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Group of Experts on Monitoring of Radioactively Contaminated Scrap Metal

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Item 4 of the provisional agenda

OVERVIEW OF KEY AREAS

Note by the secretariat

Addendum

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CONTENTS (CONT'D)

APPENDIX A

RESULTS OF ANALYSIS OF RESPONSES TO THE QUESTIONNAIRES

1. The analysis of the questionnaires is presented 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.

2. 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 the 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.

3. 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

4. "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

5. 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.

6. 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 (refer to ECE/TRANS/AC.10/2006/4). For the two questionnaires, 32 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 32 countries that responded to both questionnaires.

7. Henceforth in the remaining portions of this report, the data from the 32 countries responding to both questionnaires will only be referred to where the conclusions are measurably different for the two cases.

8. 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 or 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)

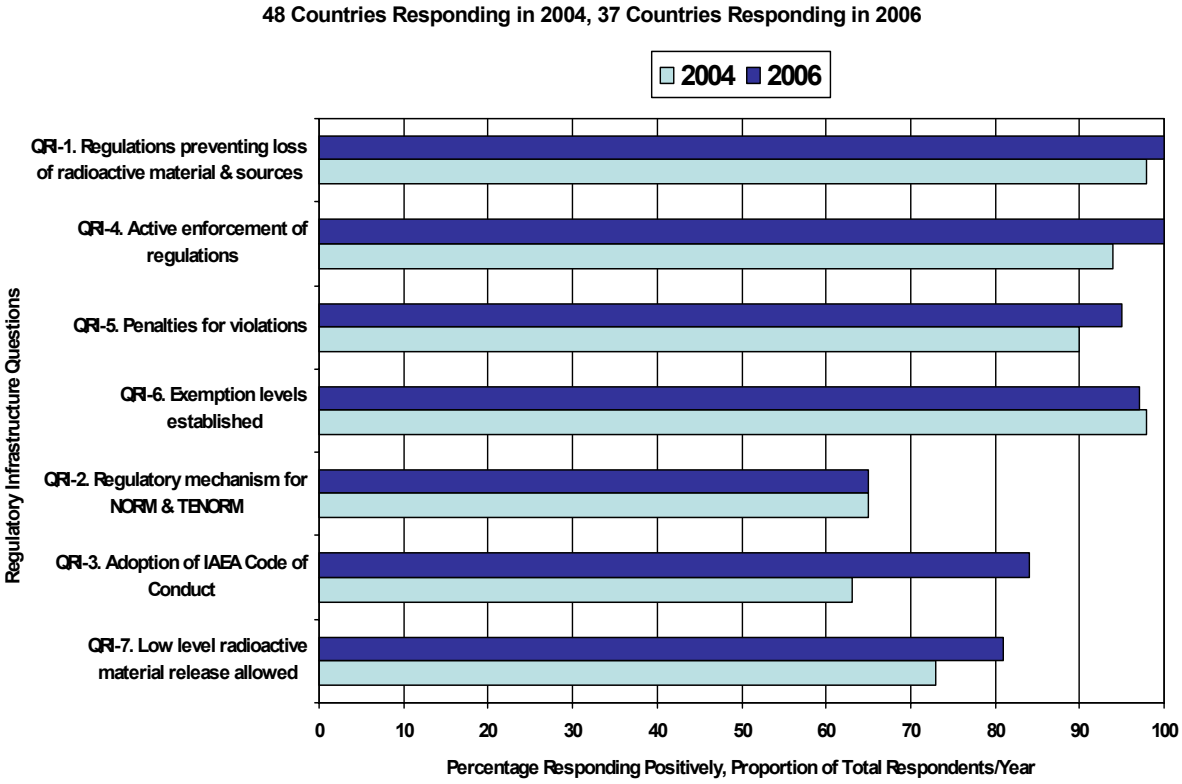
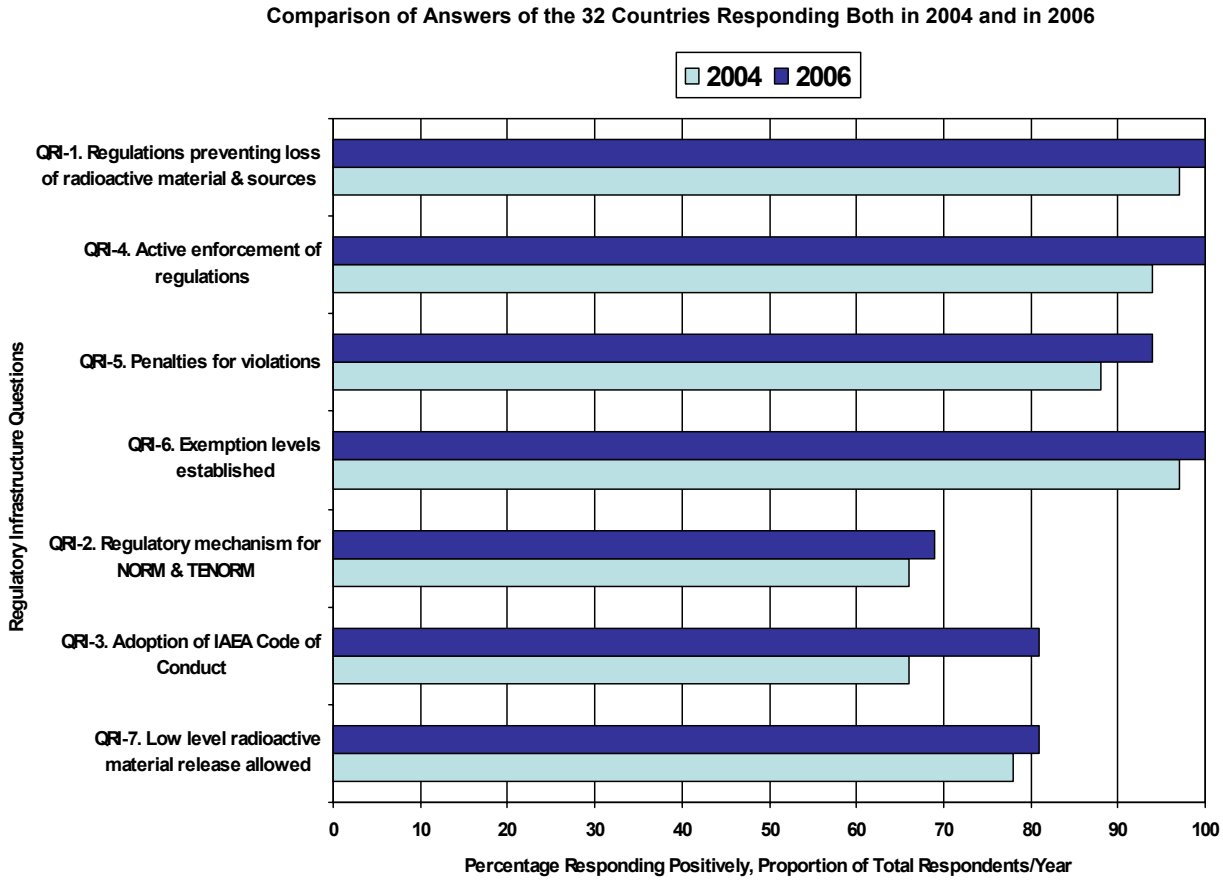


Figure A.2. Summary Comparison of Positive Responses for Regulatory Infrastructure (32 countries that responded to both 2004 and 2006 questionnaires)

