

# **ANALYSIS OF EXPERIENCES IN MONITORING RADIOACTIVE SCRAP METAL: SUMMARY OF REPLIES TO A COUNTRY QUESTIONNAIRE**

## **A. Background**

In response to the important and increasing problem of radioactive scrap metal, the UNECE has been requested to pursue the work it started in 2001 on this topic. In support of this effort, the UNECE circulated a questionnaire in advance of the first meeting of the Group of Experts in 2004, the results of which were analyzed, presented at the meeting, and included in the proceedings of the meeting ([www.unece.org/trans/radiation/radiation.html](http://www.unece.org/trans/radiation/radiation.html)).

To assess progress that has been made in the intervening two years, the UNECE circulated the questionnaire again in late 2005, with a view to presenting these updated results at the present meeting of the Group of Experts.

This report and its Addendum provides an analysis of the 2006 responses to the questionnaire, compares those with the results of the 2004 questionnaire, evaluates progress made since 2004, considers additional inputs from countries and international organizations, and makes recommendations regarding both “Best Practices” and “Areas Needing Attention” for further discussion at the present meeting.

For the purposes of this report, the questionnaire responses have been grouped in terms of the major fields of action for monitoring, intercepting and managing radioactive scrap metal. Those three fields of action are: “Prevention”, “Detection” and “Response”.

The report is structured into two parts: The present document provides a top-level set of best practices and recommendations derived from the questionnaire responses. It then discusses the basis for the analysis and describes in detail the recommended “Best Practices” and “Areas Needing Attention” for the three fields of action given above. The Addendum to the document contains three chapters providing a detailed analysis of the responses to both the 2004 and 2006 questionnaires (Appendix A), a brief analysis of existing country practices and experiences (Appendix B) and a copy of the questionnaire (Appendix C).

## **B. Summary overview of current best practices and areas needing attention**

### **Prevention**

#### **Best Practices**

- (1) All countries have established regulations directed toward preventing loss of radioactive sources and/or radioactive material.
- (2) All countries have active enforcement programmes, including penalties for non-compliance that are directed toward preventing loss of radioactive sources and/or radioactive material.
- (3) Most countries have adopted the IAEA Code of Conduct for the Safety and Security of Radioactive Sources.
- (4) Most countries have established exemption levels for materials containing low levels of radioactivity, while a large number have established regulations allowing the release of very low levels of radioactivity from nuclear facilities.

- (5) Most countries have established responsibilities and supporting materials for (a) training, including in the areas of visual inspections and response to detections arising from those inspections, and (b) accounting and storage of scrap metal and waste through contractual arrangements.
- (6) Most countries support the “Polluter Pays” principle.

#### Areas needing attention

- (1) Countries should systematically collect and analyze data on radiation levels from scrap metal and processed metal shipments for potential exposures.
- (2) Countries should increase efforts to establish appropriate regulatory mechanisms for controlling NORM and technologically enhanced naturally occurring radioactive material (TENORM).
- (3) Countries should establish: (a) guidelines for identifying and characterizing sources at metal processing facilities, and (b) regulatory provisions requiring the monitoring of imported and/or exported scrap metals for radioactivity.
- (4) The industry should ensure that contracts include provisions that: (a) scrap metal that is procured is radioactive free; and (b) when cleared scrap metal is sold, the origin of the scrap is clearly stated to the buyer.
- (5) Metal processing facilities should provide training to personnel in visual inspection and response to incidents.
- (6) Countries should agree on a standardized approach to defining the location in the processing chain where ownership of scrap metal is transferred from seller to buyer.

### **Detection**

#### Best Practices

No examples of best practices have been included as it was difficult to obtain clear trends from the answers to the questionnaires. Thus, the information analyzed is provided below under “areas needing attention”.

#### Areas needing attention

- (1) Countries should consider issuing detailed technical directives and guidance providing instructions on the proper application of detection systems.
- (2) Countries should establish a consistent and fully comprehensive approach to monitoring for radioactivity of imports and exports of scrap metal shipments at border crossings and at points of departure and arrival; and implementing checks to better control contamination of metals, focussing on: (a) making monitoring comprehensive and mandatory, (b) the location of monitoring, (c) having monitoring occur at the beginning of the distribution chain while still retaining monitoring further down the chain, and (d) issuing appropriate regulations and guidelines for controls on radioactive contamination in scrap yards and metal processing facilities.
- (3) Countries should establish a standard approach to the acquisition, quality assurance, maintenance, calibration, and use of radiation detectors at monitoring locations.
- (4) Countries should strive for a consistent, worldwide-accepted detection alarm threshold setting.

## Response

### Best Practices

- (1) Most countries require Government investigation of all detection/alarm reports.
- (2) Most countries have established protocols defining response actions in the event of a detection alarm.
- (3) Most countries have clear responsibilities for financial and physical disposition of detected radioactive materials.
- (4) Most countries have specific and detailed processes identified in regulations or guidance to facilities for disposition of a detected source.
- (5) Most countries acknowledge that, when the radioactive source or material is known, they can readily transport it in compliance with established transport regulations.

### Areas needing attention

- (1) Countries should consider developing appropriate forms to guide the reporting and response actions of those involved in detecting and acting upon detections of radioactivity in metals.
- (2) Countries should consider developing information brochures, bulletins and posters summarizing steps to be taken in response to an alarm indicating radioactivity in metals.
- (3) Countries should establish a formal protocol defining the reporting process and associated actions for a radiation alarm.
- (4) Countries should establish a consistent and comprehensive basis for response to alarms, both by Governmental agencies and by the scrap metal industry.
- (5) Countries should include in their recovery programme the regulatory method that is allowed for transporting radioactive material or sources where the contents are undefined.
- (6) Countries should consider establishing an international standard on allowing processing facilities to melt contaminated metal, and on accumulating detected materials on their site, especially if below internationally accepted clearance levels.
- (7) Countries should consider establishing a free-of-charge disposal facility or a return-to-sender policy to facilitate resolution of contaminated scrap and metal product incidents.

## **C. Basis for and process of the analysis**

### The basis for the analysis

The analysis presented in this report was derived with a view to providing detailed input into the present meeting of the Expert Group. In addition to what is contained herein, the “Spanish Protocol for Collaboration on the Radiation Monitoring of Metallic Materials” provides valuable input to the meeting. Various Spanish Government agencies and industries have collaborated to develop and implement this protocol.

In the Spanish Protocol, those Government organizations that subscribe to the protocol agree to detailed actions, including the following:

- Establishing, populating and maintaining current a National Register of those subscribing to the protocol;
- Defining the responsibilities for Government agencies, including those relating to control of discovered radioactive material in metals;
- Ensuring that any event is properly resolved;
- Facilitating communication amongst organizations to ensure each is informed of a radiation event;

- Providing inspections of surveillance and control systems;
- Issuing advice on radiation safety;
- Promoting training and education; and
- Providing technical advisory services as needed.

In turn, the companies that subscribe to the Spanish Protocol agree to detailed actions, including the following:

- Performing radiological surveillance of scrap metal and metal products;
- Staffing surveillance and control systems;
- Providing for, and collaborating in, training;
- Requiring suppliers of metal to inspect loads prior to shipment, and to issue a radiological surveillance certificate of inspection;
- Refusing to accept shipments that do not have radiological surveillance certificates of inspection;
- Returning to any foreign source material determined to be contaminated;
- Notifying immediately the appropriate Government agencies in the case of an event;
- Taking actions to prevent dispersal when contamination is detected; and
- Arranging with appropriate Government agencies for the proper disposition of detected contaminated materials.

The topics outlined above in the Spanish Protocol served to guide the development of the “Best Practices” and “Areas Needing Attention” in the current report. As such, provisions in the Spanish Protocol address all three fields of action addressed here, i.e.: prevention, detection, and response.

#### The process of the analysis

The countries that responded to the questionnaires in both 2004 and 2006 are listed in Table 1. This table shows that:

- 48 countries ultimately responded to the 2004 questionnaire (3 of which responded sufficiently late that the results were not included in the proceedings of the 2004 meeting, but have been included in the current analysis presented here),
- 43 countries responded to the 2006 questionnaire by 1 June 2006, which was in sufficient time to have their results included in the Revision 1 analysis presented in this document and the associated Revision 1 of the addendum, and
- 7 of the 43 countries responding to the 2006 questionnaire did not respond to the 2004 questionnaire.

**Table 1. Countries responding to the 2004 and 2006 questionnaires\***

Country	2004	2006	Country	2004	2006
Australia	X		Lithuania	X	X
Austria	X	X	Luxembourg	X	X
Azerbaijan	X		Malaysia	X	
Bangladesh	X	X	Mexico		X
Belarus	X	X	Netherlands	X	X
Belgium	X	X	New Zealand	X	X
Bulgaria	X	X	Norway	X	X
Canada	X	X	Paraguay		X
Croatia	X	X	Philippines	X	
Czech Republic	X	X	Poland	X	X
Denmark	X		Portugal	X	
Dominican Republic	X		Romania	X	X
Egypt		X	Russian Federation	X	X
Estonia	X	X	Serbia and Montenegro	X	
Finland	X	X	Slovakia	L	X
France	X	X	Slovenia	X	X
Georgia	X	X	South Africa	X	X
Germany	X		Spain	X	X
Hungary	X	X	Sweden	X	X
Iceland	L		Switzerland	X	X
Indonesia	X	X	Tajikistan	X	X
Ireland	X	X	Thailand		X
Italy	X	X	Turkey	X	X
Japan		X	Ukraine		X
Kazakhstan	X		United Kingdom	X	
Kyrgyzstan	L	X	U.S.A.	X	X
Korea, Republic of		X	Vietnam	X	X
Latvia	X	X	<b>TOTALS</b>	<b>48</b>	<b>43</b>

\* Note: In the 2004 and 2006 date columns, “X” indicates response received and included in the 2004 and/or the 2006 analysis, as applicable. In addition, in the 2004 columns, “L” indicates response received after the 2004 analysis was completed, but those inputs have been included in the 2006 analysis. Thus, a total of 55 countries are represented in the analysis which follows. Specifically, when assessing the written responses for “Best Practices” and “Areas Needing Attention”, the responses from all 55 were used.

The questionnaire data were provided according to 6 major topics<sup>1</sup>:

- Regulatory Infrastructure – 7 questions identified as QRI-1 through QRI-7 respectively,
- Monitoring – 18 questions identified as QM-1 through QM-8 respectively,
- Dispositioning – 6 questions identified as QD-1 through QD-6 respectively,
- Contractual – 5 questions identified as QC-1 through QC-5 respectively,
- Reporting – 6 questions identified as QR-1 through QR-6 respectively, and
- Experience – 1 opportunity to describe experience.

<sup>1</sup> The detailed questionnaire listing the respective questions are contained in the Addendum, Appendix C to this document.

These six general areas contained in the questionnaire have been transferred to appropriate topical areas based on fields of actions (prevention, detection, response).

In the 2004 analysis, all written responses provided by a country for each question were listed, by country, under that question. For this 2006 analysis, rather than list all responses, the responses from both the 2004 and the 2006 submissions have been used to assist in developing insights into the issues and in defining the “Best Practices” or “Areas Needing Attention” portions of this document. These results are summarized in a graphical form with annotations and discussions, as appropriate in the Addendum to this document.

The results provided in the Addendum are summarized graphically for questions that were to be answered by a “yes” or a “no”. For these questions, the summaries were prepared as follows:

- graphic representation of percentage of positive answers out of the total number of respondents; and
- a lack of response (i.e. the responder did not mark either “yes” or “no”), or an “N/A” (i.e. not applicable) were all counted as a “no”. In some cases the responders marked neither “yes” nor “no”, but provided descriptive text to the query; in these cases the text was analyzed and a “yes” or “no” selected based on that analysis.

Any additional comments provided by the responders for these questions were used to develop, as appropriate, additional insights into the issues. In order to assess the statistical meaning of the results, defining how practices have evolved over the 2 years between questionnaires, graphs showing the same respondents for both years have been used in some cases.

#### **(a) Best practices**

The identification of “Best Practices” is based upon the analyses in this report where such practices could assist not only those countries involved in the Group of Experts meetings, but other countries that have not participated in the meeting in addressing the problems associated with monitoring and controlling radioactivity in scrap metal.

The “Best Practices” have been derived from two sources: (a) the analysis of the responses to the questionnaire for both 2004 and 2006, where a large number of countries are utilizing a sound practice in activities associated with radioactive scrap metal; and (b) from individual country inputs and inputs from international organizations that appear to provide an internationally agreed and sound basis for regulatory control of the problem.

Thus, the “Best Practices” identified here should be considered for application by all countries since all countries will have some sources of radioactive material which can potentially be introduced into scrap metal streams. These streams can impact not only the country that is the source of the contamination, but can impact countries through which the scrap may be transported, in which the scrap may be processed, and where processed scrap metal that becomes contaminated may be used.

#### **(b) Areas needing attention**

The identification of “Areas Needing Attention” is also based on the analyses in this report. They have also been derived from two sources: (a) the analysis of the responses to the questionnaires for both 2004 and 2006, where some but not a large number of countries are utilizing a sound practice in activities associated with radioactive scrap metal and thus attention should be specifically paid to these issues; and (b) from individual country inputs and inputs from international organizations that indicate a problem may exist that needs to be further addressed to provide an internationally agreed, sound basis for regulatory control of the problem.

Generally, from the results of the questionnaire, if less than approximately 70 to 80 per cent of the responding countries are not following the practice, that practice was then identified as an “Area Needing Attention”. More specifically, those practices relate to issues where inadequate attention has been or is being paid by countries, and where additional effort could enhance the control of radioactive material in scrap metal – in the areas of Prevention, Detection and Response – both domestically in a given country, and internationally where countries may be involved in the international market of scrap metal and of products resulting from the processing of scrap metal. Thus, special attention might be given to these areas in future activities at the State and international levels.

## **D. Prevention<sup>2</sup>**

### **Prevention: Best Practices**

Best practices for prevention that can be drawn from the data analysis presented above and from the existing country practices and experience summarized in the Addendum, Appendix B are discussed below.

Prevention: Best Practice No. 1: All countries have established regulations to prevent loss of radioactive sources and/or radioactive material.

Evidence from the questionnaires:

- Essentially all countries responding to both the 2004 and 2006 questionnaires have established regulations directed toward preventing loss of radioactive sources and/or radioactive material (97 to 98 per cent in 2004 compared with 100 per cent in 2006 considering data from both Figures A.1 and A.2 in the Addendum). [QRI-1]

National examples:

- Lithuania has issued a resolution on regulations on handling of illegal sources of ionizing radiation and contaminated facilities. [Addendum, Appendix B.5]
- Switzerland established a programme focused, in part, on intervention and waste management following intervention at border crossing which significantly reduced the number of detections at their borders over a two-year period. [Addendum, Appendix B.7]

Prevention: Best Practice No. 2: All countries have active enforcement programmes, including penalties for non-compliance that are directed toward preventing loss of radioactive sources and/or radioactive material.

Evidence from the questionnaires:

- Essentially all of the countries responding to both the 2004 and 2006 questionnaires have active regulatory enforcement programmes (93 to 94 per cent in 2004 compared with 97 to 98 per cent in 2006 considering both Figures A.1 and A.2 in the Addendum). [QRI-4]
- A large percentage of responding countries have penalties for exceeding regulatory limits (86 to 90 per cent in 2004, increasing slightly to 94 to 95 per cent in 2006 considering both Figures A.1 and A.2 in the Addendum). Figure A.3 in the Addendum further supports this conclusion, which shows that currently countries impose penalties that are: (a) financial (i.e. monetary fines) ranging from unspecified values and/or small amounts to as high as US\$ 800,000, (b) penal (i.e. imprisonment) ranging from unspecified duration to as much as 10 years, (c) the suspension of licences, (d) other unspecified administrative actions, and (e) various combinations of these depending upon the severity of the violation. [QRI-5]

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<sup>2</sup> Under “Evidence from the questionnaires” the relevant question as well as references to more detailed information and figures relating to “National examples” are given in square brackets following the items.

