HERCA

HEADS OF THE EUROPEAN RADIOLOGICAL PROTECTION COMPETENT AUTHORITIES

Analysis of the 2019/2021-questionnaire on orphan sources

I. 1. Introduction

Several incidents where orphan sources have accidentally been melted have occurred in the past decades. There have also been many significant incidents of contaminated metal being imported from third countries. These incidents have raised concern throughout the world and awareness for the need of radiological surveillance of metal recycling and the management of orphan sources in scrap metal. From an international point of view IAEA's SSG-19 (Specific Safety Guide No. 19: National Strategy for Regaining Control over Orphan Sources and Improving Control over Vulnerable Sources) is deemed as a kind of basis and fulcrum for national activities in this sphere.

In addition, many countries have already strengthened their regulatory requirements by implementing the requirements of the 2013/59/EURATOM-directive or IAEA GSR Part 3 concerning orphan sources. In implementing these countries have, for example:

- Encouraged the establishment of systems aimed at detecting orphan sources in places such as large metal scrap yards and major metal scrap recycling installations where orphan sources may generally be encountered.
- Encouraged the establishment of systems to detect the presence of radioactive contamination in metal products imported from third countries, in places such as at major metal importing installations or at significant nodal transit points.
- Ensured that their competent authority is prepared, or has made provisions, including assignment of responsibilities, to control and recover orphan sources and to deal with emergencies due to orphan sources.
- Made arrangements for raising general awareness of the possible occurrence of orphan sources and associated hazards.
- Issued guidance for persons who suspect or have knowledge of the presence of an orphan source on informing the competent authority and on the actions to be taken.

As many countries have implemented the requirements of the 2013/51/EURATOM-directive on the control and recovery of orphan sources still unresolved problems remain. And there have been significant cases of contaminated metal being imported from third countries. Particular issues have been identified, e.g. regarding the detection of (large) Am-241 sources in scrap metal, usually originating from outside of Europe. Some sources, like low gamma-energy emitting radionuclides or IAEA Category-4 or –5 sources, are particularly difficult to detect.

The majority of portal monitor alarms are caused by the presence of contaminated materials (e.g. naturally occurring radioactive materials). Only a small fraction of the alarms results from sealed sources. Despite their good monitoring at the entrance of scrap using portal monitors and later during the process, some production facilities have melted several sealed sources. All the melted sources originated from other countries and were transported to the production facilities from all around the world, mainly outside of Europe.

The scrap and metal recycling industry and the production facilities normally have a strong financial interest to avoid unnecessary costs of such meltings. That is a reason for them to purchase advanced detection equipment on their own initiative. But that still doesn't guarantee that all orphan sources can be detected.

HERCA Working Group RISP noted that there are differences in what is internationally reported in terms of orphan sources. Many countries only report international events at INES (IAEA's International Nuclear and Radiological Event Scale) Level 2 or above. The working group considered if it was possible to share information on orphan sources below this level, to gather information on how small sources ca be detected and to identify good practices. A need for information on how countries have set up arrangements for handling and bringing orphan sources back into regulatory control was also identified. A questionnaire was being circulated to gather all the information.

II. 2. Purpose of the questionnaire

The purpose of the questionnaire, as performed in 2019, was to gather information from each participating country on orphan sources that may occur at scrap metal facilities and how members deal with orphan sources. The questionnaire sought to gather information on the following:

- record keeping on found orphan sources,
- where the orphan sources mostly occur,
- management of orphan sources,
- whether orphan sources can be reused,
- good practice on orphan sources.

The questionnaire was sent again at the end of 2021 to each participating country to get more answers as only 11 countries replied in 2019.

WG RISP has decided to provide a summary of the results of the 2019/2021-questionnaire. This information could be useful as background information for further discussions.

III. 3. Respondent types

The questionnaire was sent to national authorities in 26 European countries. Answers were received from national authorities of 19 countries.

IV. 4. Results of the 2019/2021-questionnaire

4.1 Record keeping of orphan sources

The record is kept by the regulatory body in 17 countries. In one of the countries the record is kept by those who encounters orphan sources. In one of the countries there is no national record of orphan sources.

4.2 Where do the orphan sources mostly occur

Orphan sources occur mostly in the scrapyards and in the metal recycling industries, but orphan sources can also be found at the border or in ports. See chart 1 for more details.

