

## THE BELGIAN APPROACH AND STATUS ON THE RADIOLOGICAL SURVEILLANCE OF RADIOACTIVE SUBSTANCES IN METAL SCRAP AND NON-RADIOACTIVE WASTE AND THE FINANCING OF ORPHAN SOURCES

### ABSTRACT

Many facilities in Belgium outside of the nuclear sector (e.g. in the non-radioactive waste processing and management sectors and in the metal recycling sector) have recently been equipped with portal monitors at their entrance for the detection of radioactive substances. These measuring ports are destined to prevent radioactive sources or radioactively contaminated materials from entering the material fluxes treated by the sectors concerned. In this way they play an important role in the protection of the workers and the people living in the neighbourhood of these facilities, as well as in the protection of the population and the environment in general.

In 2006, Belgium's Federal Agency for Nuclear Control (FANC/AFCN) drew up guidelines for the operators of non-nuclear facilities equipped with such portal monitors for the detection of radioactive substances. These guidelines describe the steps to be followed by the operators when an alarm of the portal monitor is triggered.

According to the publication of the European Directive 2003/122/Euratom of 22 December 2003 *on the control of high-activity sealed radioactive sources and orphan sources* and its transposition in the Belgian regulatory framework, the question of financing the treatment of recovered sealed orphan sources as waste became more prominent. A procedure has been drawn up by the FANC/AFCN and NIRAS/ONDRAF, the Belgian National Agency for Radioactive Waste and Enriched Fissile Materials, in order to identify the persons

responsible and to recover the costs related to the further management of detected sealed sources. If no such persons can be identified, the sealed source is declared an orphan source. In this case the so-called insolvency fund managed by NIRAS/ONDRAF covers the cost of the radioactive waste management.

This fund was fed by a special contribution levied on the normal radioactive waste treatment and was originally destined to cover the risk of insolvency. Subsequently, at the request of the Belgian government, a financing mechanism for the waste management of unsealed orphan sources was jointly established by the FANC/AFCN and NIRAS/ONDRAF. It was based on the same approach as that for the sealed sources, implying that ultimately all orphan sources would be financed by the insolvency fund.

In March 2007, the Council of Ministers approved the above-mentioned approach. At the same time the Council requested the establishment of a protocol with the professional federations of the industrial sectors that seem to be very sensitive to the appearance of orphan sources, in order to enhance the identification of the party responsible for their appearance according to the rules of common law. On 19 October 2007, the FANC/AFCN, NIRAS/ONDRAF and most of the professional federations from the metal works, the waste treatment and the recycling sectors signed this *protocol regarding the tracking and management of radioactive materials and objects outside of the nuclear sector.*

## INTRODUCTION

In recent years, more and more radioactive materials and sources, both from natural and artificial origin, have been encountered in certain industrial sectors, mainly the metal recycling and waste treatment sectors and this not only in Belgium. Anticipating this phenomenon, a number of companies from these sectors has taken the initiative to enhance the systematic control of their supply flows by installing radiation detection equipment (so-called portal monitors). These companies face the risk of a contamination of their installations, of their final products or of the local environment if radioactive sources, present in the supply of their raw materials, would ultimately find their way to the production process.

With the gradual introduction of these portal monitors, the respective industrial sectors became increasingly reticent regarding the financial responsibility for the waste treatment associated with the radioactive materials and sources discovered in their installations.

In order not to compromise the already achieved success, but instead, to stimulate the further introduction of such measuring ports, the FANC/AFCN and NIRAS/ONDRAF became aware that it was necessary to develop a structural mechanism able to bear all the costs associated with the waste management of these radioactive by-products, once they had been declared orphan sources. These radioactive materials and sources have various origins and different radiological characteristics. They are composed of both natural and artificial radioactive materials. However, most of these sources are not sealed, as many years of experience in Belgium and abroad have indicated.