Prevention: Best Practice No. 3: Most countries have adopted the IAEA Code of Conduct for the Safety and Security of Radioactive Sources.

Evidence from the questionnaires:

- Since 2004 there has been an apparent significant increase in the percentage of responding countries that have adopted the IAEA Code of Conduct for the Safety and Security of Radioactive Sources (from 63 per cent to 84 per cent using the Figure A.1 data for all countries reporting to date, and from 62 to 81 per cent using the Figure A.2 data for countries reporting in both questionnaires – see Addendum). Although the number of countries using the Code of Conduct is significant and growing with time, since approximately 20 per cent of the countries responding still have not adopted the Code of Conduct, additional attention probably should be paid here. [QRI-3]

National example:

- Lithuania has issued a decree on the control of high activity sealed radioactive sources and orphan sources, and a resolution on regulations on handling of illegal sources of ionizing radiation and contaminated facilities. [Addendum, Appendix B.5]

Prevention: Best Practice No. 4: Most countries have established exemption levels for materials containing low levels of radioactivity, while a large number have established regulations allowing the release of very low levels of radioactivity from nuclear facilities.

Evidence from the questionnaires:

- Essentially all responding countries have established exemption levels (between 97 and 100 per cent considering both Figures A.1 and A.2 in the Addendum). Typically, as summarized in Figure A.4 (in the Addendum), the countries specify exemptions in terms of: (a) specific quantified limits (e.g. specific activities from 0.3 kBq/kg to 70 kBq/kg, exposures to the public of less than 10  $\mu$ Sv/y and less than 1 man Sv/y, to background levels of exposure rates); (b) exemption of naturally occurring radioactive material (NORM) only; (c) specification of compliance with the standards established by the IAEA in its Basic Safety Standards (BSS, SS115), (d) specification of compliance with the EU BSS directive; (e) specification of compliance with nationally established laws and regulation; and (f) combinations of these specification levels. [QRI-6]
- A significant number of countries have regulations for release of materials with very low levels of radioactivity from nuclear facilities (the data varied from 73 to 81 per cent in Figures A.1 and A.2 (Addendum) with no discernable, measurable trend). The methods by which countries allow such releases are through conditional release, unconditional release, or a combination of conditional and unconditional depending upon the radioactivity level (see Figure A.5 in the Addendum). This is viewed as a Best Practice; however, those countries that have not yet addressed regulatory release of materials with very low levels of radioactivity could consider doing so. [QRI-7]
- Establishing exemption levels for radioactivity at levels sufficiently low that it poses no health or environmental hazards allows countries' regulators and also the operators of facilities and those transporting materials to conserve valuable personnel and financial resources that could be applied to those cases when the radioactivity is high.

National example:

- The United Kingdom issued a Code of Practice on clearance and exemption principles, processes and practices for use in the nuclear industry. [Addendum, Appendix B.9]

**Prevention: Best Practice No. 5:** Most countries have established responsibilities and supporting materials for (a) training, including in the areas of visual inspections and response to detections arising from those inspections, and (b) accounting and storage of scrap metal and waste through contractual arrangements.

Evidence from the questionnaires:

- The data for the 36 countries reporting on both questionnaires indicate measurable increases in training requirements at metal processing facilities; from 50 per cent in 2004 to 67 per cent in 2006 for training in visual inspection and response. [QM-16]
- In the area of training responsibilities, specific responsibilities relate to monitoring and response, and to visual inspections and response. The responding countries indicated that the requirements for training personnel in monitoring and response, primarily focused on Customs' personnel at border crossings, increased marginally from 71 per cent in 2004 to 75 per cent in 2006. [QM-8]

National examples:

- Lithuania has issued a decree on procurement, accounting and storage of base scrap metal and waste. [Addendum, Appendix B.5]
- Switzerland established a programme at its borders that includes, in part, a training programme for Customs' agents that significantly reduced the number of detections at its borders over a two-year period. [Addendum, Appendix B.7]
- The United States of America, in cooperation with its domestic scrap metal demolition industry, has developed a training programme on identifying sources at demolition facilities. By identifying the sources at the front end of the material processing chain, the likelihood of introducing radioactivity into the scrap or the processed material is reduced. [Addendum, Appendix B.10]

**Prevention: Best Practice No. 6:** Most countries support the “Polluter Pays” principle.

Evidence from the questionnaires:

- In the area of contract responsibility, where the industry has specific responsibilities, more than 80 per cent of the responding countries indicated that they support the “Polluter-Pays” principle. This provides an added incentive to the industry to ensure that they are not the polluter [QD3].

### **Prevention: Areas Needing Attention**

Areas needing attention for prevention that can be drawn from the data analysis and from the existing country practices and experience summarized in the Addendum, Appendix B are discussed below.

**Prevention: Area Needing Attention No. 1:** Countries should systematically collect, and analyze data on radiation levels from scrap metal and processed metal shipments, for potential exposures.

National examples:

- The results of an analysis of the radiation level data obtained by the Belgian authorities shows that a significant number of the detected shipments probably were made without being in compliance with the Transport Regulations, incurring the radiation hazards commensurate therewith. Had the shipments been assessed prior to departure, these non-compliance and potentially hazardous radiological situations could have been avoided. [Addendum, Appendix B.1]
- A Canadian study provides an estimation of effective dose from radioisotopes in a waste load. [Addendum, Appendix B.2]

Prevention: Area Needing Attention No. 2: Countries should increase efforts to establish appropriate regulatory mechanisms for controlling NORM and technologically enhanced naturally occurring radioactive material (TENORM).

Evidence from the questionnaires:

- As illustrated in Figure A.1 and A.2 (Addendum), less than 70 per cent of the responding countries have regulatory mechanisms controlling NORM and TENORM. The data increased slightly, from 64 to 67 per cent over the two-year period. Those countries that have not yet addressed regulatory control of NORM and TENORM should consider doing so. Some NORM and TENORM can have radioactivity well below exclusion levels, however some naturally occurring ores can have quite high radioactivity levels and proper controls are needed to ensure adequate radiation safety. [QRI-2].

Prevention: Area Needing Attention No. 3: Countries should establish: (a) guidelines for identifying and characterizing sources at metal processing facilities, and (b) regulatory provisions requiring the monitoring of imported and/or exported scrap metals for radioactivity.

Evidence from the questionnaires:

- As summarized in Figure A.6 (Addendum), less than 50 per cent of the responding countries indicated that they have guidelines for identifying and characterizing sources at metal processing facilities. [QM-17]
- Figure A.6 (Addendum) also shows that less than 45 per cent of the responding countries indicated that they have a regulatory provision that requires the monitoring of imported and/or exported scrap metals for radioactivity. In explaining their responses to this question, the approximate 50 per cent of the responding countries that do not require monitoring of imports and exports rely on spot checks (6 countries), voluntary actions at metal processing facilities (6 countries), while another 6 countries indicated they had no knowledge of what occurred in their country or that such a requirement was under consideration. [QM-2]

Prevention: Area Needing Attention No. 4: The industry should ensure that contracts include provisions that: (a) scrap metal that is procured is radioactive free; and (b) when cleared scrap metal is sold, the origin of the scrap is clearly stated to the buyer.

Evidence from the questionnaires:

- Figure A.6 (Addendum) illustrates that only about 55 per cent of responding countries have industry issuing contracts ensuring that scrap metal that is procured is radioactive free. [QC-2]
- Figure A.6 (Addendum) further illustrates that contracts should have a provision that, when cleared scrap metal is sold, the origin of the scrap is clearly stated to the buyer of the scrap. For this contractual provision, the data show that only about 40 per cent of responding countries impose this requirement; and that the number decreased from 42 per cent in 2004 to 37 per cent in 2006. In fact, the data for the 36 countries reporting on both questionnaires indicate that only 33 per cent of these responding countries impose contractual requirements for identifying the source of the scrap. [QC-4]

Prevention: Area Needing Attention No. 5: Metal processing facilities should provide training to personnel in visual inspection and response to incidents.

Evidence from the questionnaires:

- As shown in Figure A.6 (Addendum), a relatively low percentage of the responding countries indicated that they require training of personnel in visually inspecting and responding to incidents at metal processing facilities. The number of countries with this requirement increased from 46 per cent in 2004 to 58 per cent in 2006. The data for the

36 countries reporting on both questionnaires indicate an even greater increase in training requirements at metal processing facilities, from 50 per cent in 2004 to 67 per cent in 2006. Thus, it can be inferred from these data that, although many countries still have not achieved the goal of requiring training, many facilities are providing it voluntarily, and measurable progress is being made in the number of countries requiring training. [QM-16]

Prevention - Area Needing Attention No. 6: Countries should agree on a standardized approach to defining the location in the processing chain where ownership of scrap metal is transferred from seller to buyer.

Evidence from the questionnaires:

- Only about half of the responding countries appear to have requirements that impose ownership transfer at the receiving site after the load of scrap material has been screened for contamination. In some cases the transfer is also required to be approved by the relevant regulatory body. Otherwise, it appears that the point of transfer of ownership varies, depending upon individual contractual arrangements, from when it departs the seller, to when it crosses the final international border, to when it arrives at the buyer’s site but before inspection. [QC-1]

## **E. Detection: Best practices and areas needing attention<sup>3</sup>**

### **Detection: Best Practices**

While some best practices for detection could be extracted from the questionnaires, trends were more difficult to obtain so most of the data analysed under “Detection” is listed as “areas needing attention”.

### **Detection: Areas Needing Attention**

Areas needing attention for detection that can be drawn from the data analysis and from the existing country practices and experience summarized in the Addendum, Appendix B are discussed below.

Detection: Area Needing Attention No. 1: Countries should consider issuing detailed technical directives and guidance providing instructions on the proper application of detection systems.

National examples:

- Summary information on a Belgian directive and a supporting technical annex to the directive illustrates instructions to be applied by operators of a detection portal for radioactive substance and, for experts who may need to be called upon to support the application of the detection system. [Addendum, Appendix B.1]
- Turkey issued a manual on the application of radiation detection systems at border gates for use when radioactivity is discovered in a shipment. [Addendum, Appendix B.8]

Detection: Area Needing Attention No. 2: Countries should establish a consistent and fully comprehensive approach to monitoring for radioactivity of imports and exports of scrap metal shipments at border crossings and at points of departure and arrival; and implementing checks to better control contamination of metals, focussing on: (a) making monitoring comprehensive and mandatory, (b) the location of monitoring, (c) having monitoring occur at the beginning of the distribution chain

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<sup>3</sup> Under “Evidence from the questionnaires” the relevant question as well as references to more detailed information and figures relating to “National examples” are given in square brackets following the items.

while still retaining monitoring further down the chain, and (d) issuing appropriate regulations and guidelines for controls on radioactive contamination in scrap yards and metal processing facilities.

Evidence from the questionnaires:

- Although, as shown in Figure A.7, approximately 70 to 80 per cent of the countries responding (in 2004 and 2006 respectively) were monitoring imports and exports of scrap metal for radioactivity, and that monitoring is occurring both at facilities and at borders, it is not being accomplished in a consistent and comprehensive way. The written responses to this question show a definite need for improvement. [QM-1]
- Responding countries indicated that monitoring varies from “usually”, “mostly”, and “partially”; to “in process of being developed”, and “not routinely, only when a vehicle is suspect”. A more consistent approach would benefit the Customs’ authorities and scrap metal industry worldwide. [QM-1]
- Responses also showed that more focus is given to monitoring imports of scrap rather than exports. If monitoring was focused consistently at the beginning of the export process rather than at border crossings or at the receiving facilities, potential exposures and problems at the processing facilities could be reduced. [QM-1]
- In addition, Figure A.7 in the Addendum shows that in only about 45 per cent of the countries metal melting facilities (smelters) monitor their outputs for radioactivity, and even those monitoring generally do so randomly, inconsistently or voluntarily. [QM-15]
- The data shown in Figure A.8 (Addendum) illustrate that monitoring occurs most predominantly at the scrap processing facilities, and the next largest response was for monitoring at national border crossings, both of which are downstream in the distribution chain. Less than half of the countries reported monitoring at the beginning of the distribution chain, i.e. at the scrap yard. In addition, 17 countries reported that monitoring is voluntary, undertaken at the initiative of the industry. [QM-3 and QM-5]
- Although Figure A.9 (Addendum) shows that a significant number of countries are working to monitor the import and export shipments of scrap; less than half are monitoring all such shipments and approximately 25 per cent do not have data available on this aspect of detection. [QM-6]
- Finally, at least one country has terminated monitoring of scrap metal at its borders since it acceded to the European Union. [QM-3 and QM-5]

National examples:

- Lithuania has issued a decree on procedures to control radioactive contamination of scrap metal, waste and metal products in scrap yards and reprocessing plants’ waste. [Addendum, Appendix B.5]
- The United States of America is conducting a pilot study focused on determining the feasibility of monitoring imported scrap metal for radiation. [Addendum, Appendix B.10]

Detection: Area Needing Attention No. 3: Countries should establish a standard approach to the acquisition, quality assurance, maintenance, calibration, and use of radiation detectors at monitoring locations.

Evidence from the questionnaires:

- A majority of the responders (35 countries) noted that specifications for detectors were (a) qualitative, (b) not standardized, and (c) often established at the discretion of the user. A smaller number of responders (18 countries) provided quantified specifications, either in terms of the manufacturer and model number of devices used, or in terms of specific capabilities required in terms of sensitivities and types of radiation to be detected. [QM-4]
- Figure A.10 (Addendum) illustrates that a consistent approach to quality assurance in the operations of detectors does not exist. [QM-7]

- The frequency of calibration for detectors varies significantly from country to country, with responses ranging from “twice monthly” to “once every three years”, to “never”, to “unknown” or “not applicable”. Some responders reported that calibration is according to the instructions of the detector supplier. [QM-11]
- The method used for calibration of detectors was either by qualified radiological services (20 countries) or according to procedures provided by the detector supplier (13 countries). For 12 countries either the individual responding did not know or reported that it was not applicable. [QM-12]
- Regular sensitivity checks were reported to be made on detectors by no more than 72 per cent of the reporting countries but, again, the processes used were disparate. [QM-13]

National examples:

- A Canadian study provides a listing and discussion of the features of some of the commercially available vehicle radiation monitors. [Addendum, Appendix B.2]
- A document, “Procedure for radioactive material seizure” has been issued by the Czech Republic, which includes a listing of technical equipment needed at border crossing checkpoints. [Addendum, Appendix B.3]
- Switzerland established a programme focused, in part, on measuring equipment at border crossings that significantly reduced the number of detections at their borders over a two year period. [Addendum, Appendix B.7]
- Turkey issued a manual on the application of radiation detection systems at border gates. [Addendum, Appendix B.8]

**Detection: Area Needing Attention No. 4:** Countries should strive for a consistent, worldwide accepted detection alarm threshold setting.

Evidence from the questionnaires:

- Figure A.11 (Addendum) illustrates that the level at which a detection system activates an alarm to warn of potential radioactive contamination or presence of a radioactive source in shipments of scrap metal or metals processed from scrap is not standardized. Seventy five per cent of the responding countries have specified thresholds, but these vary over a large range. For example, 34 countries specify thresholds in terms of percentage or radiation level above background levels. The lowest values were simply “above background” or “5 per cent above background”, and the highest value specified was “800 per cent above background”. Radiation levels above background ranged from 0 to as high as 3  $\mu$  Sv/h above background”. [QM-10]
- The selection of thresholds is delegated to the facilities in 8 per cent of responding countries, and 15 per cent have not specified thresholds or they are unknown to those who prepared the response to the questionnaire. [QM-10]

## **F. Response: Best practices and areas needing attention**

### **Response: Best practices**

Best practices for response that can be drawn from the data analysis and from the existing country practices and experience summarized in the Addendum, Appendix B are discussed below.