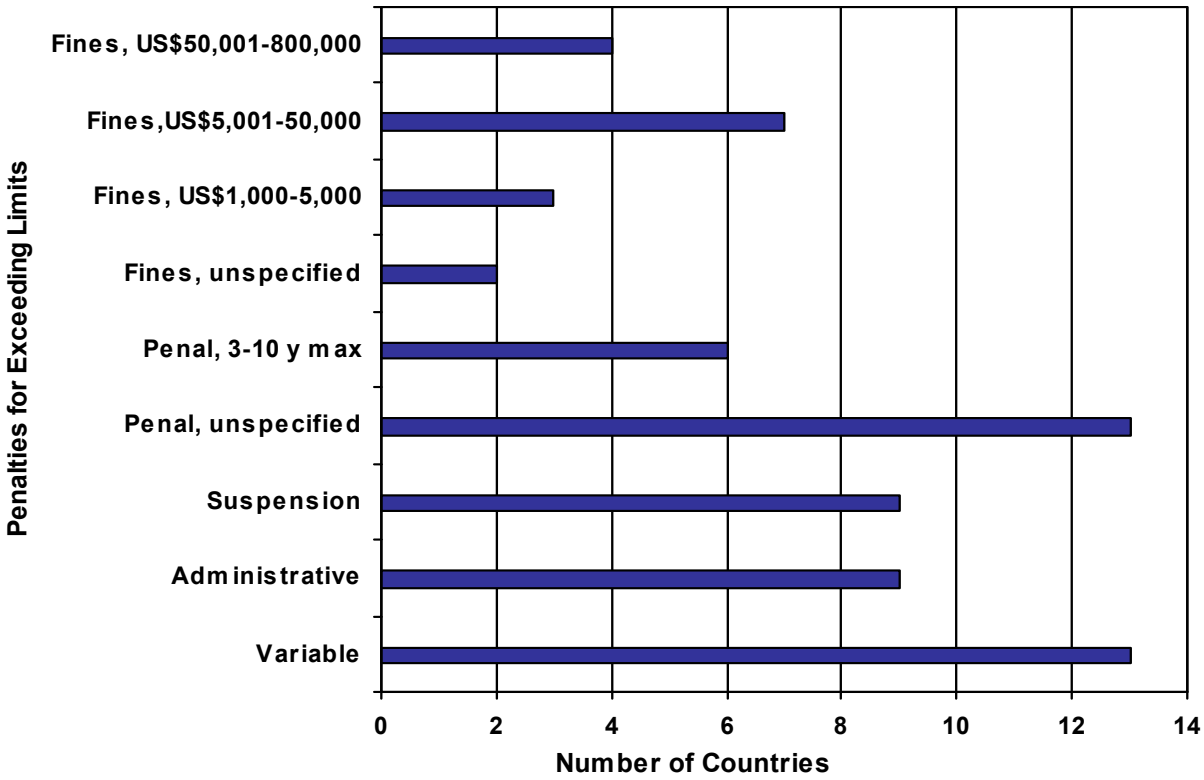


9. The following section further addresses three of the issues highlighted in figures A.1 and A.2, those of: (a) countries imposing penalties for an operator exceeding the regulatory limits and, for those countries that do impose a penalty, the type of penalty (QRI-5); (b) whether countries have established 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]

10. 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 licenses; (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]

11. 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 µSv/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]

12. 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)

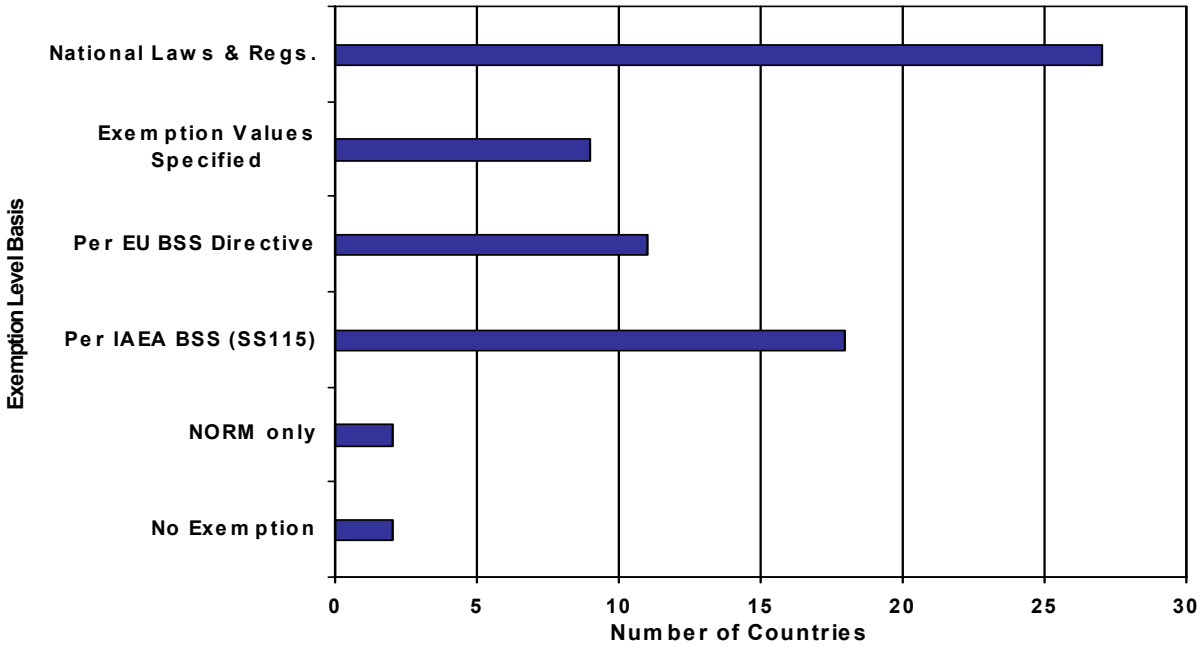
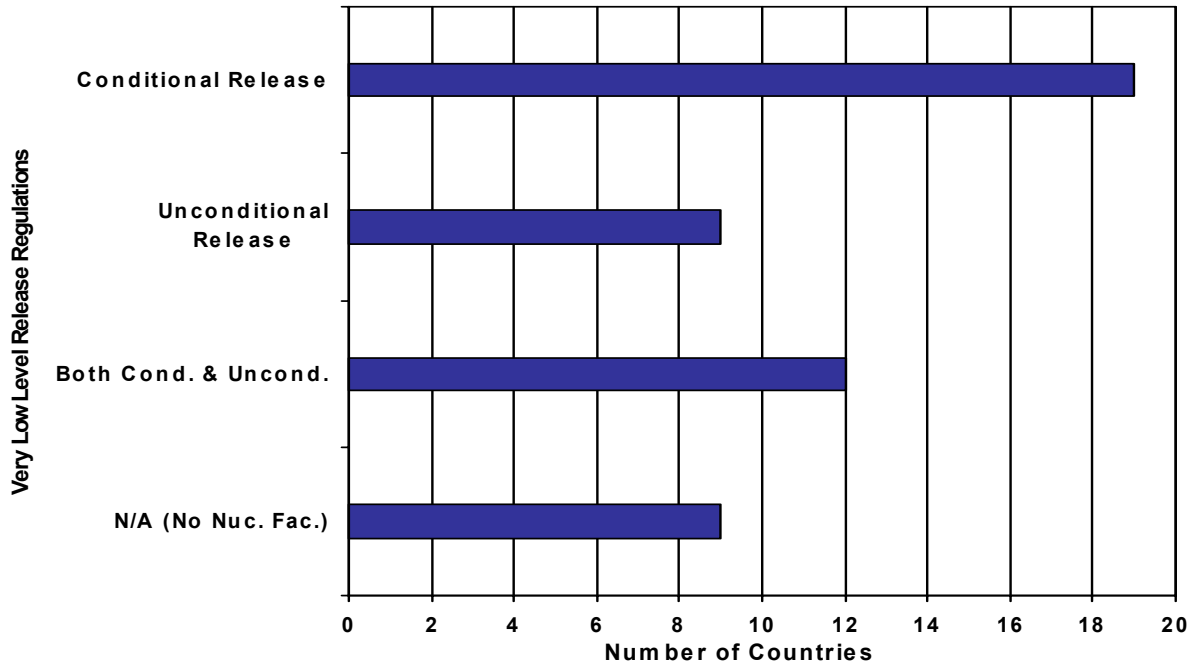


Figure A.5. Release of Material with Very Low Levels of Radioactivity
Analysis of Responses to QRI-7
(using all data provided in the 2004 and 2006 questionnaires)



13. 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?*"

14. 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.