## MONITORING RESULTS

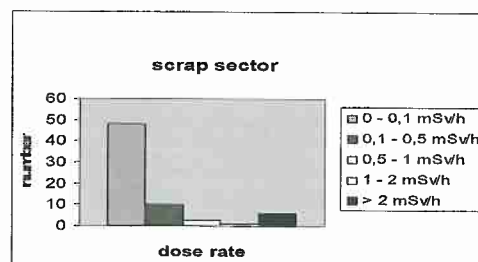
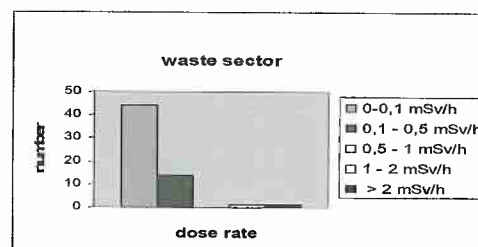
According to the data available at the FANC/AFCN at the end of 2006, 53 companies of the scrap recycling sector (major scrap yards, steel factories, foundries) and 27 companies of the waste treatment sector (incinerators and public waste landfill) in Belgium are currently monitoring the radioactivity of their incoming shipments. Most of these facilities are equipped with one (or several) portal monitors; some of them with grapple-mounted detectors.

In the waste treatment sector, a majority of the detected sources is of medical origin (waste coming from the hospitals themselves or domestic waste) or is industrial waste with NORM materials, such as refractory bricks, waste from the phosphate industry, etc. If one excludes these two categories, the following detections have been reported to the FANC/AFCN over the period 2004-2006:

- 60 radioactive sources in the waste management sector;
- 68 radioactive sources in the scrap recycling sector.

These figures are an underestimation of the real situation because not all of the operators report their detections to the FANC/AFCN.

The charts below show the distribution of the detected sources as a function of the surface radiation level:



Detected sources of medical origin are systematically followed up by the FANC/AFCN once the hospital of origin has been identified. This follow-up aims at reinforcing the waste management procedures applied within the hospitals.

The average cost of a portal monitor is about 50000 € and the average maintenance cost varies around 1000 €/y. The average full treatment cost of a radioactive source is about 1000 to 3000 €/source.

## REGULATORY ASPECTS

Although the monitoring of radioactivity outside of the nuclear sector is stimulated by the nuclear safety authorities, up to now, it has not been made compulsory. In 2006, the FANC/AFCN issued its *directives for the use of a portal monitor for radioactive substances in the non-nuclear sector* and a technical annex to these directives. They describe the various steps the operator has to follow when an alarm of the portal monitor is triggered. They describe the radioprotection measures to be taken by the staff as well as the information to be provided by the operator to the FANC/AFCN.

The operator is only allowed to intervene without the assistance of a radiation expert when the radioactivity does not exceed a certain level. Beyond that level, a radioprotection expert must be called to assist during the recovery of the source from the shipment. For shipments with naturally occurring radioactive materials (NORM), where the radioactivity is generally homogeneously spread over the whole shipment, an action level is defined (about two times the natural background) below which no intervention is necessary. The establishment of these action levels considerably simplifies the management of radiation-related alarms by the operators. These directives have been written in consultation with the various stakeholders.

## FINANCING OF ORPHAN SOURCES

In February 2006, an important decision concerning the financing of the costs associated with the waste management of recovered orphan sources was adopted by the Belgian Council of Ministers. However, a clear distinction was made according to the nature of the source:

- For orphaned sealed sources, the costs associated with the management would have to be borne by a public fund, set up by NIRAS/ONDRAF. Originally, this fund aimed at protecting NIRAS/ONDRAF against the risk of insolvency of a radioactive waste producer.
- For unsealed orphan sources, no concrete financing mechanism was yet determined. NIRAS/ONDRAF and the FANC/AFCN were invited to develop a proposal and to present it to the Council of Ministers.

This Council decision was taken in the framework of the transposition of the European Directive 2003/122/Euratom of 22 December 2003 concerning the monitoring of high-activity sealed radioactive sources and orphan sources.

## APPROACH DEVELOPED BY NIRAS/ONDRAF AND THE FANC/AFCN

The scope of the intended financial arrangement was not so easy to delimit. It depended primarily on the definition of an orphan source and on the degree in which a person, for example the previous holder of the source, could still be held financially responsible for its management and for the damage that might have resulted from its mismanagement.