**Response: Best Practice No. 1:** Most countries require Government investigation of all detection/ alarm reports.

Evidence from the questionnaires:

- Figure A.12 (Addendum) shows that a large number of countries (approximately 75 per cent) require Government investigation of all detection/alarm reports. [QR-2]

Response: Best Practice No. 2: Most countries have established protocols defining response actions in the event of a detection alarm.

Evidence from the questionnaires:

- Figure A.12 (Addendum) shows that, of the responding countries, approximately 50 per cent have a formal protocol defining the process an operator (commercial facility or border crossing Customs agents) is to take in response to a radiation alarm. These formal protocols generally call for termination of activities, sequestering the load of scrap metal, verifying the alarm with separate measurements, and notifying Government officials. [QM-18]
- What the protocol contains varies significantly. Responders to QM-9 show that the protocol may range from an informal document, developed by the individual site; to specific legal requirements established by national regulations or laws. [QM-9]

Response: Best Practice No. 3: Most countries have clear responsibilities for financial and physical disposition of detected radioactive materials.

Evidence from the questionnaires:

- Almost all countries impose financial responsibility for disposition of detected radioactive material on the owner, generally considered the consignor, if the discovery of the material is made while in transit. Many countries will impose financial responsibility upon a scrap yard or metal processing facility if the discovery is made at that facility, and then leave it to that facility to recover costs from the original source. [QD-4]
- In contrast, many of the countries accept the physical disposition responsibility for detected material to ensure timely response and adequate public health and safety. [QD-4]

Response: Best Practice No. 4: Most countries have specific and detailed processes identified in regulations or guidance to facilities for disposition of a detected source.

Evidence from the questionnaires:

- Most countries, more than 80 per cent, reported having their process for dealing with detected sources documented in regulations for, or guidance to, facilities. This constitutes a combination of isolation, securing, temporarily storing, and/or transporting to the original consignor, a licensed waste storage facility, or licensed disposal facility. [QD-1]

Response: Best Practice No. 5: Most countries acknowledge that, when the radioactive source or material is known, they can readily transport them in compliance with established transport regulations.

Evidence from the questionnaires:

- Approximately 85 per cent of the responding countries indicated their use of the recognized transport regulations based on the IAEA Transport Regulations [QD-5]

National example:

- A document has been issued by the Czech Republic “Procedure for radioactive material seizures”, which includes specifications of safety precautions during the transport of radioactively contaminated metals. [Addendum, Appendix B.3]

### **Response: Areas needing attention**

Areas needing attention for response that can be drawn from the data analysis and from the existing country practices and experience summarized in the Addendum, Appendix B are discussed below.

Response: Areas Needing Attention No. 1: Countries should consider developing appropriate forms to guide the reporting and response actions of those involved in detecting and acting upon detections of radioactivity in metals.

National examples:

- A Canadian study led to the development of an incident reporting form for radiation alarms. [Addendum, Appendix B.2]
- The Canadian study also led to the development of an “estoppel form”, which is a tool that may be used to ship hazardous waste when the complete Transport Regulations cannot be met (somewhat equivalent to a special arrangement as defined in paragraph 310 of the IAEA Transport Regulations). [Addendum, Appendix B.2]
- A document has been issued by the Czech Republic “Procedure for radioactive material seizures”, which includes charts on the procedures to be followed when an alarm is activated at either a border crossing or at a scrap metal yard or metal processing facility. Three forms have also been issued to assist in this process, including (a) “The record on radioactive material seizure”, (b) “The record on radioactive material finding”, and (c) “The Protocol on radioactive source tracking in seized or found material”. [Addendum, Appendix B.3]
- The above-mentioned Czech document also includes guidelines on tracking and disposal of discovered radioactive material. [Addendum, Appendix B.3].
- Turkey has issued a radiation material notification form for use at border crossings when radioactivity is discovered in a shipment. [Addendum, Appendix B.8]

Response: Areas Needing Attention No. 2: Countries should consider developing information brochures, bulletins and posters summarizing steps to be taken in response to an alarm indicating radioactivity in metals.

National example:

- A brochure and poster have been developed by Canada to enhance communication and education with those who will respond to an alarm indicating the potential of radioactivity in the form of a radioactive source or sources, or of contaminated material in shipments of scrap metal or processed metal or at scrap yards and metal processing facilities. [Addendum, Appendix B.2]

Response: Area Needing Attention No. 3: Countries should establish a formal protocol defining the reporting process and associated actions for a radiation alarm.

Evidence from the questionnaires:

- Figure A.12 (Addendum) shows that only about 50 per cent of the responding countries have established protocols for reporting detected contamination, and only about 65 per cent have established any requirements for reporting alarms at processing facilities. Also, Figure A.13 (Addendum) shows that of those countries with protocols, approximately 1/3 have a formal protocol with detailed requirements; whereas approximately 1/3 only require notification or contact of the regulatory body; and approximately 1/3 have either informal protocols or do not have any protocols. [QM-18 and QR-1]

Response: Area Needing Attention No. 4: Countries should establish a consistent and comprehensive basis for response to alarms, both by Governmental agencies and by the scrap metal industry.

Evidence from the questionnaires:

- Figure A.12 (Addendum) shows that only 50 to 60 per cent of the responders (a) have the metal processing facilities perform their own investigations, and (b) apply procedures for returning or rejecting shipments after they are unloaded. [QR-4 and QC-3]

- Figure A.12 (Addendum) also shows that only about 65 per cent of the responders provide Government follow-up on contaminated shipments; and less than 60 per cent have established national databases on detected materials. [QR-3 and QR-5]

Response: Area Needing Attention No. 5: Countries should include in their recovery programme the regulatory method that is allowed for transporting radioactive material or sources where the contents are undefined.

Evidence from the questionnaires:

- Figure A.14 (Addendum) shows that less than 70 per cent of the responders had knowledge of a regulatory mechanism for transporting contaminated scrap that contains “unwanted and unidentified” radioactive material. Those countries were apparently unaware of the provisions of the IAEA Transport Regulations as they are applied at the international and domestic levels, which allows for transport of unidentified material through the provision of “Special Arrangements”. [QD-6]

National example:

- A document has been issued by the Czech Republic “Procedure for radioactive material seizures”, which includes specifications of safety precautions during the transport of radioactively contaminated metals. [Addendum, Appendix B.3]

Response: Area Needing Attention No. 6: Countries should consider establishing an international standard on allowing processing facilities to melt contaminated metal, and on accumulating detected materials on their site, especially if below internationally accepted clearance levels.

Evidence from the questionnaires:

- Figure A.14 (Addendum) shows that approximately 25 per cent of responders allow processing facilities to melt contaminated metals, and approximately 40 to 50 per cent are allowed to accumulate detected radioactive materials on their site. [QC-5 and QR-6]
- Figure A.15 (Addendum) illustrates that 13 responding countries allow melting of radioactively contaminated scrap only if it is below clearance levels; while 7 countries allow melting of contaminated scrap if it is above the clearance level, but the melting facilities must be licensed. [QC-5]
- Figure A.14 (Addendum) demonstrates that approximately 40 to 50 per cent of the countries allow metal processing facilities to accumulate detected radioactive material on site. This accumulation is usually allowed only under special radiation protection controls and/or only when the facility is specifically licensed to do so. [QR-6]

National examples:

- Lithuania has issued a standard on clearance levels of radionuclides, conditions for reuse of materials and disposal of waste. [Addendum, Appendix B.5]
- The United Kingdom issued a Code of Practice on clearance and exemption principles, processes and practices for use in the nuclear industry. [Addendum, Appendix B.9]

Response: Area Needing Attention No. 7: Countries should consider establishing a free-of-charge disposal facility or a return-to-sender policy to facilitate resolution of contaminated scrap and metal product incidents.

Evidence from the questionnaires:

- Figure A.14 (Addendum) shows a small number of countries (between 20 and 30 per cent) provide free-of-charge resolution services, or allow or require a return-to-sender policy for contaminated scrap and metal product incidents. However, most of these are handled on a case-by-case basis, and many relate only to orphan sources. [QD-2]

## ADDENDUM

### Appendix A

This Appendix presents the analysis of the questionnaires in terms of the major fields of action for monitoring of radioactively contaminated scrap metal, which are (1) Prevention, (2) Detection, and (3) Response. Included in the analysis are:

- For the “Prevention” field of action, the areas of the questionnaire are those activities that relate to preventing (a) the loss of control of radioactive material and radioactive sources, and/or (b) the introduction of radioactive material and radioactive sources into the scrap metal processing stream.
- For the “Detection” field of action, the areas of the questionnaire are those activities that countries and/or the scrap metal industry can take to detect the presence of radioactive material or a radioactive source in the scrap metal stream.
- For the “Response” field of action, the areas of the questionnaire are those activities that should be undertaken by countries and/or the scrap metal industry when radioactive material and/or radioactive sources are detected in the scrap metal stream.

In analyzing the questionnaire responses, as noted earlier, when the question required a “yes” or “no” response, the “yes” response generally indicated that a positive action was being taken by the country for that topic. The results of the analyses therefore include presentation of the percentage of responding countries that provided a positive response to the question. These responses have been summarized graphically to assist the reader in evaluating the status, internationally, relative to each of these issues.

Many of the questions, including some with a “yes” or a “no” response, required elaboration. These written responses have been summarized in text and – as appropriate – graphically to assist the reader in evaluating the status relative to each issue.

#### **A.1. Prevention**

“Prevention” is directed toward preventing the occurrence of events associated with radioactive sources or radioactive material in scrap metal that could result in radiation hazards to workers, the public and the environment, or to economic or environmental problems. The focus of prevention is on the establishment of sound regulatory regimes to: (a) properly control the use of radioactive sources and radioactive material, (b) identify how to initially address issues when such radioactive material makes it into the scrap metal streams, and (c) focus on the issues of regulation, training and contractual responsibilities.

##### **A.1.1. Regulatory Infrastructure**

Seven regulatory infrastructure questions were posed in the questionnaires (identified as QRI-1 through QRI-7) (see Appendix C). All seven of these questions fall into the area of prevention, where key issues relate to regulations, regulatory infrastructure and adequacy of application and enforcement of regulations, etc. Figure A.1 presents a summary of the positive responses to the seven questions relating to regulatory infrastructure, comparing the results of the responses in 2004 to those in 2006 for all countries responding in each case.

With regard to the data analysis presented in figure A.1, it must be remembered that the population of responding countries to the two questionnaires varied. For the two questionnaires, 36 countries responded to both. To provide perspective on how the different populations responding may

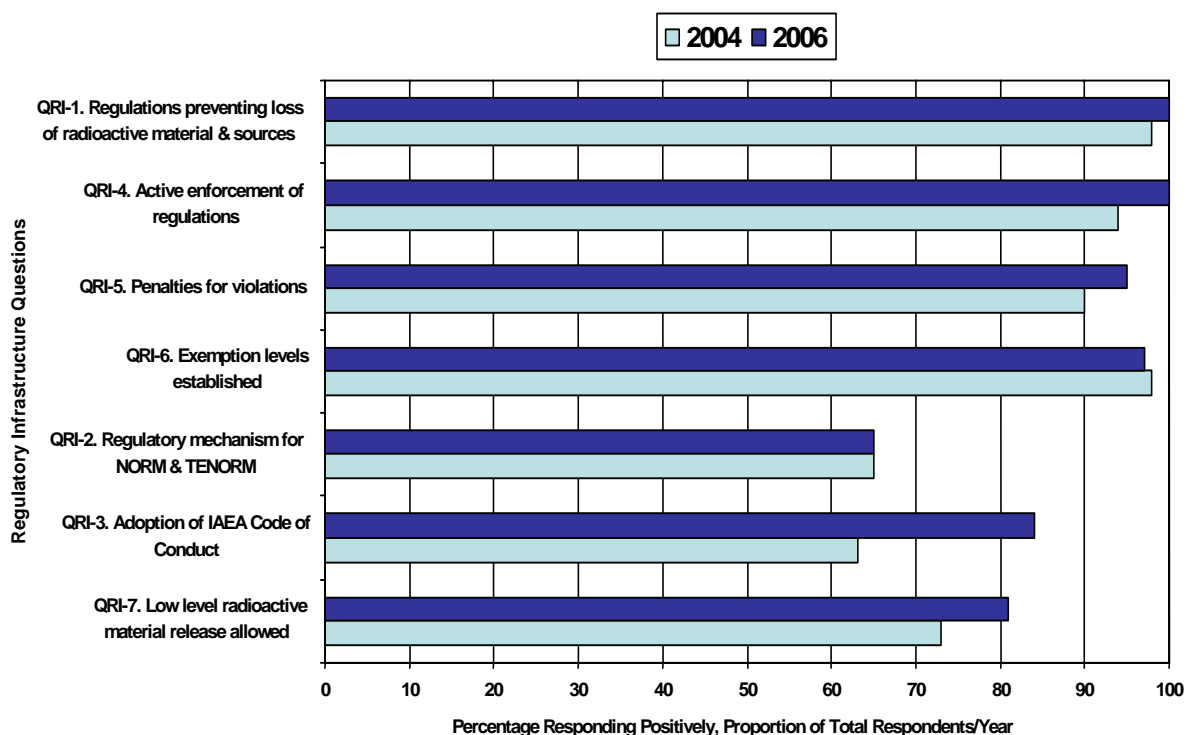
affect the conclusions, figure A.2 presents the same data in the format used in figure A.1; however, figure A.2 only presents the data for those 36 countries that responded to both questionnaires.

Henceforth in the remaining portions of this report, the data from the 36 countries responding to both questionnaires will only be referred to where the conclusions are measurably different for the two cases.

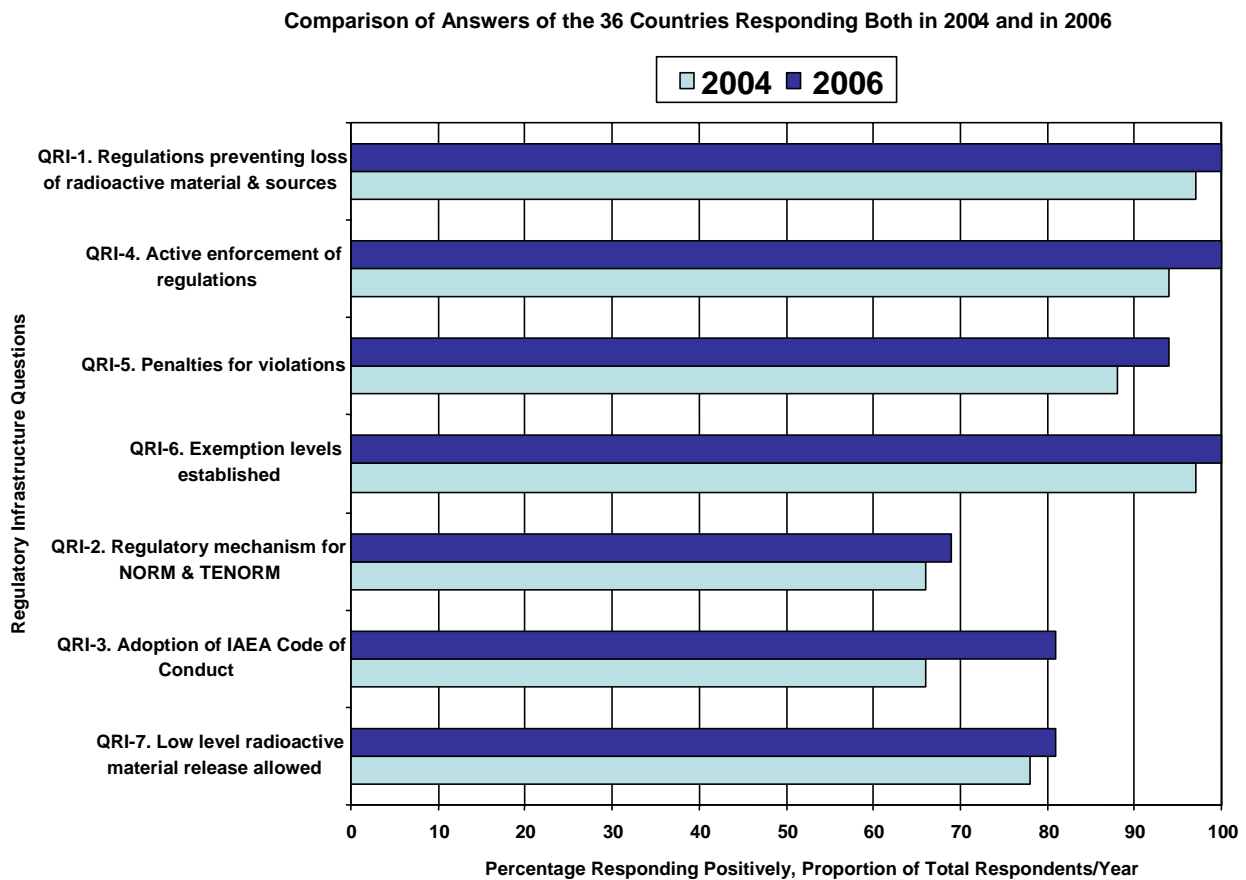
The data in the figures illustrate that a large number of countries have a regulatory regime, including active enforcement, penalties and exemption levels addressing contaminated scrap metal; whereas fewer countries have a regulatory mechanism for NORM and TENORM and allowing release of very low levels of radioactively contaminated materials. Also, a lower number of countries have adopted the IAEA Code of Conduct, although in this case a significant increase in adoption can be seen between 2004 and 2006.