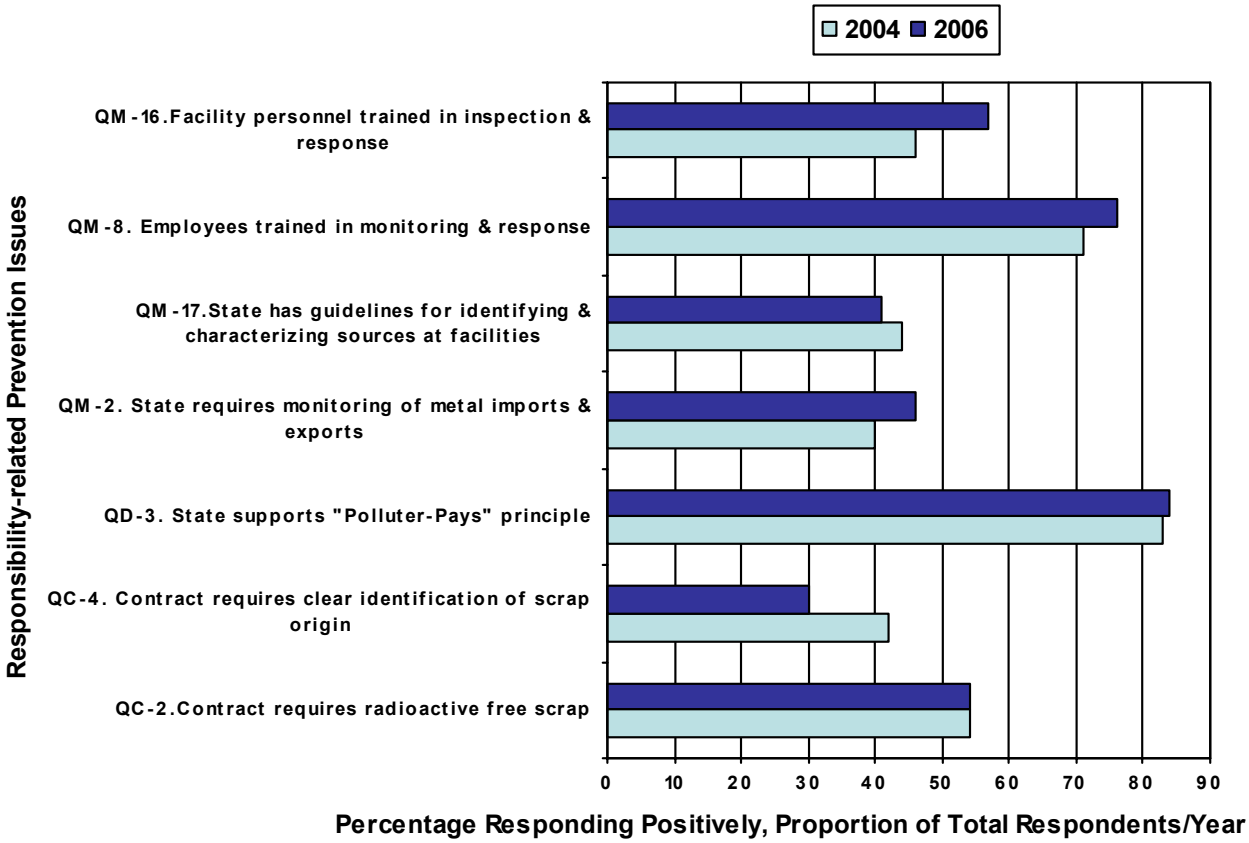
A.1.2. Responsibilities

15. Prevention of radioactive contamination 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.

(a) Transfer of ownership of scrap from seller to buyer [QC-1]

16. 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 from the seller, to when it crosses the final international border, or 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)

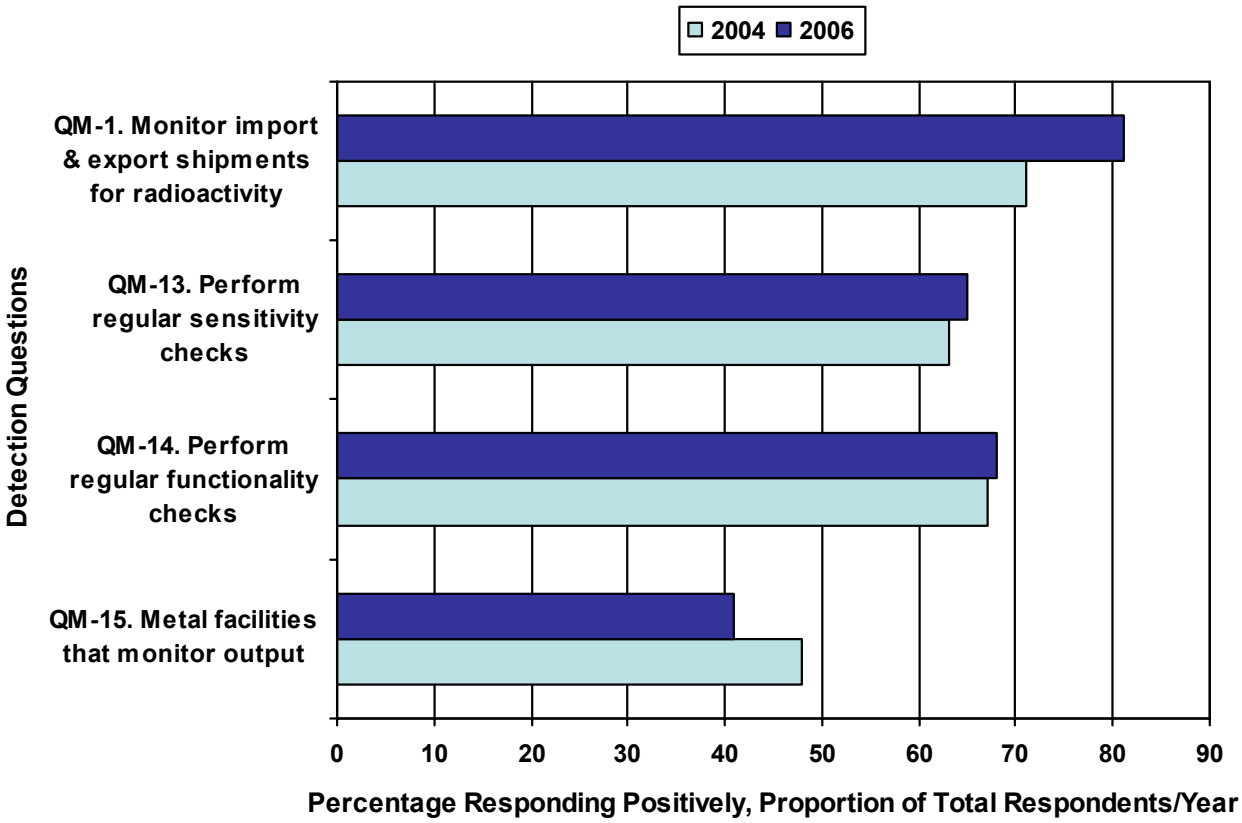


A.2. DETECTION

17. "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.