The following definition of an "orphan source" was adopted in the European directive:

*"a source whose activity level at the time of discovery exceeds the exemption value and which is not under regulatory control, either it has never been under such control, or because the source has been abandoned, lost, misplaced, stolen or, transferred, without proper notification of the competent authority, to a new holder or without informing the recipient."*

The scope of the arrangement could eventually be delimited by restricting the applicability of the definition to certain kinds of situations. However, this was not considered a good idea. The definition of an orphan source is indeed also used to determine the necessary measures for bringing the source again under safeguarded circumstances. In the interest of radiation safety, it is therefore not desirable to have this definition influenced by financial considerations. So, the definition of the European directive was accepted without modifications.

As there is no reference in the definition to any financial considerations, it is appropriate to make a distinction between the different responsibilities involved in the taking care of the orphan source:

- the finder: the person responsible for the site where the source was found (this is in many cases the same person as the one who detected the presence of the source);

and otherwise:

- the responsible financier: the person who has to bear the costs associated with the management of the source.

The principal objectives of the intended financing arrangement can be summarized as follows:

- preventing the indiscriminate dumping of orphan sources;
- promoting the recuperation of the discovered orphan sources;
- not relieving the involved industrial sectors of their own responsibilities;
- fairness with regard to the finders of orphan sources;
- being fraud-proof;
- introducing a minimum of new administrative burdens.

The financial mechanism can draw its inspiration from two principles:

- the finder pays;
  - a common system pays.
- a. The principle of “the finder pays” is inspired by “the polluter pays” principle, which is generally accepted as a powerful economic incentive for the realization of the environmental policy. It proceeds from the individual responsibility of the finder on whose site or installation the orphan source was found. In this scheme the finder is considered to be a ‘waste producer’ obliged to bear all the costs associated with the waste management of the source.
  - b. The principle of “a common system pays” proceeds from a common responsibility for the appearance of orphan sources on the finder’s site. The discovery and subsequent recovery of such radioactive sources is considered a public interest. According to this principle, the finder of an orphan source is not considered a potential polluter when he reports its detection to the competent authorities. On the contrary, by preventing further contamination he provides a public service. It would be unfair to punish the finder for his sense of duty; he should rather be rewarded with a “finder’s fee”.

If the preference goes to a financial concept based on a common system, some alternatives may be considered:

- all finders pay solidarily;
- all radioactive waste producers pay jointly;
- the government pays as the representative of the community.

b.1. In the concept indicated as “all finders pay solidarily” the waste management costs of the orphan sources are jointly borne by the operators of all non-nuclear sites where orphan sources are likely to be found. This concept reflects a combination of individual and collective liability. The costs related to the processing of the recovered orphan sources are jointly shared by all of the companies belonging to a certain professional sector: for example by means of a fund supported by contributions from the subscribing member companies. The success of this approach depends on the availability of an appropriate professional organization that will set up and manage the mechanism in charge of the companies involved.

b.2. In the financial concept “all radioactive waste producers pay jointly” the waste management costs of the orphan sources are jointly borne by all of the radioactive waste producers in Belgium when their waste is transferred to NIRAS/ONDRAF.

b.3. The concept indicated as “the government pays” is a financial arrangement by which the tax payers bear the costs, because the service is considered to be a public one.

An evaluation of the possible financing mechanisms against the postulated objectives has led to the following conclusions:

- The mechanism: ‘all radioactive waste producers pay jointly’ responds mostly to the postulated objectives. No distribution between the finders is required. All activities in Belgium that produce radioactive waste contribute in a fair way to this mechanism.
- The mechanism: “all finders pay solidarily” seems to be difficult to implement because it requires the voluntary cooperation of the sectors involved, and these are quite heterogeneously organized.

- The application of “the finder pays” principle was not considered fair and could represent the risk that the finders might ultimately turn to avoidance mechanisms.

#### **SOLUTION PROPOSED BY THE FANC/AFCN AND NIRAS/ONDRAF**

The FANC/AFCN and NIRAS/ONDRAF have presented a joint proposal to the Belgian government regarding the expansion of the already existing mechanism for sealed orphan sources, introduced by the Council decision of February 2006, to the unsealed sources, although with certain restrictions. This mechanism is based on the insolvency fund of NIRAS/ONDRAF and reflects a practical application of the principle that the radioactive waste producers have to pay jointly. The insolvency fund is indeed financed by means of a contribution levied on the tariff for the radioactive waste processing. The fund acquired its actual resources thanks to a joint contribution from all waste producers.