**Figure A.1. Summary Comparison of Positive Responses for Regulatory Infrastructure**  
(all respondents to 2004 and 2006 questionnaires)

48 Countries Responding in 2004, 43 Countries Responding in 2006



**Figure A.2. Summary Comparison of Positive Responses for Regulatory Infrastructure**  
(36 countries that responded to both 2004 and 2006 questionnaires)

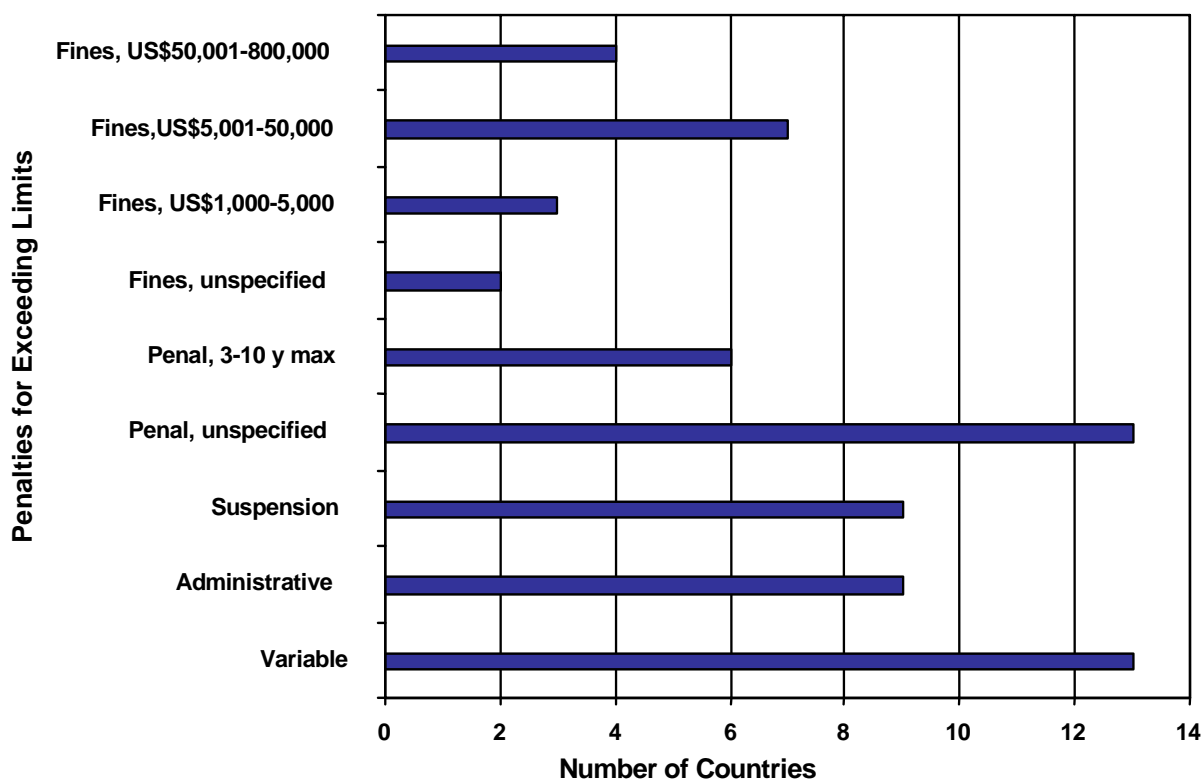


The following section further addresses three of the issues highlighted in figures A.1 and A.2, those of: (a) countries imposing penalties for an operator exceeding the regulatory limits and, for those countries that do impose a penalty, the type of penalty (QRI-5); (b) whether countries have established any levels below which material is exempted from regulatory control and, if so, what are the levels (QRI-6); and (c) whether materials from nuclear facilities, with very low levels of radioactivity, are allowed to be released in accordance with national regulations and, if so, are such releases conditional or unconditional (QRI-7).

(a) Penalties for Exceeding Regulatory Limits [QRI-5]

Figures A.1 and A.2 illustrated that approximately 90 per cent of the responding countries impose penalties of some kind for exceeding regulatory limits. The types of penalties established by these countries, based on their written responses to question QRI-5, are summarized in figure A.3. The figure shows that the penalties include: (a) financial (i.e. monetary fines) ranging from unspecified values and/or small amounts to as high as US\$800,000, (b) penal (i.e. imprisonment) ranging from unspecified duration to as much as 10 years, (c) suspension of licences, (d) other unspecified administrative actions, and (e) various combinations of these depending upon the severity of the violation.

**Figure A.3. Penalties for Exceeding Regulatory Limits**  
**Analysis of Responses to QRI-5**  
 (using all data provided in the 2004 and 2006 questionnaires)



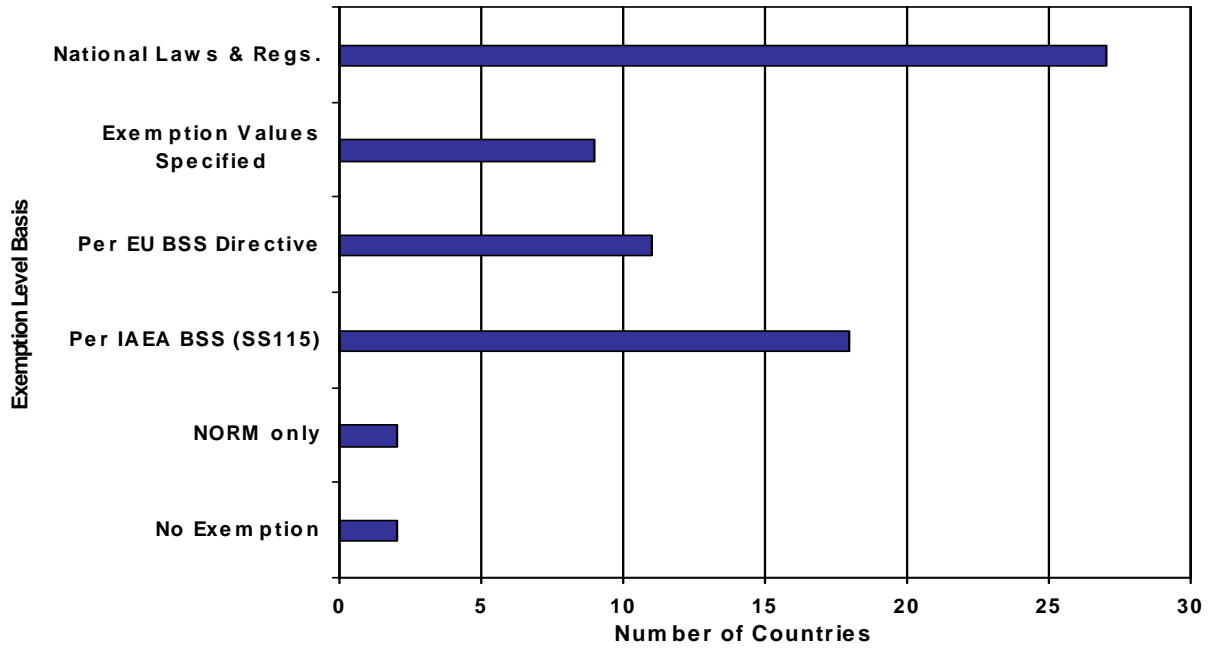
(b) Established Exemption Levels [QRI-6]

Figures A.1 and A.2 illustrated that almost 100 per cent of the responding countries have established exemption levels. The written responses to QRI-6, dealing with the establishment of these exemption levels, are summarized in figure A.4, which shows that the specification of these exemption levels include: (a) specific quantified limits (e.g. specific activities from 0.3 kBq/kg to 70 kBq/kg, exposures to the public of less than 10  $\mu$ Sv/y and less than 1 man Sv/y, to background levels of exposure rates); (b) exemption of NORM only; (c) specification of compliance with the standards established by the IAEA in its Basic Safety Standards (BSS, SS115), (d) specification of compliance with the EU BSS directive; e) specification of compliance with nationally established laws and regulation; and (f) combinations of these specification levels.

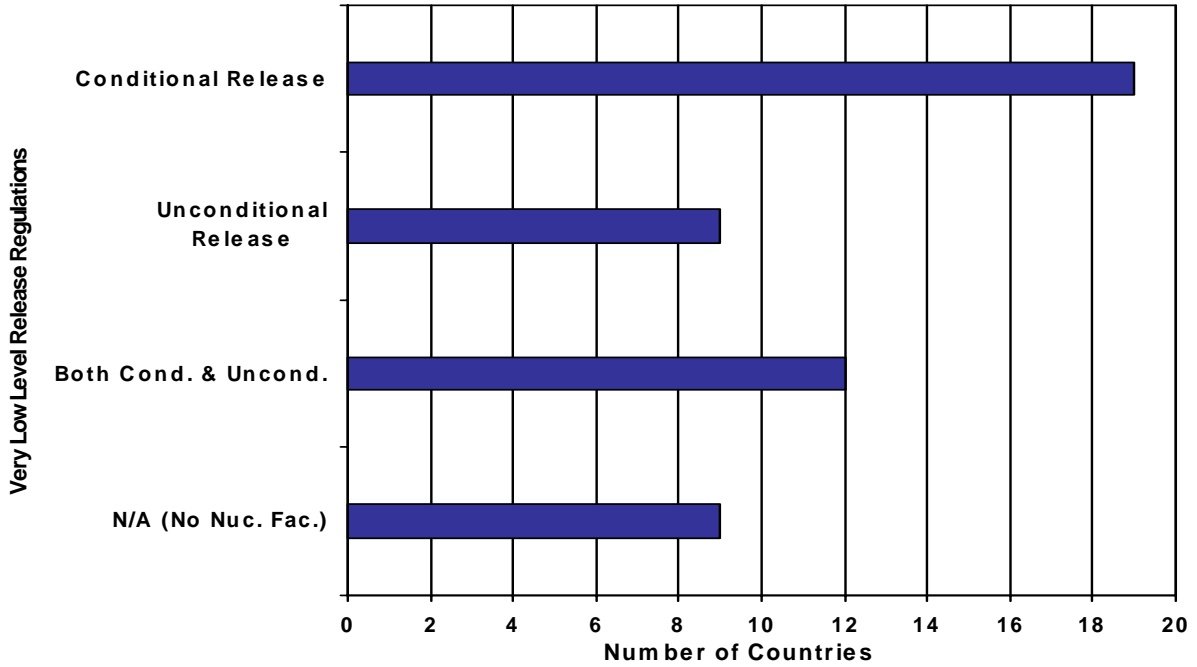
(c) Release of Low Levels of Radioactivity [QRI-7]

Figures A.1 and A.2 illustrated that 70 to 80 per cent of responding countries deal positively with the issue of the release of very low levels of radioactivity from nuclear facilities. Their responses indicate that they handle this issue in various ways, as illustrated in figure A.5, with a majority allowing conditional release or a combination of conditional and unconditional release.

**Figure A.4. Established Exemption Levels**  
**Analysis of Responses to QRI-6**  
 (using all data provided in the 2004 and 2006 questionnaires)



**Figure A.5. Release of Material with Very Low Levels of Radioactivity**  
**Analysis of Responses to QRI-7**  
 (using all data provided in the 2004 and 2006 questionnaires)



In considering the responses shown in figure A.5, it was recorded in the proceedings of the 2004 meeting of the Group of Experts that the wording of the last question in Regulatory Infrastructure (QRI-7) may have led to responses, which were not necessarily consistent. The question was worded as follows: “*Are materials from nuclear facilities, with very low levels of radioactivity, released in accordance with a national regulation?*”

Nuclear materials are defined very specifically by the IAEA through its Safeguards and Securities programme such that “Nuclear materials” are limited to those few radionuclides that are capable of sustaining a chain reaction if properly processed (i.e. fissile isotopes of uranium and plutonium, irradiated nuclear fuel and possibly high-level radioactive waste). Thus the term “nuclear facility” was interpreted by a number of countries responding to the questionnaire as being a facility associated with the nuclear fuel cycle (the front-end production of fresh fuel materials, the power and research nuclear reactors that burn the fuel and those facilities that handle discharged fuel and their reprocessed products). As a result, many respondents noted that they did not have nuclear facilities in their country and did not address the question of release of low levels of radioactivity further (the figure shows that nine countries responded in this manner). Because there are many other radionuclides and radioactive sources that can be produced and/or used in non-nuclear facilities in a country (e.g. in medicine, industry and agriculture) that can result in significant contamination of metals if inadvertently processed into them, the response to this question should be viewed with care.

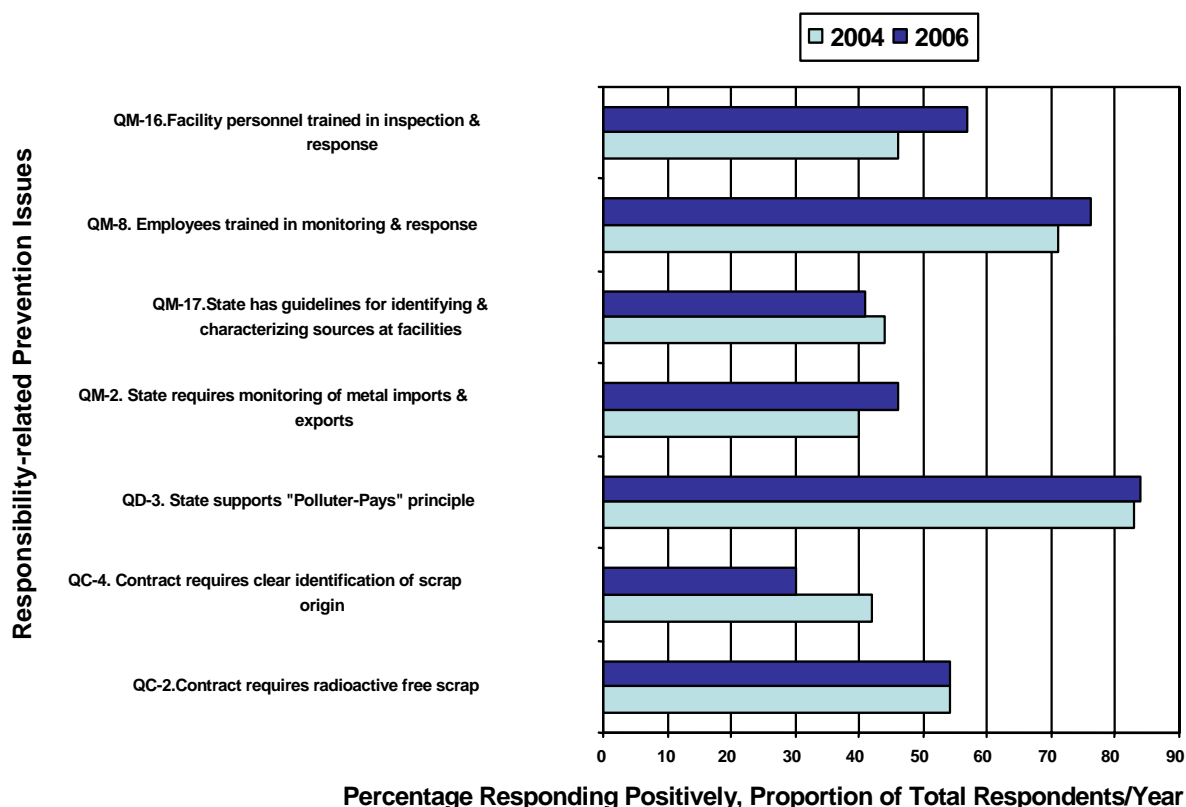
### **A.1.2 Responsibilities**

Prevention of radioactivity in scrap metal also relates to the issues of regulatory, contractual, and training responsibilities - on the part of both the regulators and the industry. The questionnaire focused on these areas with questions on regulatory responsibilities (QM-2 and QM-17), on contract responsibility (QD-3, QC-1, QC-2 and QC-4), and on training responsibility (QM-8 and QM-16). Figure A.6 shows a visual representation of the analysis of the responses to these questions.