18. 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]

19. 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.

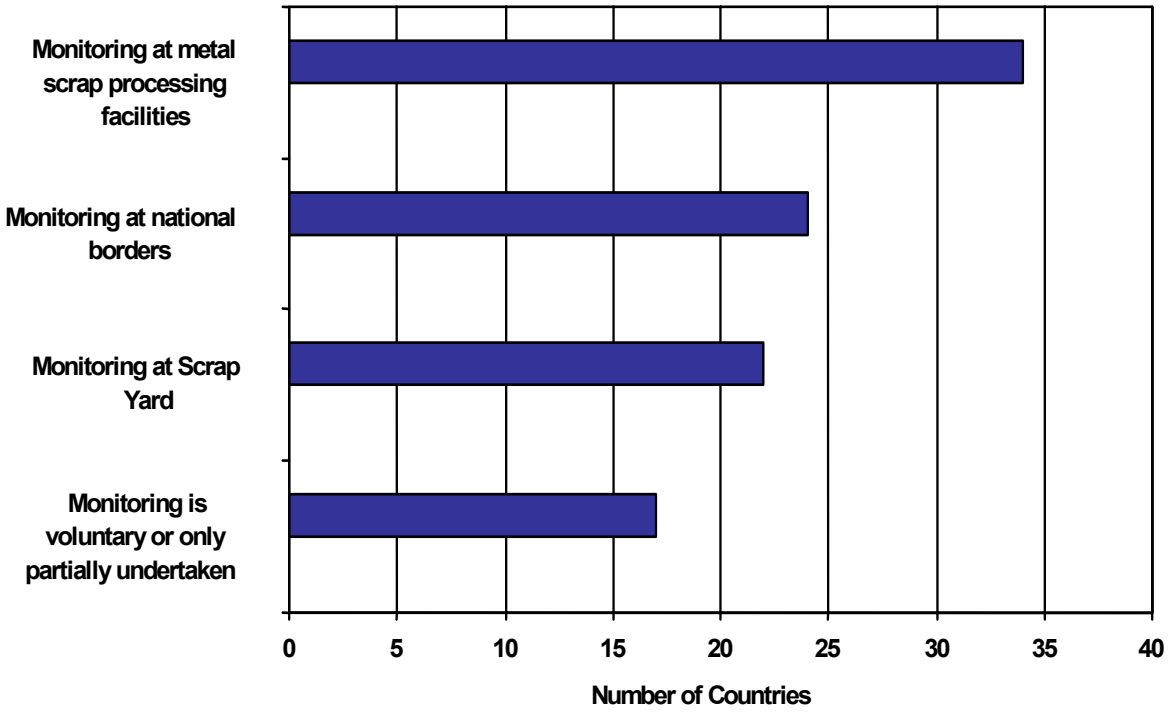
Thus, it appears that there is no consistent method used worldwide, and that few countries have a fully comprehensive monitoring programme.

(b) Location of monitoring in distribution chain [QM-3 and QM-5]

20. 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 22 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)



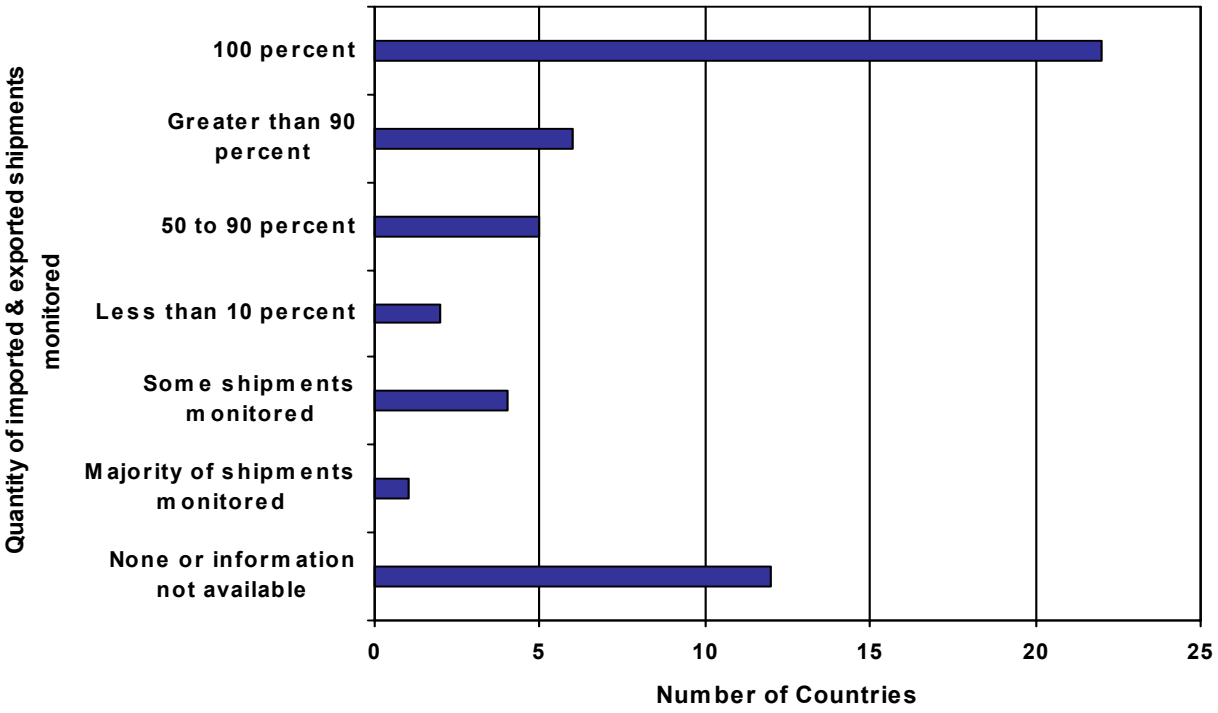
(c) Specification for detectors [QM-4]

21. A majority of the respondents (33 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 (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.

(d) Quantity of imported/exported material monitored [QM-6]

22. 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.

