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Group of Experts on Monitoring of Radioactively Contaminated Scrap Metal

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OVERVIEW OF KEY AREAS

Note by the secretariat

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CONTENTS (CONT'D)

A. BACKGROUND

1. In response to the important and increasing problem of radioactive contamination of 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).

2. 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.

3. This report and its addendum 1 provide an analysis of the 2006 responses to the questionnaire, compare those with the results of the 2004 questionnaire, evaluate progress made since 2004, consider additional inputs from countries and international organizations, and make recommendations regarding both "Best practices" and "Areas needing attention" for further discussion at the present meeting.

4. 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 radioactively contaminated scrap metal. Those three fields of action are: "Prevention", "Detection" and "Response".

5. The report is structured in two parts: it first 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. Addendum 1 to the document contains three chapters providing a detailed analysis of the responses to both the 2004 and 2006 questionnaires, a brief analysis of existing country practices and experiences and a copy of the questionnaire.

B. SUMMARY OVERVIEW OF CURRENT BEST PRACTICES AND AREAS NEEDING ATTENTION

1. 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.

2. 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; they should also implement checks to better control contamination of metals, focussing on: (a) making monitoring comprehensive and mandatory, (b) identifying 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.

3. 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

1. The basis for the analysis

6. 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" (refer to

document ECE/TRANS/AC.10/2006/2) could serve as a valuable input to the meeting. Various Spanish government agencies and industries have collaborated to develop and implement this protocol.

7. 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.

8. 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.

9. 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.

2. The process of the analysis

10. 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),
- 37 countries responded to the 2006 questionnaire by 28 March 2006, which was in sufficient time to have their results included in the analysis presented in this document, and
- 5 of the 37 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			Luxembourg	X	
Austria	X	X		Malaysia	X	
Azerbaijan	X			Mexico		X
Bangladesh	X			Netherlands	X	X
Belarus	X	X		New Zealand	X	X
Belgium	X	X		Norway	X	X
Bulgaria	X	X		Paraguay		X
Canada	X	X		Philippines	X	
Croatia	X	X		Poland	X	X
Czech Republic	X	X		Portugal	X	
Denmark	X			Romania	X	X
Dominican Republic	X			Russian Federation	X	X
Estonia	X	X		Serbia and Montenegro	X	
Finland	X	X		Slovakia	L	X
France	X			Slovenia	X	X
Georgia	X	X		South Africa	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
Latvia	X	X		Vietnam	X	X
Lithuania	X	X		**TOTALS**	**48**	**37**

* 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 53 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 53 were used.

11. The questionnaire data were provided according to 6 major topics[1]:

– Regulatory Infrastructure – 7 questions identified as QRI-1 through QRI-7 respectively,
– Monitoring – 18 questions identified as QM-1 through QM1-8 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.

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

12. 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 addendum 1 to this document.

13. The results provided in addendum 1 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 in (13) above, 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.

[1] The detailed questionnaire data as well as respective questions are contained in addendum 1, appendix C to this document.

(a) Best practices

14. 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.

15. 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 radioactively contaminated 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.

16. 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 in countries where processed scrap metal that becomes contaminated may be used.

(b) Areas needing attention

17. 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 radioactively contaminated 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.

18 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 produced 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 – BEST PRACTICES AND AREAS NEEDING ATTENTION[2]

1. Prevention: Best practices

19. Best practices for prevention that can be drawn from the data analysis presented above and from the existing country practices and experience summarized in addendum 1 to this report are discussed below.

Prevention: Best practice No. 1: All countries have established regulations directed toward preventing 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 addendum 1). [QRI-1]

National examples:

– Lithuania has issued a resolution on regulations on handling of illegal sources of ionizing radiation and contaminated facilities. [addendum 1, appendix B.4]
– 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 1, appendix B.5]

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 100 per cent in 2006 considering both figures A.1 and A.2 in addendum 1). [QRI-4]
– A large percentage of responding countries have penalties for exceeding regulatory limits (86 to 90 per cent in 2004, increasing slightly to 93 to 94 per cent in 2006 considering both figures A.1 and A.2 in addendum 1). Figure A.3 in addendum 1 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 licenses,

[2] The relevant question in the questionnaire relating to "Evidence from the questionnaires" as well as references to more detailed information and figures relating to "National examples" are given in square brackets following the relevant items.