#### Transfer of Ownership of Scrap from Seller to Buyer [QC-1]

Approximately half of the responding countries appear to have requirements in place that impose ownership transfer at the receiving site after the load of scrap material has been screened for contamination and, in some cases approved by the relevant regulatory body. The remaining countries indicated generally that the point of transfer of ownership is a function of the contractual arrangements between seller and buyer, varying from when it departs the seller, to when it crosses the final international border, to when it arrives at the buyer’s site. Generally, all countries have a mechanism in place for specifying ownership transfer, but it is far from consistent internationally.

**Figure A.6. Summary Comparison of Responses for Prevention Issues Relating to Responsibilities**  
(all respondents to 2004 and 2006 questionnaires)

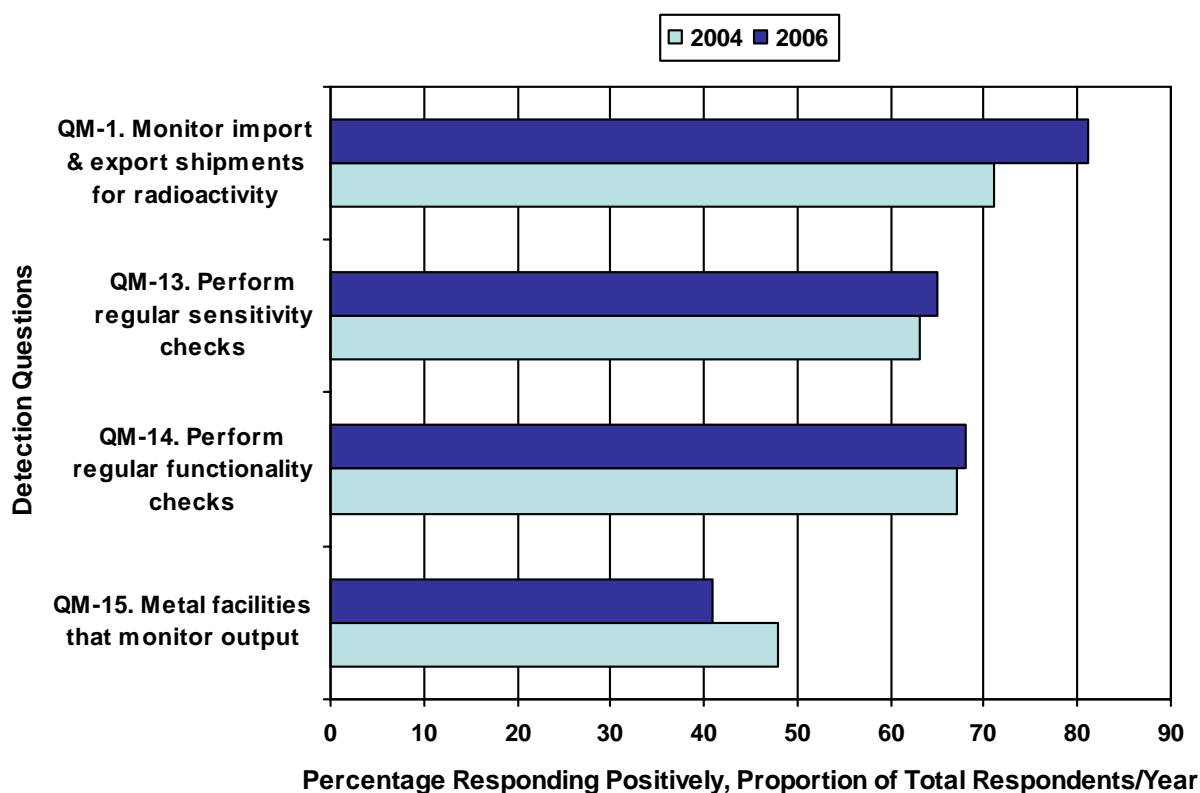


## A.2. Detection

“Detection” focuses on those actions applying the requirements discussed in section A.1, provisions in specific international and domestic regulations, and measures arising from any applicable voluntary protocols. The focus of this major field of action is directed toward detecting the presence of radioactive materials or radioactive sources in the metal waste stream as early in the process as possible, and feeding necessary information and data to the response actions.

A number of questions fall into this area of detection, including QM-1, QM-3 through QM-7, and QM-10 through QM-15. Figure A.7 presents a summary of the positive responses to the four questions of the “yes” / “no” type, comparing the results of the responses in 2004 to those in 2006 for all countries responding in each case. The data show that a large number of countries (60 to 80 per cent) are performing monitoring functions, including sensitivity checks. However, (a) many responses show this monitoring is not comprehensive, and (b) only a relatively small percentage is monitoring the outputs on a regular basis from metal processing facilities. These issues are addressed in greater detail in the following topical subsections.

Figure A.7. Summary Comparison of Responses for Issues Relating to Detection  
(all respondents to 2004 and 2006 questionnaires)



(a) Monitoring of Imported/Exported Scrap [QM-1]

Figure A.7 illustrates that: (a) 71 per cent of the countries responding in 2004 were monitoring imports and exports of scrap metal for radioactivity, and (b) the extent of this monitoring has grown to more than 80 per cent in 2006. However, in the written responses to this question, the comments:

- varied from “usually”, “mostly”, and “partially”; to “in process of being developed”, and “not routinely, only when a vehicle is suspect”;
- indicate that more focus is given by countries to monitoring imports of scrap rather than exports; and
- show that monitoring is occurring at both facilities and at borders.

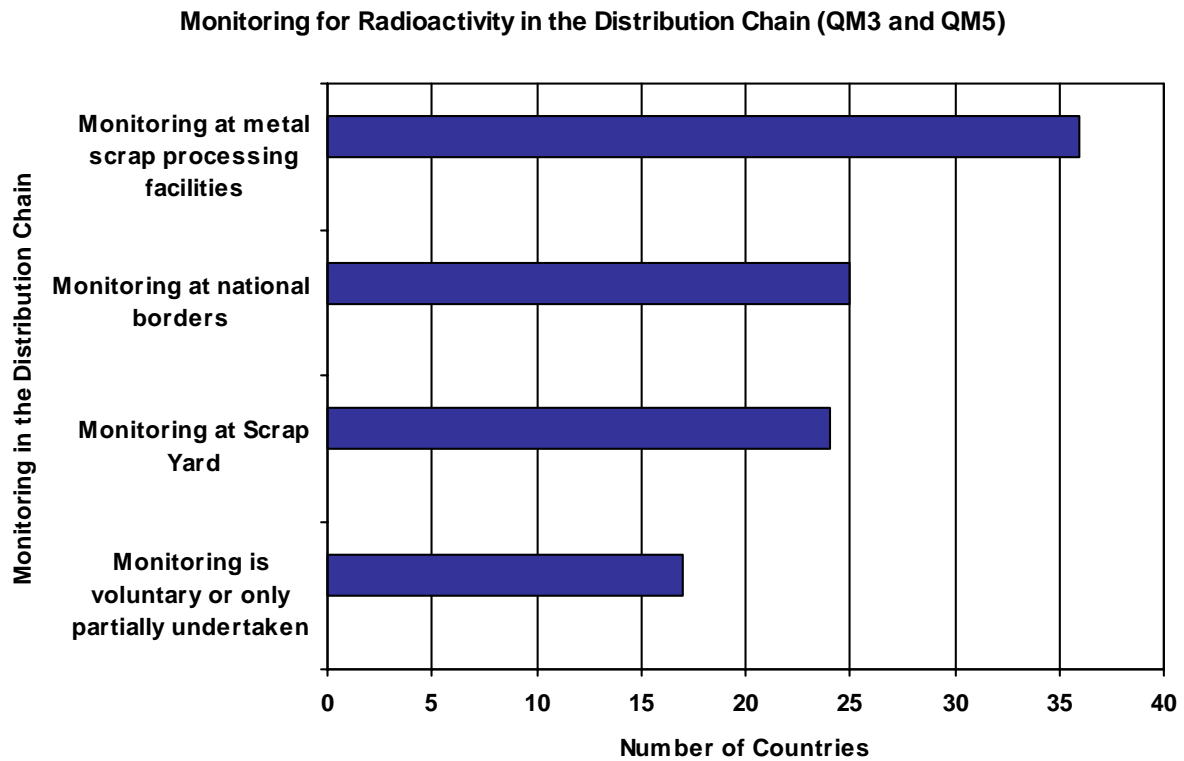
Thus, it appears that there is no consistent method used worldwide, and that few countries have a fully comprehensive monitoring programme.

(b) Location of Monitoring in Distribution Chain [QM-3 and QM-5]

The written responses to the question “At what point in the distribution chain is the scrap metal monitored” are summarized in figure A.8. These data illustrate that the largest number of responses were for monitoring at the scrap processing facilities, which is downstream in the distribution chain. The next largest response was for monitoring at border crossings, which is again downstream in the distribution chain. Only 24 countries indicated that monitoring occurs at the beginning of the distribution chain, i.e. at the scrap yards. In addition, 17 countries responded that the monitoring is voluntary, undertaken at the initiative of the industry. Finally, one country noted that it had been monitoring scrap metal at its borders until it adhered to the European Union, at which time it terminated this activity. Thus, it appears that (a) greater attention needs to be paid to the location of monitoring, (b) consideration should be given to monitoring at the beginning of the distribution chain while still

retaining monitoring further down the chain, and (c) monitoring should be comprehensive and mandatory rather than voluntary.

**Figure A.8. Monitoring for Radioactivity in the Distribution Chain:  
Analysis of Detection Issue  
Responses to QM-3 and QM-5  
(all respondents to 2004 and 2006 questionnaires)**



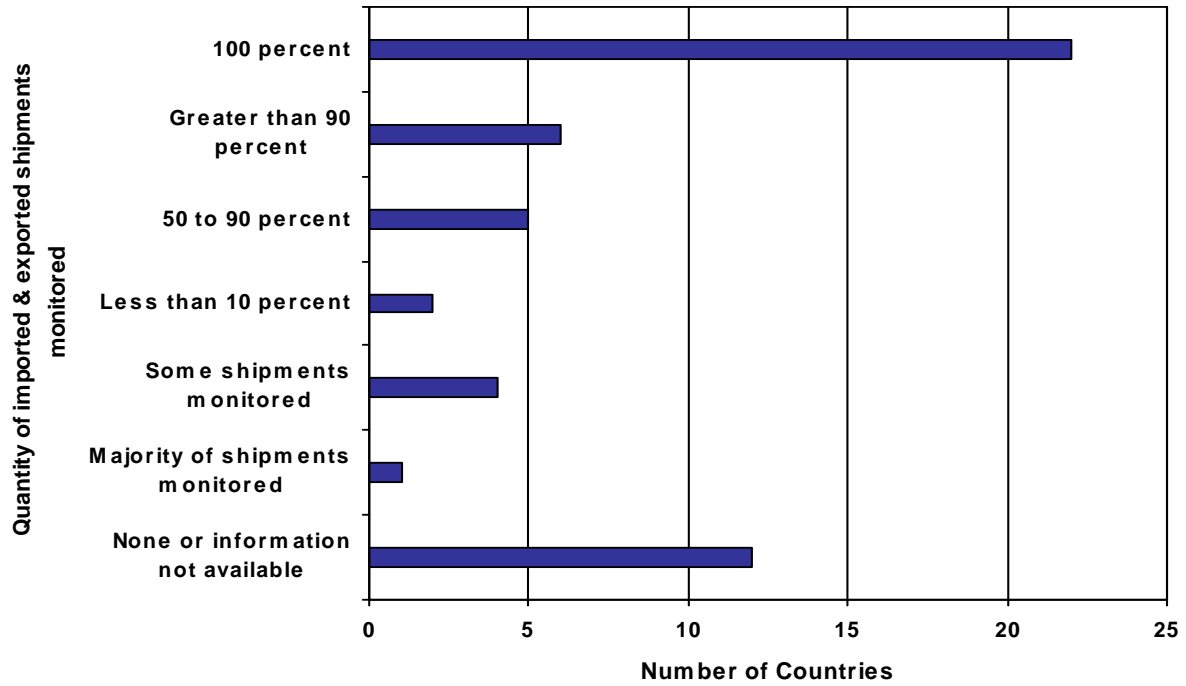
(c) Specification for Detectors [QM-4]

A majority of the respondents (34 countries) noted that their specifications for the detectors were: (a) qualitative in nature, (b) non-standardized and left to the individual monitoring organization or company to define, or (c) not specified in any way. A smaller number of respondents (19 countries) provided quantified specifications, either in terms of the manufacturer and model number of devices used, or in terms of specific capabilities required in terms of sensitivities and types of radiation to be detected.

(d) Quantity of Imported/Exported Material Monitored [QM-6]

Figure A.9 illustrates the responses to the question regarding the percentage of imported and exported materials that are monitored for radiation. These data illustrate that a significant number of countries are working to monitor the import and export shipments of scrap. However, a large number are either monitoring only small portions of such shipments or do not have data available on this aspect of detection.