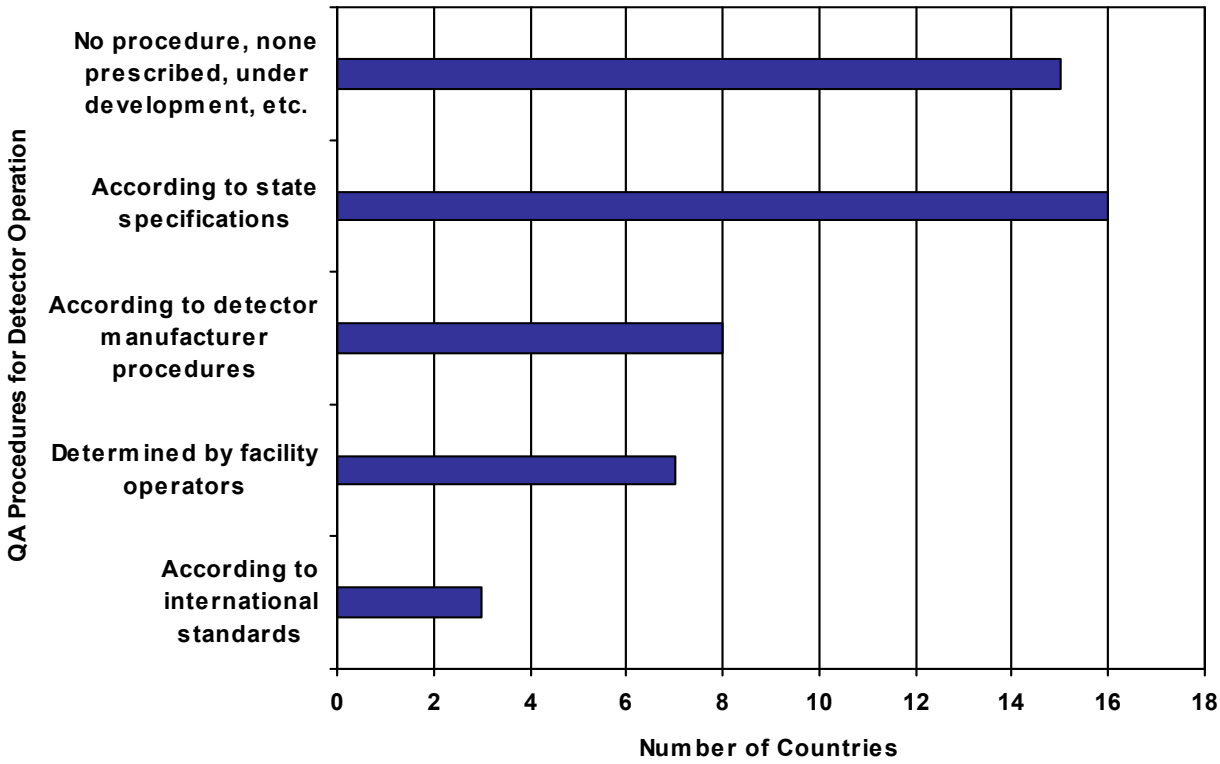
Figure A.9. Quantity of Imported/Exported Material Monitored:
Analysis of Detection Issue
Responses to QM-6
(all respondents to 2004 and 2006 questionnaires)



(e) Quality assurance in the operation of detectors [QM-7]

23. 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.

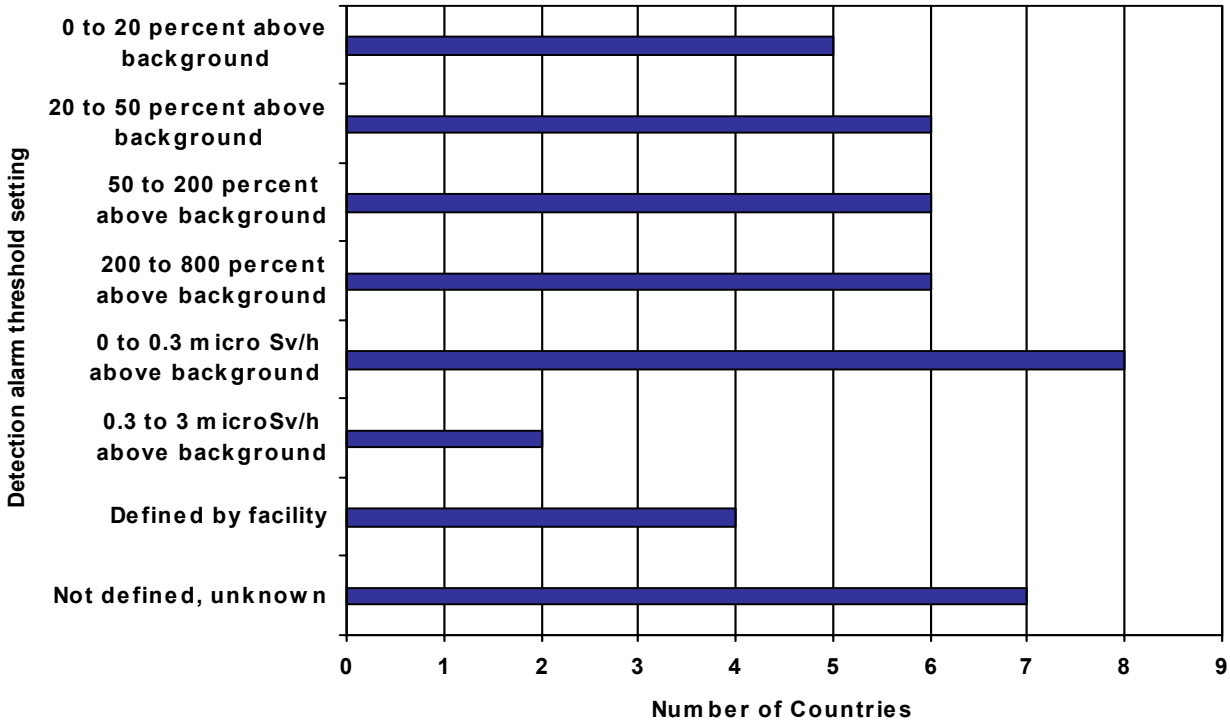
Figure A.10. Quality Assurance in the Operation of Detectors:
Analysis of Detection Issue
Responses to QM-7
(all respondents to 2004 and 2006 questionnaires)



(f) Threshold of detection alarm systems [QM-10]

24. 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, 33 countries specify thresholds in terms of percentage or radiation level above background, with the lowest values being "above background", "5 per cent above background" and 0 to 0.3 μ Sv/h above background; with the highest values being "800 per cent above background" and 3 μ 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]

25. The frequency of calibration for detectors (QM-11) varies significantly from country to country. For 32 countries reporting in this area, it ranged from twice monthly to once every three years, and an additional 8 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.

26. The methods used for calibration of detectors (QM-12) was either by qualified radiological services (20 countries) or according to procedures provided by the detector supplier (12 countries). For 12 countries either the individual responding did not know or reported that it was not applicable.

27. Regular sensitivity checks (QM-13) were reported to be made on detectors by 81 per cent of the reporting countries. The manner in which these checks were made included (a) using standardized sources and/or according to methods specified by the manufacturer (24 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

28. "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.