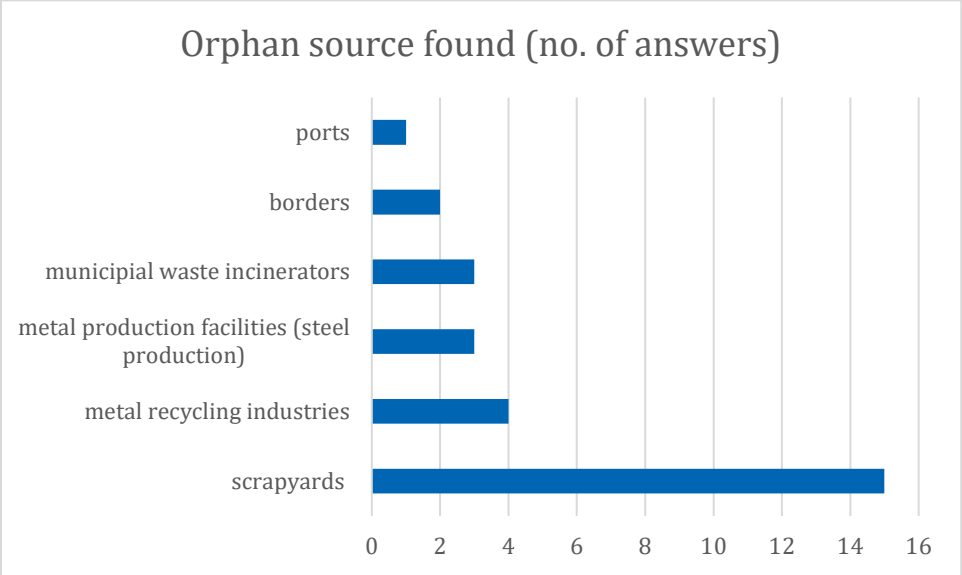

Chart 1. Places, where orphan sources are found.

4.3 Regulatory control of orphan sources

In most countries, orphan sources are traced to its owner (if possible) or at least to the country of origin/supplier of the scrap metal where its then shipped back if possible. This can though be difficult due to international transport regulations. If it is not possible to ship back the found orphan source, the found orphan source is sent to centralized/national storage facility/centre for radioactive waste disposal (in thirteen countries) or to undertakings whose line of business includes collecting waste and delivering them to national storage centre (see chart 2). The orphan source can also be stored on site where it was detected (in three countries). In one of the countries the source can be stored on site where they were detected if the orphan source is not accepted by the waste management facility. In another country the found orphan source can be stored at user's premises with a maximum storage period of 10 years. In the third country the found orphan source can be stored at found location/premises if the licensee has a storage for radioactive sources. Based on answers storage on site may facilitate a cost-efficient way of disposal and will mostly be temporarily.

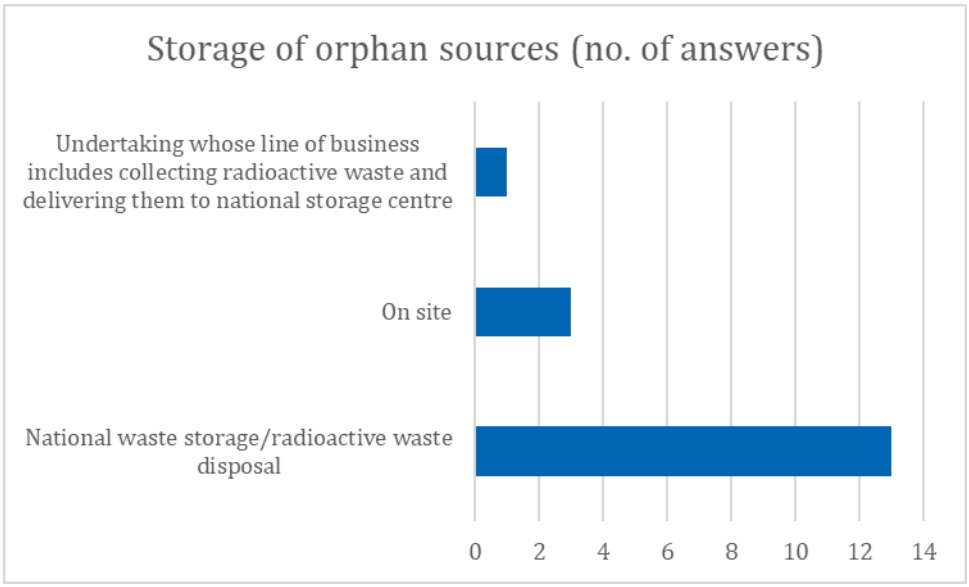

Chart 2. Storage of orphan sources

4.4 Responsibility for the cost of found orphan sources

If it is possible to determine the legal owner of the orphan source the legal owner will be responsible for the cost. In all other cases the cost is covered by the State.