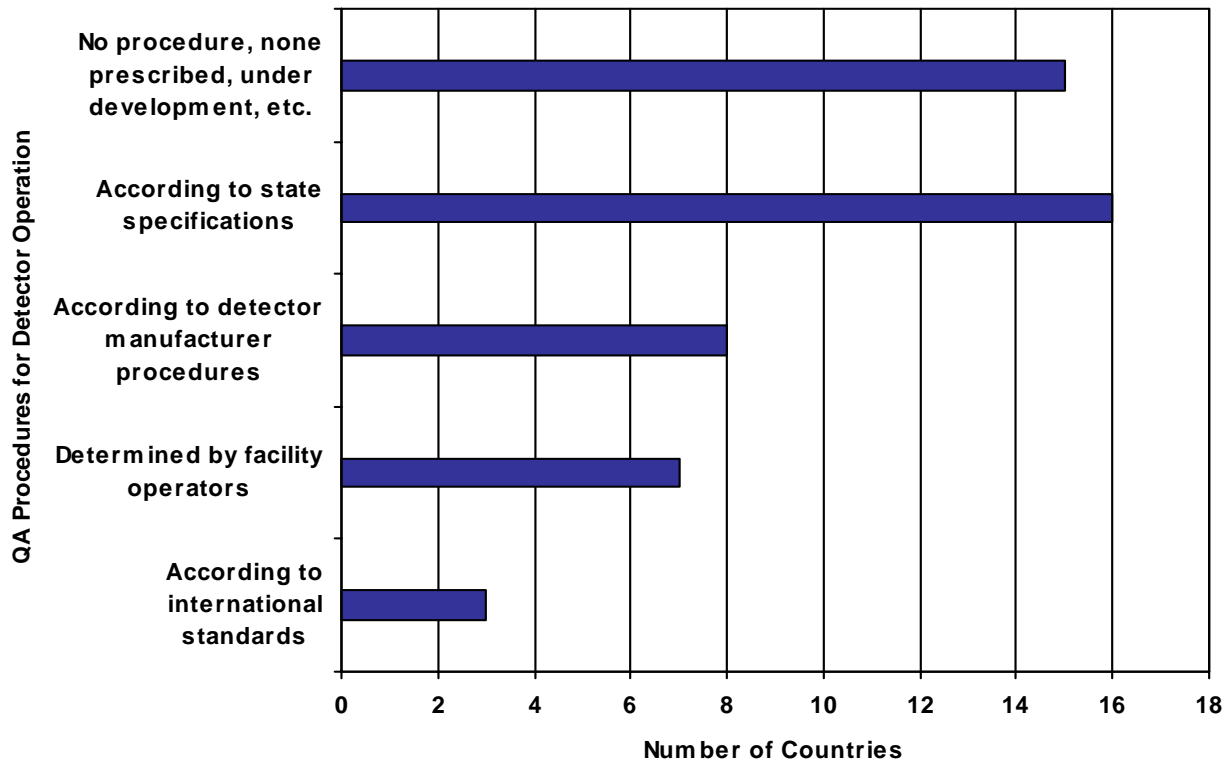
**Figure A.9. Quantity of Imported/Exported Material Monitored:  
Analysis of Detection Issue  
Responses to QM-6  
(all respondents to 2004 and 2006 questionnaires)**



(e) Quality Assurance in the Operation of Detectors [QM-7]

The responses on quality assurance (QA) procedures for the operation of detectors are summarized in figure A.10. These data illustrate that there is no consistent standard for QA applied to the radiation detectors.

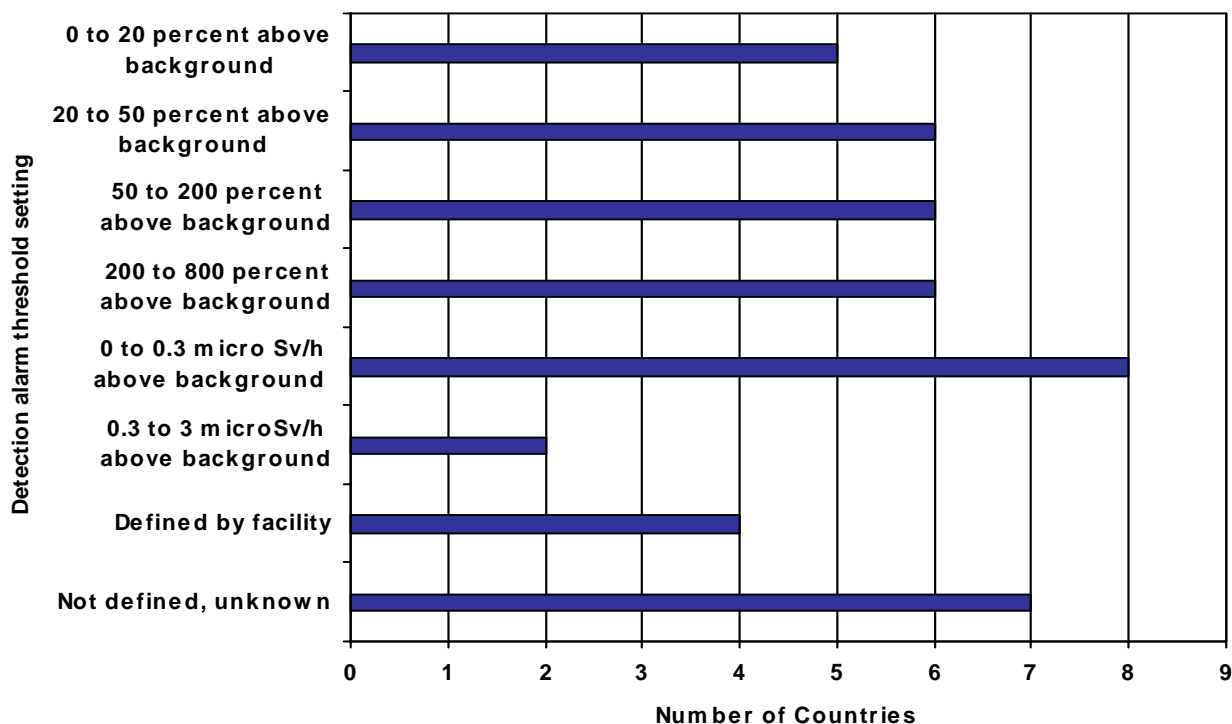
**Figure A.10. Quality Assurance in the Operations of Detectors:  
Analysis of Detection Issue  
Responses to QM-7  
(all respondents to 2004 and 2006 questionnaires)**



(f) Threshold of Detection Alarm Systems [QM-10]

The level at which a detection system activates an alarm to warn of potential radioactive contamination or presence of a radioactive source in shipments of scrap metal or metals processed from scrap is summarized in figure A.11. The data show that 75 per cent of the respondents have specified thresholds; however they vary over a large range. For example, 34 countries specify thresholds in terms of percentage or radiation level above background, with the lowest values being “above background”, “5 per cent above background”, “20 per cent above background”, “the clearance limit”, and 0 to 0.3  $\mu$  Sv/h above background; with the highest values being “800 per cent above background” and “3  $\mu$  Sv/h above background”. The selection of thresholds is delegated to the facilities in 9 per cent of responding countries, and 16 per cent have not specified thresholds or they are unknown to those who prepared the response to the questionnaire. Thus, it would appear that detector calibration methods and frequency is an issue.

**Figure A.11. Threshold of Detection for Alarm Systems:  
Analysis of Detection Issue  
Responses to QM-10  
(all respondents to 2004 and 2006 questionnaires)**



(g) Periodic Calibration of Detection Systems [QM-11, QM-12 and QM-13]

The frequency of calibration for detectors (QM-11) varies significantly from country to country. For 37 countries reporting in this area, it ranged from twice monthly to once every three years, and an additional 9 countries reported that they follow the instructions of the detector supplier. However, in one case it was reported that over a period of 10-years, their detectors had never been calibrated, and for 9 countries either the individual responding did not know or reported that it was not applicable.

The methods used for calibration of detectors (QM-12) was either by qualified radiological services (21 countries) or according to procedures provided by the detector supplier (14 countries). For 12 countries either the individual responding did not know or reported that it was not applicable.

Regular sensitivity checks (QM-13) were reported to be made on detectors by approximately 65 per cent of the reporting countries (see figure A.7). The manner in which these checks were made included (a) using standardized sources and/or according to methods specified by the manufacturer (26 countries); (b) process left to the discretion of the operator (5 countries); and (c) unknown, none or being developed (10 countries). Thus, it would appear that periodic calibration of detectors is an issue.

### **A.3. Response**

“Response” focuses on those actions applying the requirements discussed in section A.1, provisions in specific international and domestic regulations, and measures arising from any applicable voluntary protocols. The focus of this major field of action is directed toward responding to situations when (a) radioactive material or radioactive sources are detected in scrap metal at its source, at border crossings, at other sites while in transit, at arrival, at a metal processing facility or within the facility prior to processing of the scrap; and (b) when radioactivity is detected in processed metal.

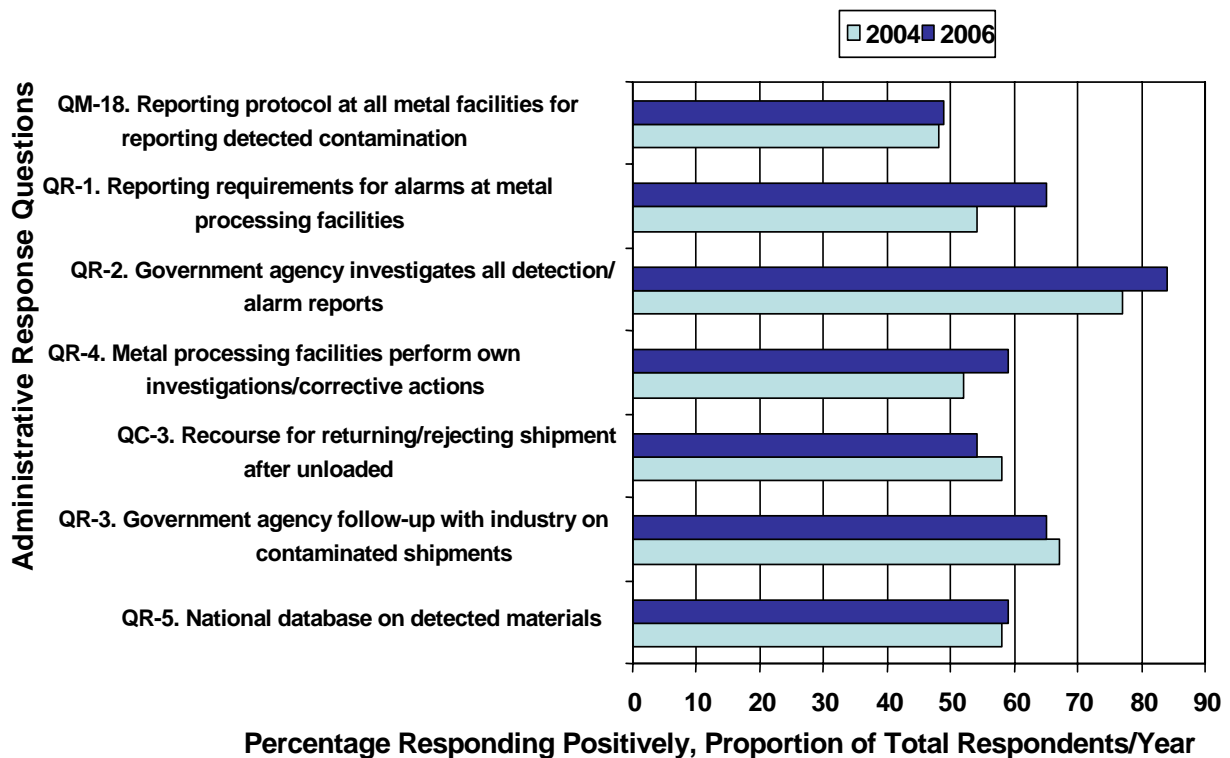
#### **A.3.1. Administrative Procedures and Responsibilities after Detection**

A number of questions fall into the area of administrative procedures after detection including protocols, investigations, implementing corrective actions to avoid similar problems in the future, follow-up actions, and establishing a national database on these issues. These questions include QM-9, QM-18, QR-1 through QR-5, and QC-3, and QD-4.

Figure A.12 presents a summary of the positive responses to the seven questions of the “yes”/“no” type, comparing the results of the responses in 2004 to those in 2006 for all countries responding in each case. The data show that a large number of countries require Government investigation of all detection/alarm reports, and there appears to be a slight increase in the number requiring investigation between the 2004 and 2006 responses. However, only 50 to 70 per cent of the responding countries provided positive response in the areas of:

- (a) establishing protocols for reporting detected contamination,
- (b) having the metal processing facilities perform their own investigations,
- (c) applying procedures for returning or rejecting shipments after they are unloaded,
- (d) providing Government follow-up on contaminated shipments, and
- (e) establishing national databases on detected materials.

Figure A.12. Summary Comparison of Responses for Issues Relating to Administrative Procedures after Detection  
(all respondents to 2004 and 2006 questionnaires)

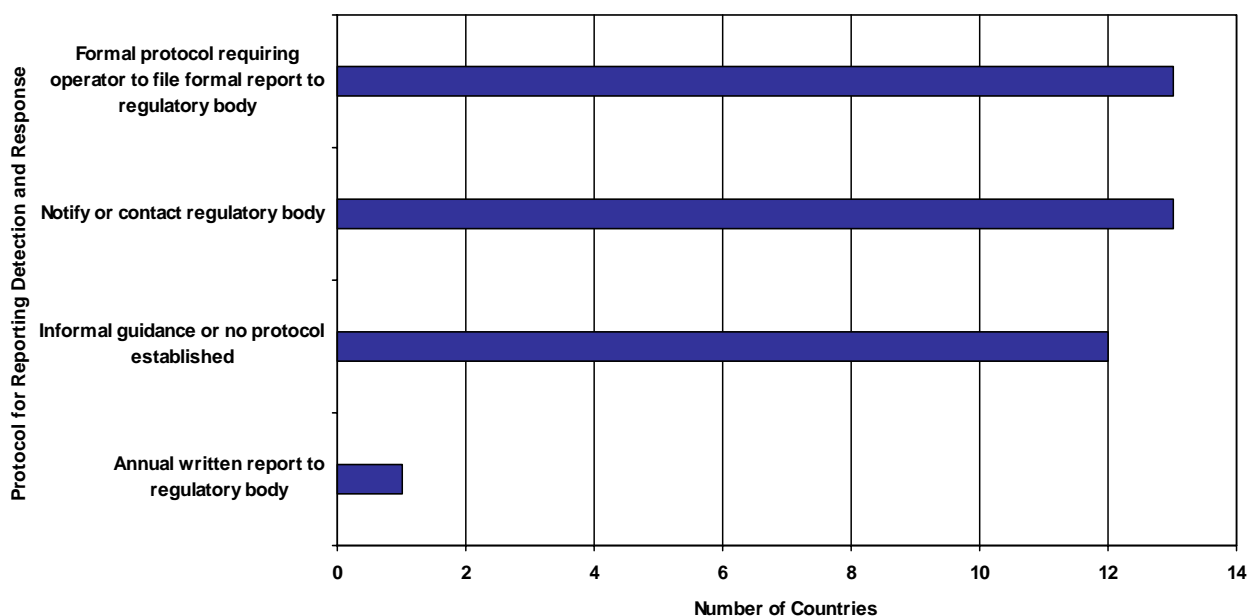


(a) Facility Reporting Protocol for Detection and Action for Radioactivity [QM-18]

Figure A.12 illustrates that only approximately 50 per cent of the responding countries have established protocols for reporting detected contamination. The status of protocols for reporting detections and associated action is summarized in figure A.13. Of those countries, approximately 1/2 have a formal protocol requiring at least some of the following elements: (a) initial reporting of the alarm, (b) cessation of activities, (c) verification of the alarm, (d) remedial actions, and (e) filing a written report to the regulatory body of these events. On the other hand, approximately 1/2 only require notification or contact of the regulatory body.

Figure A.13 also shows that, of those countries without protocols, approximately 1/2 have only informal guidance or no guidance, while the other half indicated “unknown” or “not applicable”.

**Figure A.13. Reporting Protocol at Facilities for Detection and Associated Action:  
Analysis of Protocol Requirement  
Responses to QM-18  
(all respondents to 2004 and 2006 questionnaires)**



(b) Protocol for Response to a Radiation Alarm [QM-9]

Of the responding countries, approximately 80 per cent have a formal protocol defining the process an operator (commercial facility or border crossing Customs’ agent) is to take in response to a radiation alarm. These formal protocols generally call for termination of activities, sequestering the load of scrap, verifying the alarm with separate measurements, and notifying Government officials.