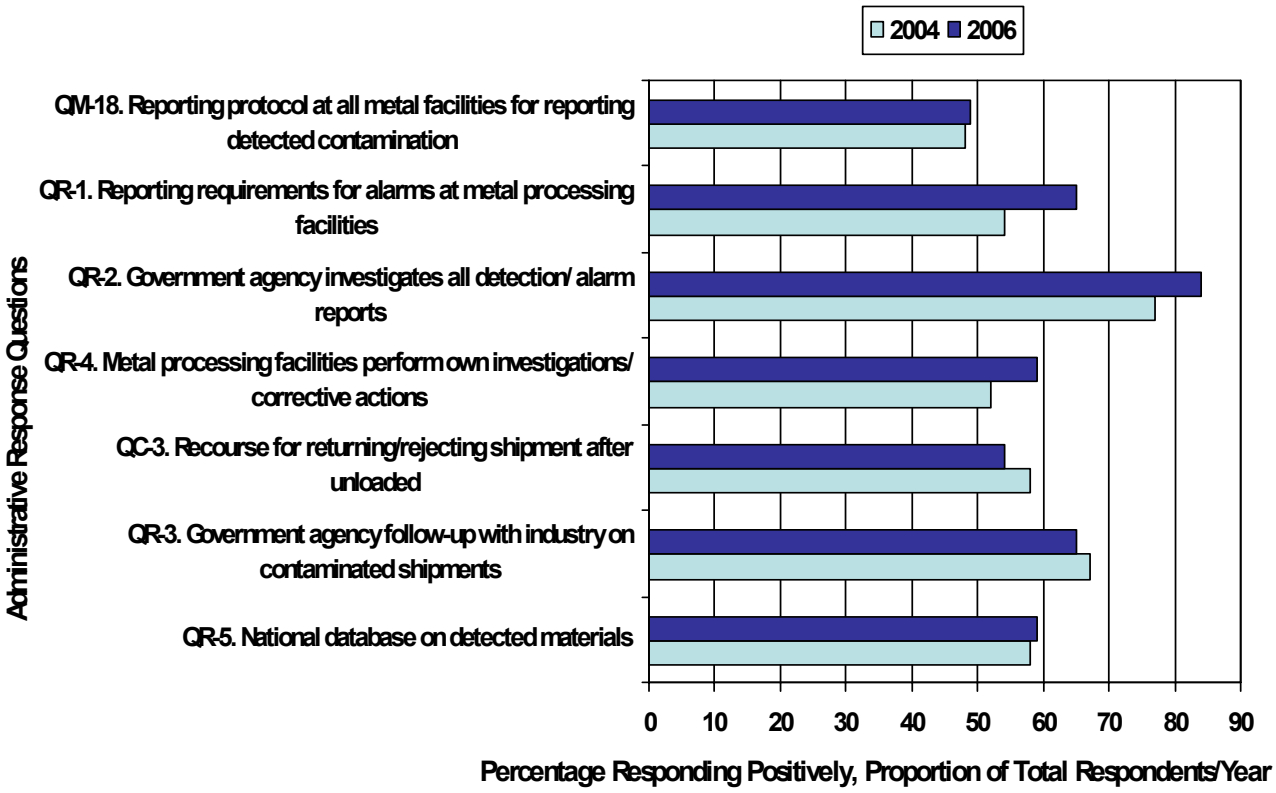
A.3.1. Administrative procedures and responsibilities after detection

29. 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.

30. 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)

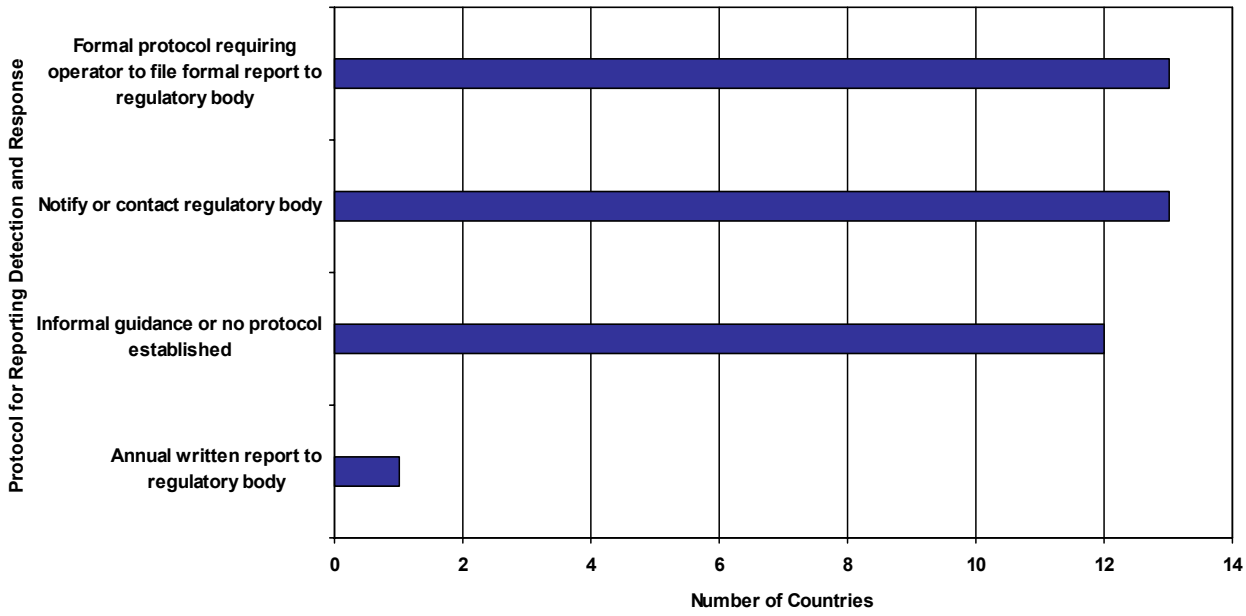


(a) Facility reporting protocol for detection and action for radioactivity [QM-18]

31. Figure A.12 illustrates that less than 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.

32. 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]

33. Of the responding countries, 78 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]

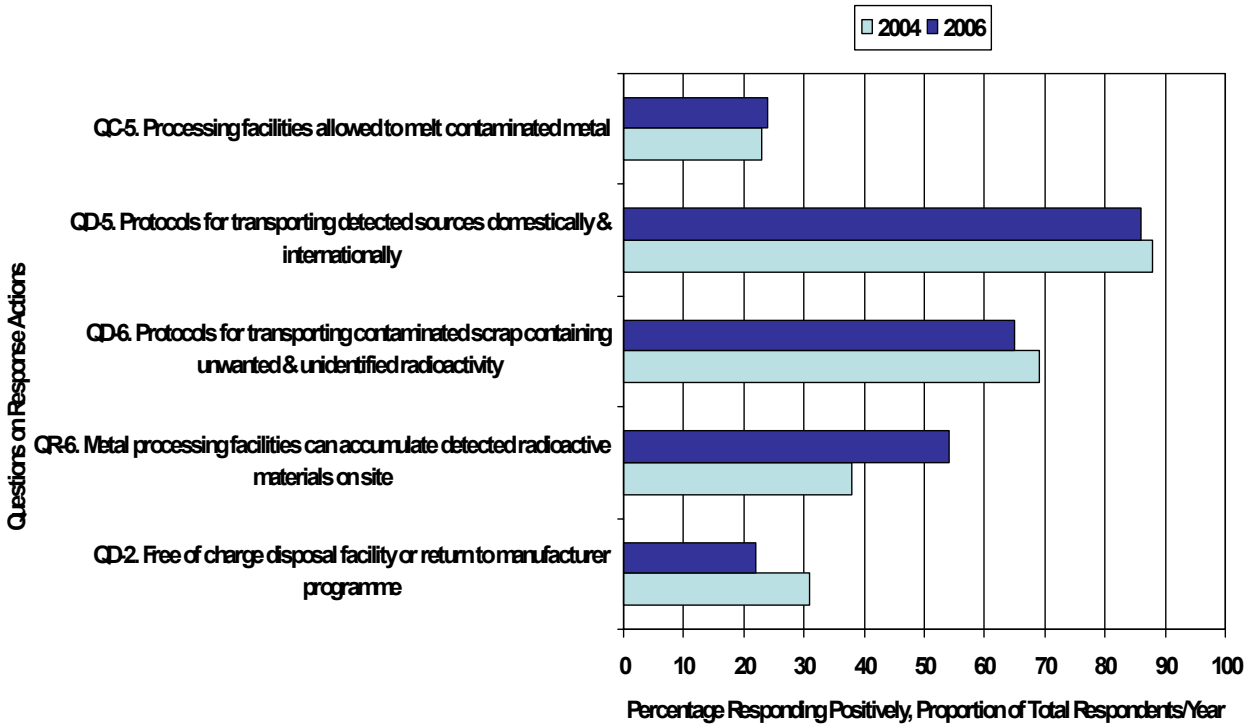
34. Almost all countries impose financial responsibility for disposition of detected radioactive material on the owner (some countries stated "last owner"). If the discovery of the material is made while in transit, e.g. at a border crossing, then the consignor can usually be readily identified. If the 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

35. 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.