In some of the countries the finder can apply for payment of the disposal costs by the state. The decision depends, among others, on the efforts of the finder to narrow down the possible suppliers of the material which contained the source. For certain radioactive legacies, e. g. consumer products with radium in moderate amounts, the disposal costs can be paid by the state without further investigations. See chart 3 for more details on responsibility for the cost of found orphan sources.

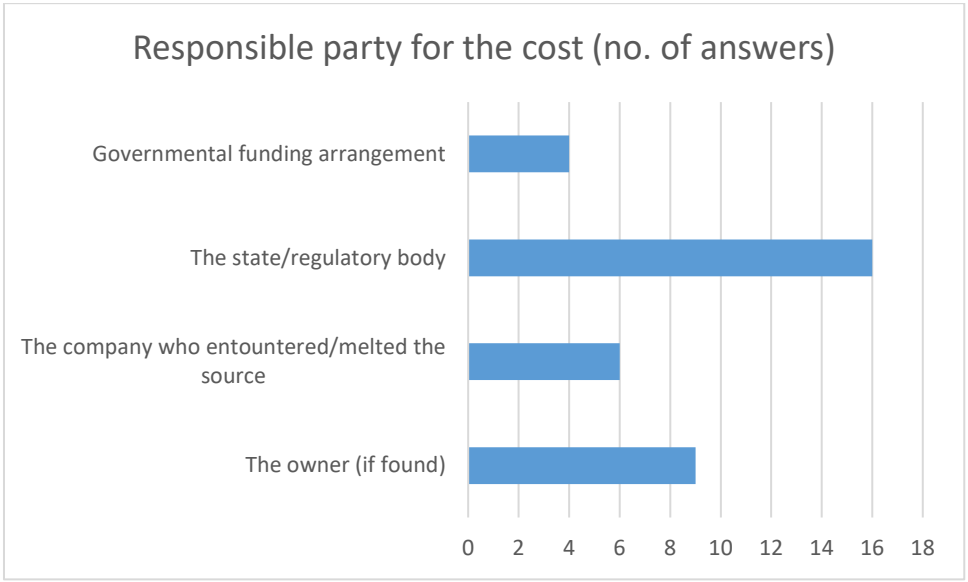

Chart 3. Responsible party for the cost of orphan sources.

4.5 Re-use of orphan sources

In most of the countries the orphan sources are mostly declared as disused sources since they lack a valid source certificate (see chart 4). In one country the orphan sources are always declared as radioactive waste, except the case when the owner of the orphan source was identified and control over the source were re-established. In another country orphan sources can legally be re-used, but this rarely happens. They are usually disposed as radioactive waste.

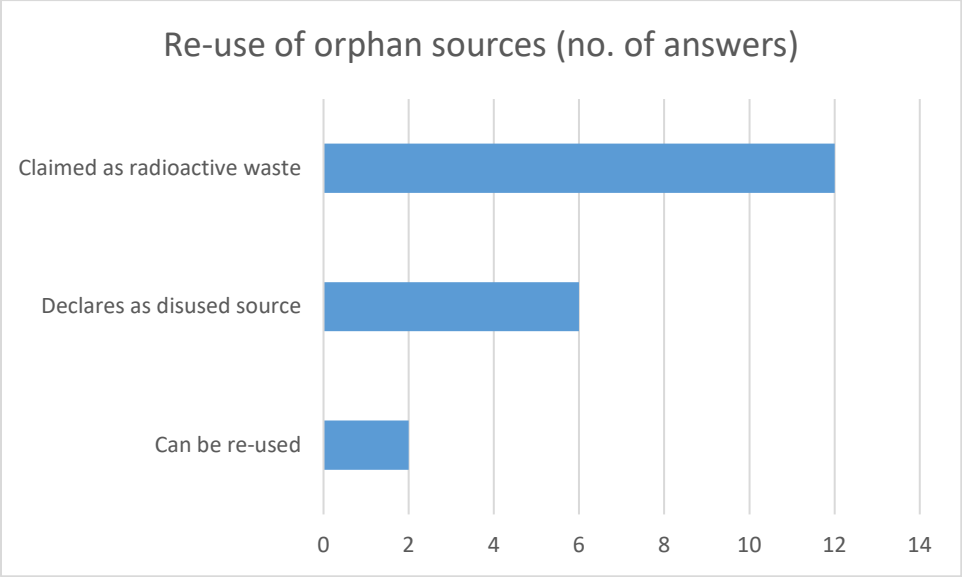

Chart 4. Re-use of orphan sources.

4.6 Have metal recycling industry or production facilities melted any orphan sources?

First, it is important to realize that not all countries have melting facilities. Some countries have melted a few sources (nine countries). Some countries don't know whether they have melted sources (eight countries). Some countries have melted a lot of sources (two countries).