(c) Financial and Physical Responsibility for Disposition of Detected Radioactivity [QD-4]

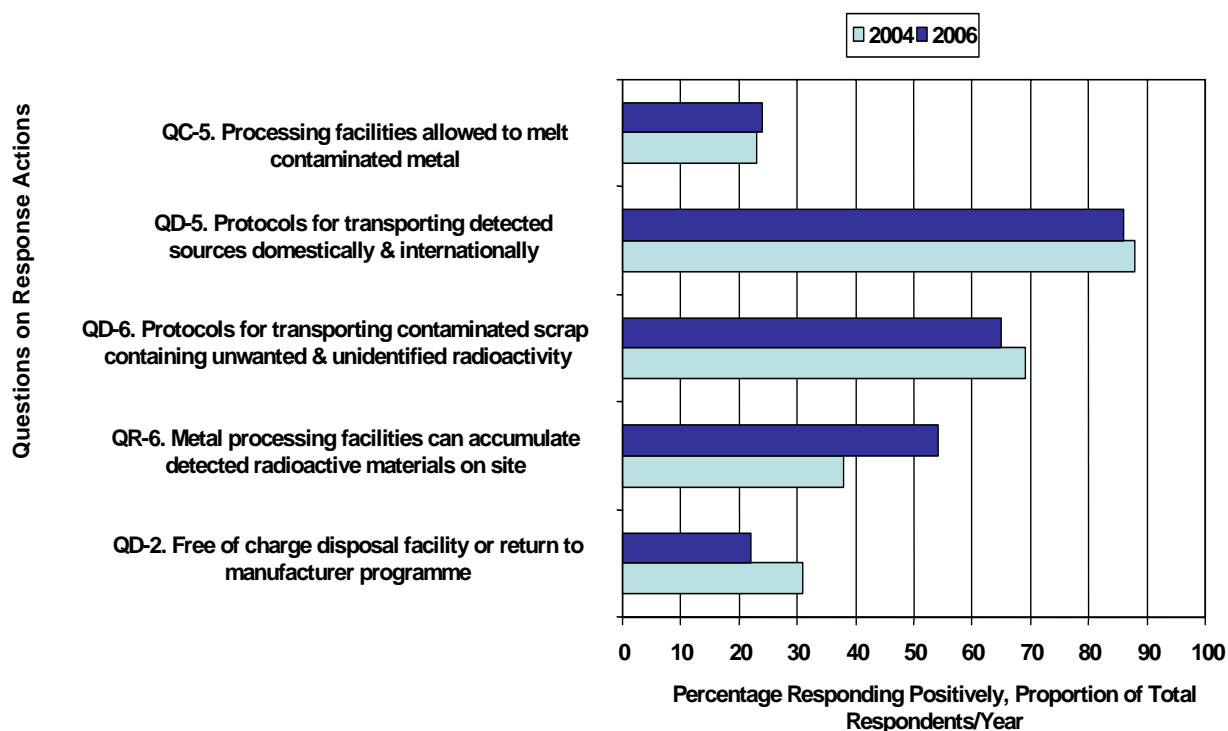
Almost all countries impose financial responsibility for disposition of detected radioactive material on the owner (some countries stated “last owner”). If the discovery of the material is made while in transit, e.g. at a border crossing, then the consignor can usually be readily identified. If the discovery is made at a facility, then many of the countries will impose financial responsibility upon that scrap yard or metal processing facility, and leave it to that facility to recover costs from the original source. In contrast, many of the countries accept the responsibility for the physical disposition of the detected material to ensure timely response and adequate public health and safety. Only three countries noted that the process for assigning financial and physical responsibility was unknown or undefined.

**A.3.2. Responsive Actions after Detection**

A number of questions fall into the area of responsive actions after detection. These include QC-5, QD-1, QD-2, QD-5, QD-6 and QR-6.

Figure A.14 presents a summary of the positive responses to the seven questions of the “yes”/“no” type, comparing the results of the responses in 2004 to those in 2006 for all countries responding in each case.

**Figure A.14. Actions after Detection**  
**Summary Comparison of Responses for Issues Relating to Response**  
**(all respondents to 2004 and 2006 questionnaires)**



(a) Disposition of Detected Source [QD-1]

The majority of the responding countries, 84 per cent, reported that their process for dealing with detected sources is documented in regulations for, or guidance to, facilities. This constitutes a combination of:

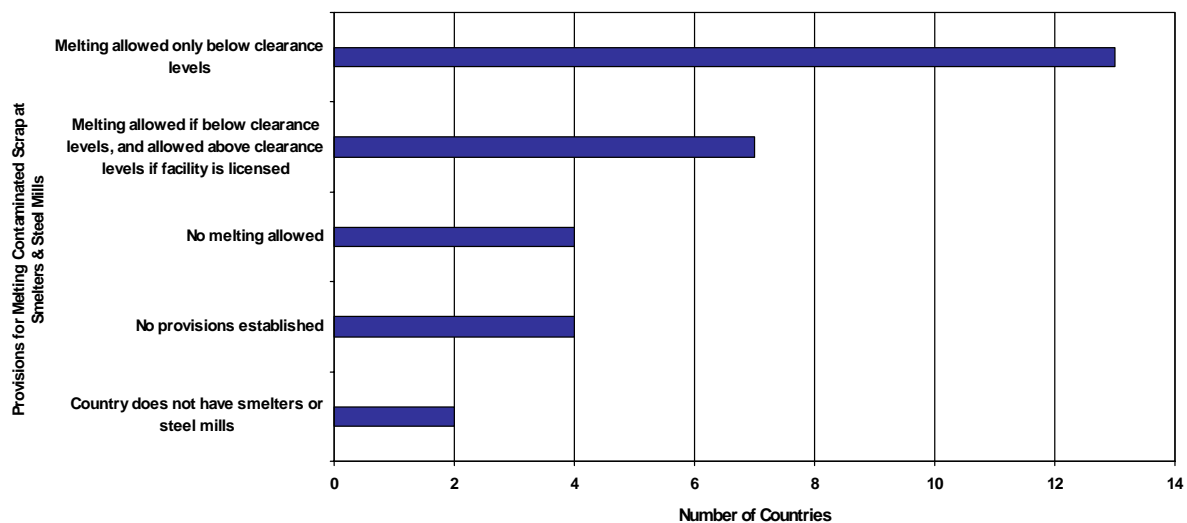
- (a) isolating and securing the identified source;
- (b) temporarily storing the source until ultimate disposition can be arranged and agreed with the regulatory body;
- (c) in some cases and depending upon the activity of the source, returning to the original consignor;
- (d) transporting from the facility according to appropriate transport regulations to the original consignor, a licensed waste storage facility, or licensed disposal facility.

Others reported only that the source would be returned to the original consignor, while some indicated they did not have an existing protocol for disposition.

(b) Melting of Radioactively Contaminated Metal Allowed at Steel Mills and Smelters [QC-5]

Figure A.15 illustrates that 13 responding countries allow melting of radioactively contaminated scrap only if it is below clearance levels; while 7 countries allow melting of contaminated scrap if it is above the clearance level, but the melting facilities must be licensed. A limited number of countries reported that they do not allow any melting while another small group of countries have not established provisions for melting. Two countries responded that they do not have smelters or steel mills.

Figure A.15. Melting of Radioactively Contaminated Metal Allowed at Steel Mills and Smelters  
Analysis of Protocol Requirement Responses to QC-5  
(all respondents to 2004 and 2006 questionnaires)



(c) Protocols for Transporting Contaminated Scrap with Unwanted and Unidentified Radioactivity [QD-6]

As noted in figure A.14, more than 85 per cent of the responding countries impose the IAEA Transport Regulations on the transport of detected radioactive materials (QD5); whereas, less than 70 per cent had knowledge of a regulatory mechanism for transporting contaminated scrap that contains “unwanted and unidentified” radioactive material (QD6). Most countries responding positively to QD6 indicated an understanding of the provisions of the IAEA Transport Regulations as they are applied at the international and domestic levels, which allows for transport of unidentified material through the provision of “Special Arrangements”. Thus, it appears that approximately 30 per cent of the responding countries were not aware of the “Special Arrangement” provision of the international regulations, and/or simply indicated that the method for handling this problem was either unknown or a procedure was under development.

(d) Accumulation of Radioactive Material at Metal Processing Facilities [QR-6]

Figure A.14 illustrates that 40 to 50 per cent of the countries allow metal processing facilities to accumulate detected radioactive material on site. The majority of these allow this accumulation only under special radiation protection controls and/or only when the facility is specifically licensed to do so.

## **Appendix B**

In addition to the inputs obtained from the responding countries on the questionnaires reviewed in detail in Appendix A, some countries provided specific information on their practices which can serve as guides to other countries. These are briefly introduced here.

### **B.1. BELGIUM – DIRECTIVE, TECHNICAL ANNEX AND HISTORICAL DATA**

The “Agence Fédérale de Contrôle Nucléaire” (AFCN) of Belgium issued a technical directive “Directives for the use of a detection portal for radioactive substances in the non-nuclear sector” (9 August 2005). This directive provides instructions to be applied by operators of a detection portal for radioactive substance and, for experts who may need to be called upon to support the application of the detection system. The AFCN has also issued a technical annex to this directive, which is aimed at radioprotection experts, giving indications on the characterization of the radioactive materials, which have been detected. The AFCN notes that these two documents are technical in nature and do not address the issues of responsibility and costs.

The AFCN has some general information on this issue on its webpage<sup>4</sup> (in French) and the directive and the technical annex can also be downloaded from this site (in French and Dutch).

Finally, the AFCN provided data to the UNECE on their recent experience with detections at portals in the waste sector (landfills and incinerators, but excluding radioactive medical wastes), and in the scrap metal recycling industry. The number of detections in Belgium for 2004 and 2005 is shown in Table B-1, and the dose rates at surface contact for these events is shown in Figure B.1, for shipments of scrap in the sector, and Figure B.2, for shipments in the scrap metal recycling sector.

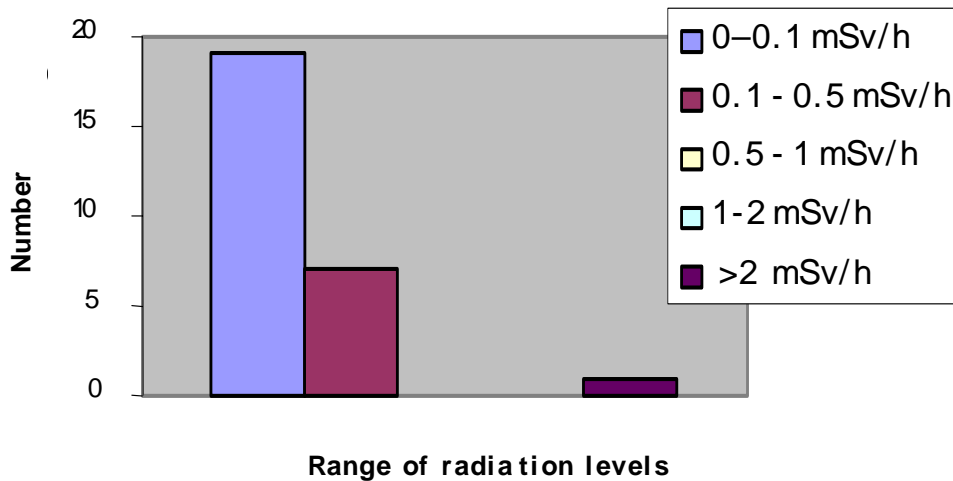
Table B-1. Number of Detections of Radioactive Contaminations in Belgium.

	<b>Waste sector</b>	<b>Scrap metal recycling sector</b>	<b>Total</b>
2004	37	23	60
2005	34	29	63

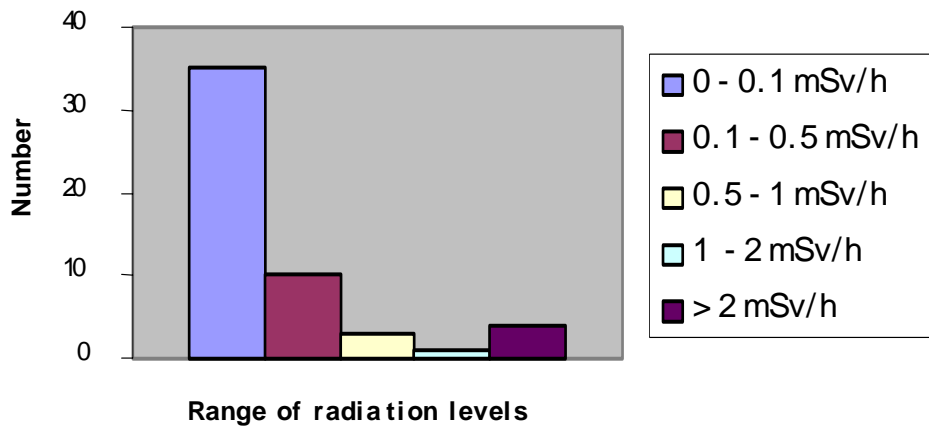
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<sup>4</sup> The Belgian document is available at the following URL:  
[http://www.fanc.fgov.be/fr/portiques\\_detection.htm](http://www.fanc.fgov.be/fr/portiques_detection.htm).

**Figure B.1.** Radiation Levels at Surface Contact for Detections in Belgium in the Waste Sector during 2004 and 2005.



**Figure B.2.** Radiation Levels at Surface Contact for Detections in Belgium in the Scrap Metal Sector during 2004 and 2005.



Data such as these are very useful to a competent authority in a country in determining the extent of the problem arising from contamination in metal scrap (and in waste materials going to land fills and incinerators).

To place these data in perspective, it is beneficial to consider the radiation level limits specified in the IAEA Transport Regulations. Paragraph 533 of the Transport Regulations establishes the radiation levels at any point on the surface of a package or overpack that are used in establishing the category to be used for that package or overpack as follows:

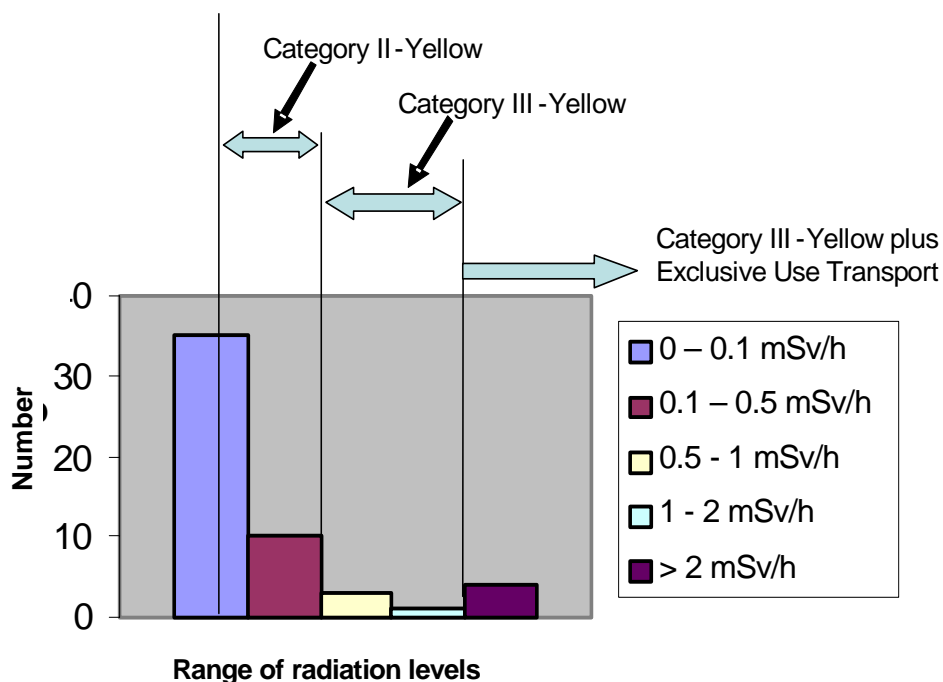
- If the radiation level at the surface is “more than 0.005 mSv/h but not more than 0.5 mSv/h” then the package would be categorized as II-Yellow.
- If the radiation level at the surface is “more than 0.5 mSv/h but not more than 2 mSv/h” then the package would be categorized as III-Yellow (The highest category for radioactive material).
- If the radiation level at the surface is “more than 2 mSv/h but not more than 10 mSv/h” then the package would be categorized as III-Yellow, and the material would have to be transported under exclusive use.