36. 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]

37. The majority of the responding countries, 83 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) the isolation and securing of 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;

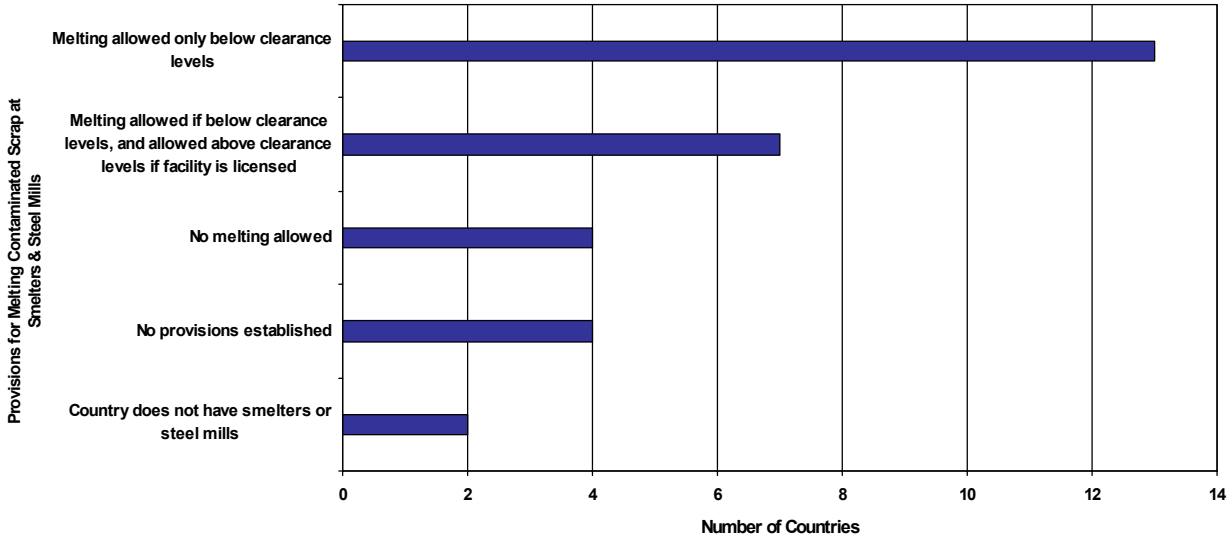
(d) transport from the facility according to appropriate transport regulations to the original consignor, a licensed waste storage facility, or licensed disposal facility.

38. 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]

39. 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]

40. As noted in figure A.14, approximately 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]

41. 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

EXISTING COUNTRY PRACTICES AND EXPERIENCES[1]

42. 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. Belgian directive, technical annex and historical data

43. The "Agence fédérale de Contrôle nucléaire" (AFCN) of Belgium issued technical "Directives for the use of a detection portal for radioactive substances in the non-nuclear sector", 9 August 2005. These directives provide 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 these directives, 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.

44. The AFCN has some general information on this issue on its webpage[2] (in French) and the directives and the technical annex can also be downloaded from this site (in French and Dutch).

45. 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.

	Waste sector	Scrap metal recycling sector	Total
2004	37	23	60
2005	34	29	63

[1] Except where noted, these documents are available from the UNECE Secretariat at the following URL: http://www.unece.org/trans/radiation/tools_nbp.html.
[2] The Belgian document is available at the following URL: 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.

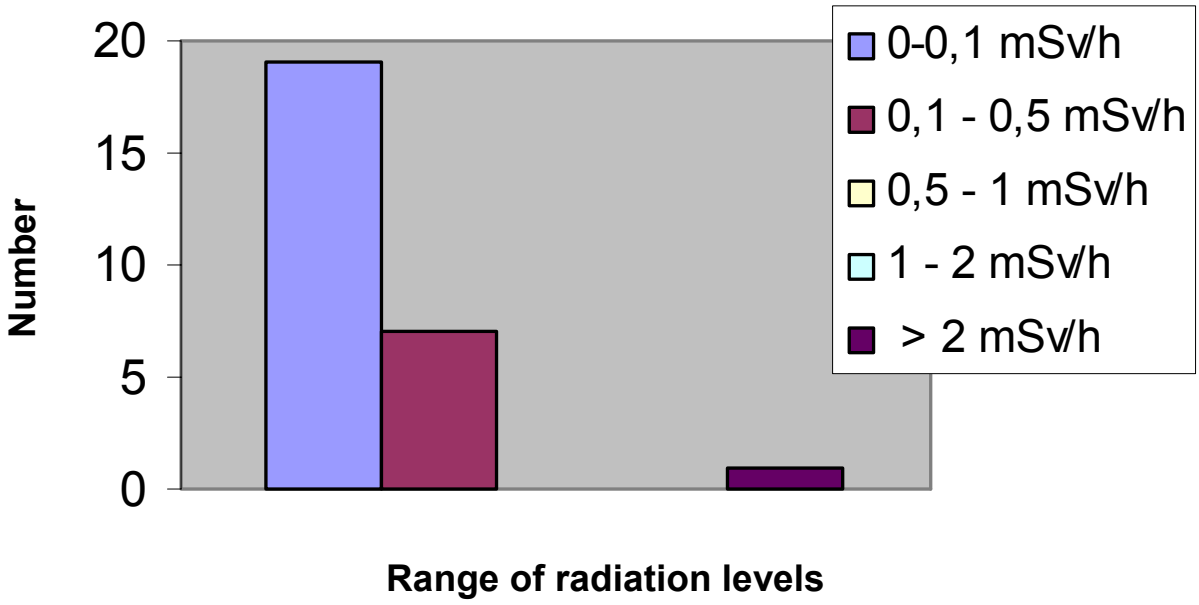
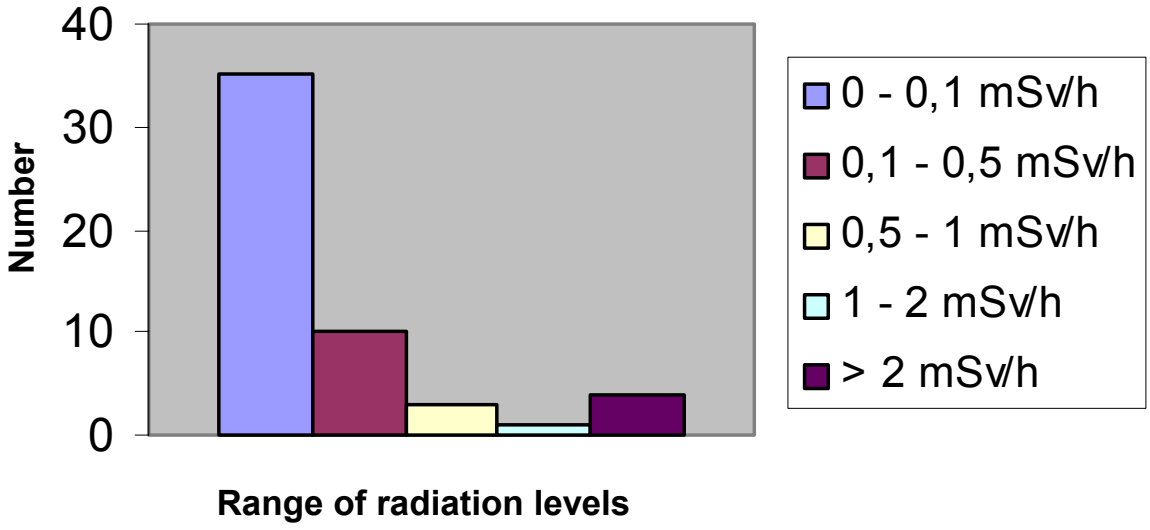


Figure B.2. Radiation Levels at Surface Contact for Detections in Belgium in the Scrap Metal Sector during 2004 and 2005.