A major advantage of the proposal is that a distinction no longer has to be made between sealed and unsealed sources. The postulated financial mechanism uses the same decision scheme for both sealed and unsealed orphan sources, in order to unequivocally determine in any situation the financial responsibility and the intervention of the fund.

Nevertheless, some restrictions have been introduced both for sealed and unsealed sources. A number of categories of orphan sources will not be covered by the mechanism, such as:

- 1° Sources that do not satisfy the definition of orphan source are at the expense of the finder.
- 2° Orphan sources originating from identifiable practices, work activities involving NORM and TE-NORM and interventions are at the expense of the identified operator.
- 3° Orphan sources forming an inseparable part of immovable property are at the expense of the owner of that property.
- 4° Radioactive sources and materials found in contractual supplies originating from foreign suppliers will not be compensated.

In March 2007 the Council of Ministers approved the approach developed by the FANC/AFCN and NIRAS/ONDRAF. This approval however was conditional on the following supplementary initiatives:

- undertakings belonging to certain industrial sectors were required to have special detection equipment available and to use it in accordance with the directives promulgated by the FANC/AFCN
- a protocol had to be established with the professional federations of some of the industrial sectors that seem to be very sensitive to the appearance of orphan sources, in order to enhance the identification of the party responsible for their appearance according to the rules of common law.
- an evaluation of the application of the financial mechanism had to be conducted after 3 years.

In collaboration with the stakeholders and the environmental administrations of the three Belgian Regions (the Flemish, Walloon and Brussels-Capital Regions) the FANC/AFCN is establishing a list of facilities for which the monitoring of radioactivity could be made compulsory. In order to do so, a careful study of the flows of scrap and waste is being made so as to identify the nodal points in the scrap recycling network where a monitoring system would be the most appropriate choice. The goal is to keep a balance between the need to monitor as much scrap flow as possible without imposing heavy regulations on small facilities.

#### **CURRENT STATUS AND CONCLUSION**

The joint proposal of the FANC/AFCN and NIRAS/ONDRAF on the financing of orphan sources services has been transposed into formal regulations of both agencies. Discussions have been undertaken with orphan sensitive sectors in order to conclude, at the request of the Council of Ministers, the protocol defining the responsibilities of each of the parties involved.

On 19 October 2007, the FANC/AFCN, NIRAS/ONDRAF and most of the professional federations from the metal works, the waste treatment and the recycling sectors signed this

protocol regarding *the tracking and management of radioactive materials and objects outside of the nuclear sector*.

The following Belgian federations signed the convention: COBEREC (Belgian Recuperation and Recycling Federation), FEBEM/FEGE (Waste Management Federation), GSV (Belgian Steel Federation), INTERAFVAL (Flemish Intermunicipal Companies for Waste Treatment), VVSG (Association of Flemish Cities and Municipalities – public waste management), COPIDEC (Walloon Intermunicipal Companies for Waste Treatment, and its members: BEP, IBW, ICDI, IDEA, IDELUX, INTERSUD, INTRADEL, IPALLE, ITRADEC) and AGORIA (Federation for the Technology Industry).

Undertakings wanting to profit from the financial

arrangement for orphan sources have to register their facilities at the FANC/AFCN. The operators of these facilities are obliged to take measures in order to prevent the appearance of orphan sources on their sites, in their installations or in the supply of goods and bulk materials. In the event of the detection of such a source the operator has to follow the guidelines of the Agency and accept its investigation to verify if its guidelines are observed and to determine possible responsibilities.

It is expected that with this instrument more orphan sources will be recovered and declared at NIRAS/ONDRAF. A further “responsibilization” of the involved undertakings will help to protect the workers of the facilities, the population in general and the environment against the hazards that uncontrolled orphan sources might represent.

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All the above-mentioned directives, guidelines and documents are available on the website of the FANC/AFCN in Dutch and in French (See [www.fanc.fgov.be](http://www.fanc.fgov.be)).