4.7 What kind of radionuclides have been melted?

Based on the answers Am-241 has been melted in most of the cases (30 times), but also Cs-137 has been melted often (9 times). Other radionuclides that have been melted:

- Co-60
- Ba-133
- Eu-152
- Ra-226
- Sr-90
- Pu-238

4.8 What is the process for returning orphan sources that originate from a foreign country?

If possible, the orphan source is returned to the supplier or at least to the country of origin. Based on the answers found orphan sources have been returned to the supplier three times in three countries.

If the owner of orphan source was identified, the orphan sources that originate from a foreign country could be returned to the supplier by applying the Directive 006/117/EURATOM.

In one country orphan sources originating from a foreign county are usually disposed of as radioactive waste and stored at the national radioactive waste facility.

4.9 Good practices to be shared among HERCA countries

Spain stablished in 1999 the so called “Spanish Protocol”. This system has showed that it is a good practice in order to detect orphan sources. It was published in the IAEA IRRS report to Spain in 2008. As a result of the accidental melting of a ^{137}Cs source in a Spanish steelmill in 1998 (see Annex I), the national authorities, relevant private companies and the main trade unions prepared a protocol for the management of any future events of a similar nature. This became known as the ‘Spanish Protocol’. It was signed in 1999 and revised on 1 January 2005. The Protocol is a voluntary agreement defining the radiological surveillance of scrap metal and its products, and the duties and rights of the signatories. Its objective is “to establish the conditions required to undertake the radiological surveillance of metallic materials and resulting products … with a view to detecting the possible presence of radioactive materials and avoid the risk of their becoming dispersed and irradiating or contaminating people, property, and the environment.” It is applicable to the recovery, storage or handling of metallic materials for recycling and the processing of metallic materials. The companies subscribing to the Protocol obtain advice, assistance, and training from expert governmental organizations on the monitoring of scrap metal shipments or processed metal and on appropriate response actions. If radioactive material is discovered, a well-defined scheme exists for its management, which involves all governmental agencies concerned. The costs are to be borne by the companies unless they can be recovered from the supplier or dispatcher. These costs are much higher for companies that do not subscribe to the Protocol. An exception is where the radioactive source or substance originates from within the territory of Spain, in which case the costs are borne by the national organization responsible for radioactive waste management (ENRESA). The regulatory body can claim back from the company the costs of any work it has performed.

In another country scrap metal companies must make financial provisions (at least 110 000 € per company) to cover the costs of recovery and disposal of an orphan source. These financial provisions can only be used by the regulatory body in case a company encountering an orphan source is likely to go bankrupt.

In another country the costs of collecting, transporting, and storing of found orphan sources are borne by the competent authority. If necessary to carry out the recovery of the source, or for environmental remedial measures that may be required, a specific financial instrument (Fund) can be used to fund the activities. To this effect, 10% of all fees collected by the regulatory body under the authorization of practices regime are integrated into this Fund.

In another country the regulatory body carries out checks. To prevent situations where a licensee does not have sufficient financial resources, automatic checks are carried out at regular weekly intervals by comparing the status of the register of licensees with the trade register so that the regulatory body can intervene in a timely manner through emergency control to prevent loss of control of the resource. The licensee who has been ruled bankrupt by the court, is required to hand over all radionuclide sources for which he currently has no use to a recognized warehouse for safekeeping.

Another relatively efficient system for dealing with situations associated with loss of control of any source of radiation in another country is as follows: An essential element in preventing the emergence of orphan sources is the issuing of permits for, or registration of, individual activities. Important information relating to the source of radiation is submitted to the regulatory body throughout its lifetime from production to final disposal (from manufacturers, suppliers, users, from test results if the source is transferred to another authorised user, returned to the supplier, or liquidated).

V. 5. Conclusions

It is important to have a well-working authorization process for all sources throughout their whole life cycle to minimize the possibility that a source may end up missing or stolen within the country. It is important to have a clear picture and supervision of what comes into the country. Co-operation with all countries is important. Outreach and goal-oriented support may also enhance regional capabilities to detect radiation “at its origin”.

All respondent countries have detection systems in place, and they have arrangements to deal with found orphan sources. Most countries have requirements for detection equipment, and these are specified in regulations. Metal recycling companies have detection facilities, but they may have problems detecting low gamma energy sources. A voluntary action of the metal recycling companies is to use the best available technologies for detection (e.g. using detectors on four sides of a passing vehicle or installing a detection system for neutrons). Or this can be put as a requirement to the national legislation.

Active following of and notifying to IAEA Incident and Trafficking Database (ITDB) of all found orphan sources could also be an advantageous step ahead. Certain analytical products could e obtained from the IAEA (based upon a request), considering regional data and threats, trends and patterns.