46. 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).

47. 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 radiation levels at any point on the surface of a package or overpack that are to be used in establishing the category 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.

48. Paragraphs 567 and 573 of the IAEA Transport Regulations 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 Belgian detections in the scrap metal sector.

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

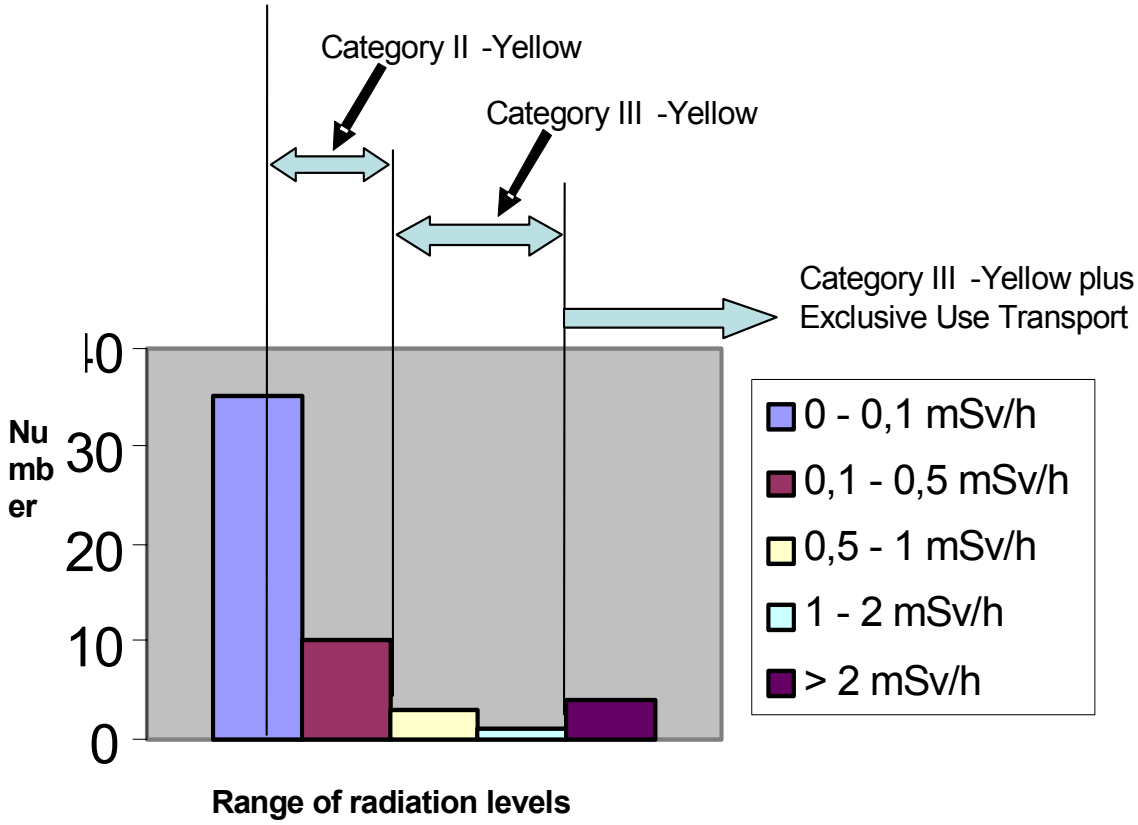
(a) The five shipments of contaminated material that had radiation levels exceeding 2 mSv/h would not have been in compliance with the radiation level limit requirement for transport vehicles, or if in packages smaller than the width of the vehicle, should have been categorized as III-Yellow and transported 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 05 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.



50. Thus, a significant number of the 81 shipments shown in figures B.1 and B.2 probably were made without being in compliance with the Transport Regulations, incurring the radiation hazards commensurate therewith.

B.2. Canadian portals detection study

51. 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.

52. 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

53. 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.

54. 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.*"

55. 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. Lithuanian actions for the control of radioactivity in scrap metal

56. 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.5. Switzerland experience with controlling contaminated scrap metal shipments at borders

57. 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.6. Turkey

58. 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.7. United Kingdom code of practice on clearance and exemption principles

59. 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.8. United States of America training programme, pilot study and website

60. 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.

61. 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.

62. EPA is also conducting a pilot study to determine the feasibility of monitoring imported scrap metal for radiation. Over 2.3 million tons 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.

63. Finally, EPA prepared a poster on the results of the 2004 Meeting of the Group of Experts[3].

[3] The poster can be obtained, in English, from the following URL: http://nlquery.epa.gov/epasearch/epasearch?typeofsearch=epa&areaname=&filter=&result_template=epahome_results.xsl&querytext=kopsick.

APPENDIX C
QUESTIONNAIRE

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

	Monitoring (cont'd)	Yes	No
QM10	What is the detection alarm threshold setting?		
QM11	How often is the detection system calibrated?		
QM12	How is it calibrated?		
QM13	Are regular sensitivity checks performed? If so, how?	☐	☐
QM14	Are regular functionality checks performed? If so, how?	☐	☐
QM15	Do metal melting facilities (smelters) monitor output? If so, at what location and how?	☐	☐
QM16	Are personnel in metal processing facilities (scrap yards, smelters, etc.) trained in visual inspection and response?	☐	☐
QM17	Are there guidelines for identifying and characterizing sources at metal processing facilities?	☐	☐
QM18	Is there a reporting protocol at all metal processing facilities for detection of radioactive materials and associated action? What is it?		
	Dispositioning		
QD1	How is the detected source dispositioned (removed, eliminated, transported to a waste repository)?		
QD2	Is there a free of charge disposal facility or a return to manufacturer program?	☐	☐
QD3	Does your Ministry/office/organization support the "Polluter Pays" principle?	☐	☐
QD4	Who is responsible, financially and physically, for disposition of detected radioactive materials?		
QD5	Are there protocols (regulations, procedures, instructions, orders) for transporting detected radioactive materials, both internally and across national borders?	☐	☐
QD6	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?	☐	☐
	Contractual		
QC1	At what point does ownership transfer from the seller to the buyer?		
QC2	When scrap metal is purchased, does the contract state it be radioactive-free?	☐	☐
QC3	If radioactive material is found in a shipment after it is unloaded, is there recourse for returning/rejecting the shipment?	☐	☐
QC4	If cleared scrap metal is sold, is the origin of the scrap clearly stated to the buyer?	☐	☐
QC5	Are steel mills and/or smelters allowed to melt radiologically contaminated metal? If so, at what level of radiation and how is it monitored?	☐	☐

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

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