Paragraphs 567 and 573 require that the radiation level at the external surfaces of a transport vehicle (e.g. road trailer or railcar) not exceed 2 mSv/h. These regulatory limits for transport are depicted graphically in figure B.3 for the detections in the scrap metal sector.

If the materials in these detections were all transported in freight containers or closed-sided vehicles from an originating site to the portal where radiation was detected, then the following can be concluded:

- (a) The five shipments of contaminated material that had radiation levels exceeding 2 mSv/h would not have been in compliance with the radiation level limit requirement for transport vehicles, or if in packages smaller than the width of the vehicle, should have been categorized as III-Yellow and transported under exclusive use.
- (b) One shipment in the waste sector had a surface radiation level between 1 and 2 mSv/h; and three shipments had surface radiation levels between 0.5 mSv/h and 1 mSv/h. These four shipments, if made in a freight container serving the function of a package, should have been categorized as III-Yellow.
- (c) The 17 shipments of material with radiation levels between 0.1 mSv/h and 0.5 mSv/h, if made in a freight container serving the function of a package, should have been categorized as II-Yellow.
- (d) An indeterminate number of the 55 shipments with radiation levels below 0.1 mSv/h, if made in a freight container serving the function of a package, should also have been categorized as II-Yellow.

**Figure B.3.** Depiction of the Transport Radiation Level Limits with the Radiation Levels at Surface Contact for Detections in Belgium in the Scrap Metal Sector during 2004 and 2005.



Thus, a significant number of the 81 shipments shown in figures B.1 and B.2, including all of those in items 1 through 3 above, probably were made without being in compliance with the Transport Regulations, incurring the radiation hazards commensurate therewith.

## B.2. CANADA – PORTALS DETECTION STUDY

The Canadian Nuclear Safety Commission undertook a study in 2003 of radiation alarms at waste management facilities. The study included a number of internal appendices as follows: (a) a listing and discussion of the features of some of the commercially available vehicle radiation monitors; (b) an incident reporting form for radiation alarms, (c) an estoppel form; which is a tool that may be used to ship hazardous waste when the complete Transport Regulations cannot be met (somewhat equivalent to a special arrangement as defined in paragraph 310 of the IAEA Transport Regulations); (d) an information bulletin; and (e) an estimation of effective dose from radioisotopes in a waste load.

Since this study was completed, Canada has developed and issued an information bulletin on response to alarms from vehicle radiation monitoring systems (INFO-0746-1), and a similar poster for display in facilities (INFO-0746-1).

## B.3. CZECH REPUBLIC – PROCEDURE ON RADIOACTIVE MATERIAL SEIZURE

The State Office for Nuclear Safety in the Czech Republic developed in 2002 a “Procedure for radioactive material seizure”, which was submitted to the UNECE for consideration at the second meeting of the Group of Experts.

The document is intended to specify the rules for seizures of suspected radioactive materials. It notes that the “*Recommendation is not a legally binding document, however, compliance with the Recommendation will reduce the probability of penalties for persons who own radioactive material (i.e. material, substance or subject) and do not own a licence for management of such radioactive sources. This Recommendation is mainly intended for Customs’ officers, fire fighters, policemen, and persons who handle secondary raw materials and municipal waste. However, the principles of this Recommendation can be applied to all other cases of seizures of radionuclide contaminated materials.*”

The procedure discusses at some length, the following: (a) technical equipment at check points; (b) procedures for the suspected presence of radioactivity, radioactive material seizure at border crossings, radioactive material seizure at metal processing facilities, and for all other reported cases and seizures of radioactive material; (c) specifications of safety precautions during transport; and (d) tracking and disposal of discovered radioactive material.

## B.4. REPUBLIC OF KOREA – MONITORING AT FACILITIES

Korea provided, in their 2006 response to the questionnaire, an example of the portal monitoring equipment used. It demonstrates that the monitor measures radiation levels on both sides and on top of a conveyance at the portal (see figures B.4 and B.5).

Figure B.4. Schematic diagram of the Korean Portal Monitoring System.

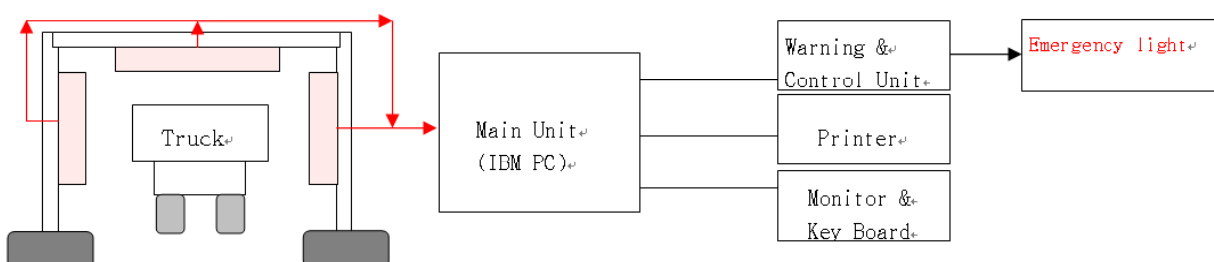


Figure B.5. Photographs of Korean Portal Monitoring System.



#### **B.5. LITHUANIA – ACTIONS FOR THE CONTROL OF RADIOACTIVITY IN SCRAP METAL**

Responsible Government agencies in Lithuania have issued various decrees with a view to providing control over radioactivity in scrap metal. These decrees include:

- (a) Order of the Minister of Health, Regulations for the Control of High-Activity Sealed Radioactive Sources and Orphan Sources,
- (b) Order of the Minister of Economy On the Change of Order of Procurement, Accounting and Storage of the Base Metal Scrap and Waste,
- (c) Order of the Director of Radiation Protection Centre on Procedures to Control Radioactive Contamination of Metal Scrap, Waste and Metal Products in Scrap Yards and Reprocessing Plants Waste,
- (d) Lithuanian Norm LAND 34-2000 on Clearance Levels of Radionuclides. Conditions for Reuse of Materials and Disposal of Waste, and
- (e) Governmental Resolution: Regulations on Handling of Illegal Sources of Ionizing Radiation and Contaminated Facilities.

Actions by Government agencies, such as these, assist greatly in regulating and controlling the inadvertent contamination of scrap metal.

#### **B.6. SOUTH AFRICA – RECOMMENDATIONS FOR MANAGEMENT OF CONTAMINATED SCRAP**

South Africa provided, in their 2006 response to the questionnaire, a newly developed set of draft recommendations prepared by a steering committee on methods for management of contaminated scrap. The recommendations were prompted by various problems arising in their country, including:

- most mines were not complying with the requirements of their nuclear authorizations in terms of the control over scrap;
- some scrap dealers encourage scavenging and theft of scrap metal from mines by accepting almost anything that is presented to them for purchase;

- frequent changes in mine ownership and new managements that are not always aware of the requirements of the nuclear authorization;
- people being prepared to resort to scavenging and stealing scrap and to sell these to scrap dealers, since it is their only source of income;
- an undefined quantity of contaminated scrap was already in the public domain by 1993, and still remains in the public domain;
- not all mines and industries generating contaminated scrap have been identified as yet; and
- contaminated scrap are being transported into our country, either to be processed here or to be exported again through the South African harbours, without being monitored at any point of the chain.

The draft recommendations include definition of scope and objectives, specification of current regulatory controls, a process flow diagram, an enumeration of main areas of concern, and recommendations and a plan of action. The plan of action is delineated in two areas: (a) the mining industry, and (b) the scrap industry.

### **B.7. SWITZERLAND – EXPERIENCE WITH CONTROLLING CONTAMINATED SCRAP METAL SHIPMENTS AT BORDERS**

The Schweizerische Unfallversicherungsanstalt (SUVA) of Switzerland submitted a document “Radioactive Materials in Scrap Metal, the Situation in Switzerland” to the UNECE for consideration at the second meeting of the Group of Experts. The document provides information on the steps that have been taken to reduce the number of detections at its border with Italy. A programme was instituted that focused on training, measuring equipment, intervention and waste management. As a result of this added effort, the number of incidents at the borders declined significantly over a short period of time as shown in the table below.

Table B-2. History of Detections at Swiss/Italian Border, Benefits of Enhanced Border Detection Programme.

Year	Number of Detections
From July 1993	12
1994	17
1995	4
To April 1996	4

### **B.8. TURKEY – INSTRUCTION MANUALS FOR RADIATION DETECTION AND NOTIFICATION OF DETECTION**

Turkey provided an Instruction Manual of Radiation Detection System at the Border Gates, and a Nuclear and Radioactive Material Notification Form for use at border crossings when Customs officers discover radioactivity in a shipment crossing their border.

### **B.9. UNITED KINGDOM – CODE OF PRACTICE ON CLEARANCE AND EXEMPTION PRINCIPLES**

Various bodies in the United Kingdom have collaborated in issuing a Code of Practice on “*Clearance and Exemption Principles, Processes and Practices for Use by the Nuclear Industry*”. The Executive Summary of this Code states that “*This Code of Practice has been produced to identify and facilitate consistent application of good practice within the nuclear industry regarding the clearance (including sentencing) of articles, substances and wastes which may be clean, or radioactive at levels below the thresholds of regulatory control.*”

## **B.10. UNITED STATES OF AMERICA – TRAINING PROGRAMME, PILOT STUDY AND WEBSITE**

In the United States, it is generally not known if the contaminated scrap metal is coming from domestic or imported sources. The United States Environmental Protection Agency (EPA) is conducting work with a view to identifying the sources and to reducing the number of radioactive sources that find their way into the scrap metal supply.

In partnership with the scrap metal demolition industry, EPA has produced a CD ROM-based training programme entitled “*Identifying Radioactive Sources at the Demolition Site*”. This programme is being incorporated into the health and safety programmes of the metal processing industry with the goal of making demolition workers aware of the types and locations of radioactive gauges and devices at industrial facilities, which will hopefully decrease the number of these devices that are put into outgoing scrap metal.

EPA is also conducting a pilot study to determine the feasibility of monitoring imported scrap metal for radiation. Over 2.3 million tonnes of metal have been monitored at two U.S. ports during off-loading operations using grapple mounted radiation detection systems. By monitoring each small, discrete volume of scrap metal as it is taken off the ship, any radioactive material can be identified before it is transported to the metal processing facility.

Finally, EPA prepared a poster on the results of the 2004 Meeting of the Group of Experts<sup>5</sup>.

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<sup>5</sup> The poster can be obtained, in English, from the following URL:  
[http://www.epa.gov/ORD/scienceforum/2005/pdfs/oeiposter/Kopsick\\_OEI4.pdf](http://www.epa.gov/ORD/scienceforum/2005/pdfs/oeiposter/Kopsick_OEI4.pdf)

## QUESTIONNAIRE

Monitoring Radioactive Scrap Metal Questionnaire			
<i>Name:</i> <i>Ministry (Office /Organization):</i> <i>Mailing Address:</i> <i>E-mail:</i> <i>Phone:</i> <span style="float: right;"><i>Fax:</i></span>			
<b>Regulatory Infrastructure:</b>		Yes	No
<b>QRI 1</b>	Does your country/organization have a regulatory mechanism to prevent loss of discrete radioactive sources and/or radioactive materials?		
<b>QRI 2</b>	If so, does this regulation include NORM and TENORM? ( <i>NORM = Naturally Occurring Radioactive Material</i> ) ( <i>TENORM = Technologically-Enhanced Naturally Occurring Radioactive Material</i> )		
<b>QRI 3</b>	Has your country/organization adopted the IAEA Code of Conduct for the Safety and Security of Radioactive Sources?		
<b>QRI 4</b>	Is there active enforcement of the regulations? What agency is responsible for the enforcement?		
<b>QRI 5</b>	Are there penalties for exceeding the regulatory limits? What are the penalties?		
<b>QRI 6</b>	Are there any levels below which material is exempted from regulatory control? If so, what are these levels?		
<b>QRI 7</b>	Are materials from nuclear facilities, with very low levels of radioactivity, released in accordance with a national regulation? Is the release conditional or unconditional?		
<b>Monitoring</b>			
<b>QM1</b>	Are imported and exported shipments monitored for radioactive materials?		
<b>QM2</b>	Is there a regulatory requirement regarding monitoring imported and/or exported scrap metals for radioactivity? If so, please explain.		
<b>QM3</b>	At what point in the distribution chain is the scrap metal monitored?		
<b>QM4</b>	What are the specifications of the radiation detectors used?		
<b>QM5</b>	Where are the detectors physically located in relation to the scrap metal?		
<b>QM6</b>	What percentage of imported and exported material is monitored?		
<b>QM7</b>	Explain QA (quality assurance) procedures for the operation of the radiation detectors.		
<b>QM8</b>	Are employees trained in monitoring and response techniques? What topics are covered in the employee training?		
<b>QM9</b>	What is the protocol (including organizational structure and coordination) for response to a radiation alarm?		
<b>QM10</b>	What is the detection alarm threshold setting?		
<b>QM11</b>	How often is the detection system calibrated?		

	<b><i>Monitoring (cont'd)</i></b>	Yes	No
<b>QM12</b>	How is it calibrated?		
<b>QM13</b>	Are regular sensitivity checks performed? If so, how?		
<b>QM14</b>	Are regular functionality checks performed? If so, how?		
<b>QM15</b>	Do metal melting facilities (smelters) monitor output? If so, at what location and how?		
<b>QM16</b>	Are personnel in metal processing facilities (scrap yards, smelters, etc.) trained in visual inspection and response?		
<b>QM17</b>	Are there guidelines for identifying and characterizing sources at metal processing facilities?		
<b>QM18</b>	Is there a reporting protocol at all metal processing facilities for detection of radioactive materials and associated action? What is it?		
	<b><i>Dispositioning</i></b>		
<b>QD1</b>	How is the detected source dispositioned (removed, eliminated, transported to a waste repository)?		
<b>QD2</b>	Is there a free of charge disposal facility or a return to manufacturer programme?		
<b>QD3</b>	Does your Ministry/office/organization support the “Polluter Pays” principle?		
<b>QD4</b>	Who is responsible, financially and physically, for disposition of detected radioactive materials?		
<b>QD5</b>	Are there protocols (regulations, procedures, instructions, orders) for transporting detected radioactive materials, both internally and across national borders?		
<b>QD6</b>	Are there protocols (regulations, procedures, instructions, orders) for transporting contaminated scrap metal that contain unwanted and unidentified radioactive materials. If so, what is the protocol?		
	<b><i>Contractual</i></b>		
<b>QC1</b>	At what point does ownership transfer from the seller to the buyer?		
<b>QC2</b>	When scrap metal is purchased, does the contract state it be radioactive-free?		
<b>QC3</b>	If radioactive material is found in a shipment after it is unloaded, is there recourse for returning/rejecting the shipment?		
<b>QC4</b>	If cleared scrap metal is sold, is the origin of the scrap clearly stated to the buyer?		
<b>QC5</b>	Are steel mills and/or smelters allowed to melt radiologically contaminated metal? If so, at what level of radiation and how is it monitored?		

	<b><i>Reporting</i></b>	Yes	No
<b>QR1</b>	Are there reporting requirements for alarms at metal processing facilities? If so, explain.		
<b>QR2</b>	Does your Ministry (office/organization) investigate all reports on detected radioactive materials/alarms?		
<b>QR3</b>	Does your agency (Ministry/office/organization) follow-up with the receiver/originator of rejected shipments containing radiologically contaminated scrap metal?		
<b>QR4</b>	Are metal processing facilities allowed to perform their own investigations and corrective actions on found radioactive materials? If so, what level of training is required for these site workers?		
<b>QR5</b>	Is there a national database on detected radioactive materials? Who is the information available to?		
<b>QR6</b>	Are metal processing facilities allowed to accumulate detected radioactive materials on-site? If so, what are the restrictions?		
	<b><i>Experience</i></b>		
	If you have ongoing scrap metal monitoring programmes, are there any lessons learned to share with other countries? Please describe.		