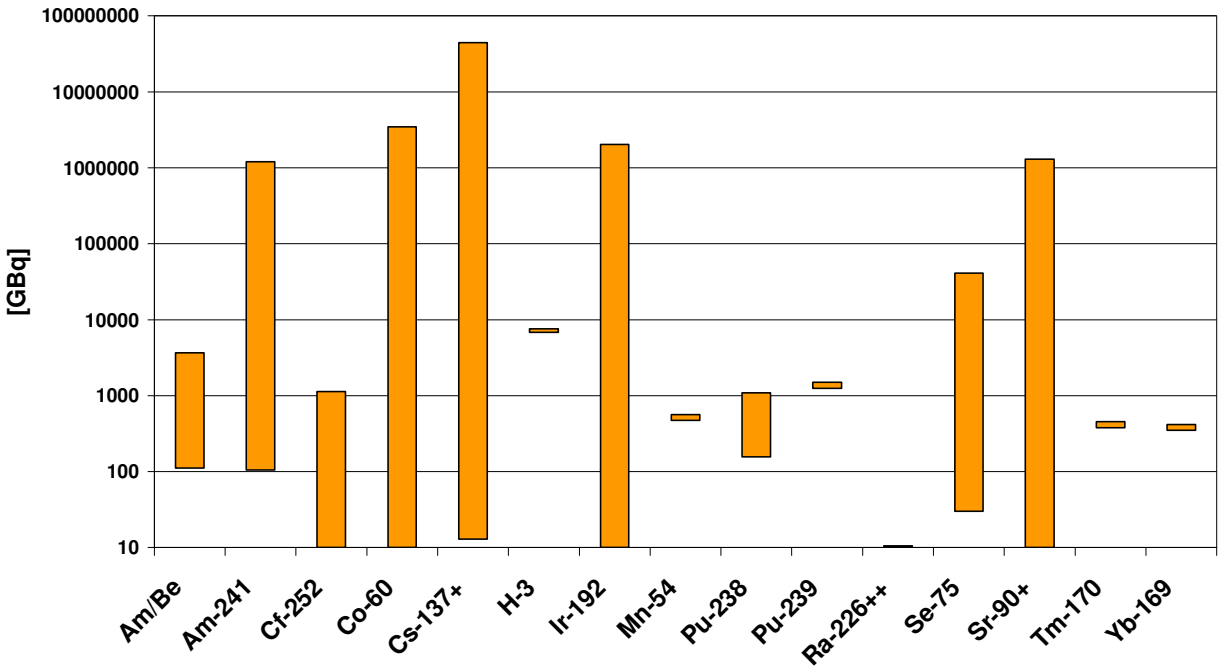

Figure 2: Range of activity of sources in the HASS database

Experience and Development

The HASS register is in operation now for approximately four years. The software is accepted by most of the users and several bugs of the first revision were eliminated with the currently operating second revision. Some still existing problems are summarized in the following categories.

Quality control of data
Exact and detailed data are essential for a storage system. Unfortunately, some licensees do not hold a proper documentation (source certificate) and announce incorrect source data, especially for old sources. Most of these cases can usually be clarified with the aim of the state authority and the source manufacturer, but it would be preferable to avoid inconsistency of the database. Thus, apart from requirements concerning the documentation addressed to source manufacturers, an inherent periodical screening of the source data might be helpful. Additionally, in order to avoid problems with differing serial source numbers due to typing errors, a barcode system helping to identify sources from the database should be designed.

Software problems
The direct access of licensees to the HASS database has been restricted for security reasons. On the other hand, this impedes the user to reload or change the data he send before and these restrictions reduce the acceptance of the system considerably. Future improvements will introduce a local file management for the user to access his own data. Though, a general access to the HASS register for licensees is still not considered.

International data exchange
Based on the HASS-Directive every member state of the European Union holds a system to trace back high-activity sealed radioactive sources. Besides, the data kept in storage might be fairly similar, since all systems record information, that was notified using the standard record sheet. The exchange of data and - thus - to pursue each national tracking system abroad might be possible. These questions have been discussed already at some workshops and led to a recommendation to introduce a formal information about the receipt of a HASS in the foreign country. Unfortunately, cross border movements of sources are still not recorded - even between European Countries. Further improvements and conditions for an international exchange of data should be developed and a broad political commitment is needed to establish an international source tracking system.

International harmonization of the regulatory background
With the HASS-Directive the level for the activity of a HASS was set to A_1 / 100, where A_1 is an activity limit for radioactive material in special form according to transport legislation. Against this, the activity level for sources to be recorded in a national register set by the Code of Conduct [4] is 10 x D (corresponding to category 2), where D is a certain nuclide specific value defined by “Dangerous quantities of radioactive material” [5]. Since the levels of the European HASS-Directive for most of the nuclides used for HASS are lower than the levels of the IAEA, a European register usually comprises more sources. This problem was discussed at former workshops and first steps to adopt the D-value system of the IAEA for the European Union have already been undertaken. Thereby sources of an activity of at least 1 x D (corresponding to category 3) shall be included.

Summary

Following international recommendations or directives a lot of countries operate a national registry of sealed radioactive sources of different types. Germany established its national register as a central communication system via encrypted internet connection between licensees, state authorities and the BfS, who maintains the system. The German register is in operation now for about 4 years and has already been revised in order to eliminate some software bugs. The general acceptance of the system by the users is good, although future improvements will still enhance user-friendliness.

Some workshops and discussions took place already to exchange information about different national source registers. It was obvious, that a general difference concerning the activity levels occurred between the European Union and the regulations from the IAEA. Meanwhile, the differences are well-known and first steps to adopt the D-value system of the IAEA for the European Union have been made. Further international cooperation and data exchange is still a future challenge.

References

[1] Council Directive 2003/122/EURATOM, 22.12.2003 (OJ L 346, 31.12.2003, p. 57

[2] Gesetz über die friedliche Verwendung der Kernenergie und den Schutz gegen ihre Gefahren (Atomgesetz) of 15.07.1985 (BGBl. I, p. 1565), last amendment of 17.03.2009 (BGBl. I S. 556)

[3] Verordnung über den Schutz vor Schäden durch ionisierende Strahlen (Strahlenschutzverordnung – StrlSchV) of 20.07.2001 (BGBl. I, p. 1714 and BGBl. 2002 I, p. 1459), last amendment of 13.12.2007 (BGBl. I S. 2930)

[4] Code of Conduct on the Safety and Security of Radioactive Sources, IAEA, Vienna, 2007 (IAEA/CODEOC/2004/Rev.1)

[5] Categorization of Radioactive Sources, IAEA Safety Standards Series No. RS G-1.9, Vienna 2005