(d) other unspecified administrative actions, and (e) various combinations of these depending upon the severity of the violation. [QRI-5]

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 82 per cent using the figure A.1 data for all countries reporting to date, and from 62 to 79 per cent using the figure A.2 data for countries reporting in both questionnaires – see addendum1). 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 1, appendix B.4]

Prevention: Best practice No. 4: Most countries have established exemption levels for materials containing low levels of radio activity, 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 addendum 1). Typically, as summarized in figure A.4 (in addendum 1), 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 µSv/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 79 per cent in figures A.1 and A.2 (addendum 1) 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 addendum 1). 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 1, appendix B.7]

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 29 countries reporting on both questionnaires indicate an even greater increase in training requirements at metal processing facilities; from 83 per cent in 2004 to 90 per cent in 2006.
– 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 76 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 1, appendix B.4]
– 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 their borders over a two-year period. [addendum 1, appendix B.5]
– 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 1, appendix B.8]

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]

2. Prevention: Areas needing attention

20. Areas needing attention for prevention that can be drawn from the data analysis and from the existing country practices and experience summarized in addendum 1, 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 potential radiological hazard situations could have been avoided. [addendum 1, appendix B.1]
- A Canadian study provides an estimation of effective dose from radioisotopes in a waste load. [addendum 1, 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 1), less than 70 per cent of the responding countries have regulatory mechanisms controlling NORM and TENORM. The data increased slightly, from 65 to 69 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 1), less than 45 per cent (only 44 per cent in 2004 and only 38 per cent in 2006) of the responding countries indicated that they have guidelines for identifying and characterizing sources at metal processing facilities. [QM-17]
- Figure A.6 (addendum 1) also shows that less than 50 per cent (only 40 per cent in 2004 and only 44 per cent in 2006) 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 1) illustrates that only about 50 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 1) 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 32 per cent in 2006. In fact, the data for the 29 countries reporting on both questionnaires indicate that only 29 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 1), 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 59 per cent in 2006. The data for the 29 countries reporting on both questionnaires indicate an even greater increase in training requirements at metal processing facilities, from 48 per cent in 2004 to 69 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[3]

1. Detection: Best practices

21. 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".

2. Detection: Areas needing attention

22. Areas needing attention for detection that can be drawn from the data analysis and from the existing country practices and experience summarized in addendum 1, 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 1, 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 1, appendix B.6]

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; they should also implement checks to better control contamination of metals, focussing on: (a) making monitoring comprehensive and mandatory, (b) identifying 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.

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

[3] The relevant question in the questionnaire relating to "Evidence from the questionnaires" as well as references to more detailed information and figures relating to "National examples" are given in square brackets following the relevant items.

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 addendum 1 shows that in only about 40 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 1) illustrate that monitoring occurs most predominantly at the scrap processing facilities, and the next largest response was for monitoring at 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 1) 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 1, appendix B.4]
- The United States of America is conducting a pilot study focused on determining the feasibility of monitoring imported scrap metal for radiation. [addendum 1, appendix B.9]

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 (33 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 1) 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 (12 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 81 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 1, 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 1, 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 1, appendix B.5]
- Turkey issued a manual on the application of radiation detection systems at border gates. [addendum 1, appendix B.6]

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 1) 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 process 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, 33 countries specify thresholds in terms of percentage above background 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 µSv/h above background". [QM-10]
- 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. [QM-10]

F. RESPONSE: BEST PRACTICES AND AREAS NEEDING ATTENTION

1. Response: Best practices

23. Best practices for response that can be drawn from the data analysis and from the existing country practices and experience summarized in addendum 1, 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 1) shows that a large number of countries (approximately 75 per cent in 2004, 85 per cent in 2006) 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 1) shows that, of the responding countries, 78 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, verifying the alarm with separate measurements, and notifying government officials. [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, 83 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 1, appendix B.3]

2. Response: Areas needing attention

24. Areas needing attention for response that can be drawn from the data analysis and from the existing country practices and experience summarized in addendum 1, 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 1, appendix B.2]
– A Canadian study 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 1, 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. Two 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 1, appendix B.3]
– The above-mentioned document also includes guidelines on tracking and disposal of discovered radioactive material. [addendum 1, appendix B.3]
– Turkey has issued a radiation material notification form for use at border crossings when radioactivity is discovered in a shipment. [addendum 1, appendix B.6]

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 1, 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 1) shows that less than 50 per cent of the responding countries establish 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 1) shows that of those countries with protocols, approximately 1/2 has a formal protocol with detailed requirements; whereas approximately 1/2 only requires notification or contact of the regulatory body. [QM-18 and QR-1]
– Figure A.13 (addendum 1) 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. [QM-18]

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 1) shows that only 50 to 60 per cent of the responders (a) have the metalprocessing 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 1) also shows that only about 65 per cent of the responders provide government follow-up on contaminated shipments; and only about 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 1) 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 1, 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 1) shows that approximately 25 per cent of responders allow processing facilities to melt contaminated metals, and 40 to 50 per cent are allowed to accumulate detected radioactive materials on their site. [QC-5 and QR-6]
– Figure A.15 (addendum 1) 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 1) illustrates that 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 1, appendix B.4]
– The United Kingdom issued a Code of Practice on clearance and exemption principles, processes and practices for use in the nuclear industry. [addendum 1, appendix B.7]

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 1) shows a small number of countries (23 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]

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