



INTERNATIONAL CONFERENCE ON “CONTROL AND MANAGEMENT OF INADVERTENT RADIOACTIVE MATERIAL IN SCRAP METAL”

Session 3: “COMPLIANCE WITH RADIOLOGICAL CRITERIA: MONITORING, CHARACTERIZATION AND GOOD OPERATIONAL PRACTICES”

Paper 8: “THE ACCUMULATED EXPERIENCE DERIVED FROM THE APPLICATION OF THE SPANISH PROTOCOL AND OTHER INITIATIVES OF THE AUTHORITIES”

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OUTLINE

1. INTRODUCTION
2. GENERAL OVERVIEW OF THE ACTIONS TAKEN IN SPAIN TO REGAIN CONTROL OF RADIOACTIVE SOURCES NOT SUBJECT TO THE REGULATORY CONTROL SYSTEM ESTABLISHED
3. SUMMARY OF THE EXPERIENCE GAINED IN SPAIN THROUGH THE APPLICATION OF THE “PROTOCOL” FOR THE RADIOLOGICAL SURVEILLANCE OF METALLIC MATERIALS (1998 – 2008)

1. INTRODUCTION

- **SINCE 1960’S THERE IS A “REGULATORY CONTROL SYSTEM” IN PLACE**
 - The use and transfer of radioactive material is subject to authorization
 - Experience shows the existence of radioactive materials “outside” the system
- **SPANISH AUTHORITIES HAVE PROMOTED SEVERAL ACTIONS SINCE 1970’S**
 - Complementary to the continuous improvement of the system
 - Additionally pursued since the creation of the “Safety Council” (CSN) in 1982
 - Initially performed by the JEN-CIEMAT
 - Since 1986, basically assigned to ENRESA
- **SPECIFITIES OF THE SPANISH “RADIOLOGICAL HISTORY”**

2. GENERAL OVERVIEW

2.1. CAMPAIGNS FOR THE REMOVAL OF RADIUM-226 SOURCES

- Very extensive efforts (since 1970's)
- Many practical difficulties (dispersion; private use; etc)
- Technical needs fully available
- Several thousand sources collected and finally sent to USA (Hanford)
- See figure 1

SPANISH EXPERIENCE: THE “PROTOCOL” AND OTHER INITIATIVES



Figure 1. A mock-up of the Ra-226 sources finally conditioned and the aircraft used for their transportation to USA for final management



Figure 3

2. GENERAL OVERVIEW

2.2. CAMPAIGN FOR THE REMOVAL OF LIGHTNING ROD HEADERS

- Based on a change in the regulatory system (1988)
- Practical difficulties (lack of reliable information; dispersion; private use, etc)
- Need to establish specific “management routes” (recycle; storage; disposal)
- More than 22500 rods removed and properly managed (see fig. 2)
- Campaign practically finished. Some 100 headers per year still being removed

Figure 2. Removal of radioactive lightning rod headers.



2. GENERAL OVERVIEW

2.3. CAMPAIGN FOR THE REMOVAL OF TELETHERAPY EQUIPMENT HEADERS

- Limited in scope and duration (11 headers; 1989-1991)
- Essentially a “preventive action”
- Complemented by a decision to ensure control in future replacements of these equipments within the Spanish national health system
- Need to define specific “management routes”
- See figure 3

Figure 3. Dismantling and removal of disused teletherapy equipment headers



2. GENERAL OVERVIEW

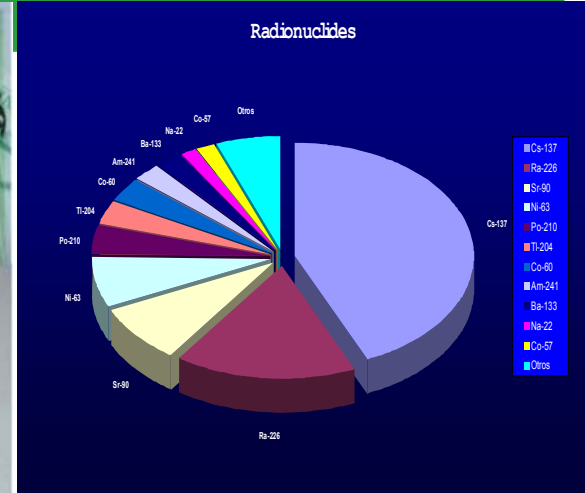
2.4. CAMPAIGN FOR THE SEARCH AND RECOVERY OF “ORPHAN” RADIOACTIVE SOURCES

- Specific and recent decision by the Authorities following an European Directive and assigned to ENRESA
- 2007-2008 and recently approved to continue during 2009
- Established contacts with other countries (USA)
- Practical difficulties (lack of information; difficult to “advertise”; attitude of users; etc)
- A kind of “end-point” considering the other previous and “on going” actions. It seems difficult to imagine the existence of too many “additional” sources to be recovered
- See figure 4
- Only a few sources found with radiological significance (total activity ~ 100 GBq)

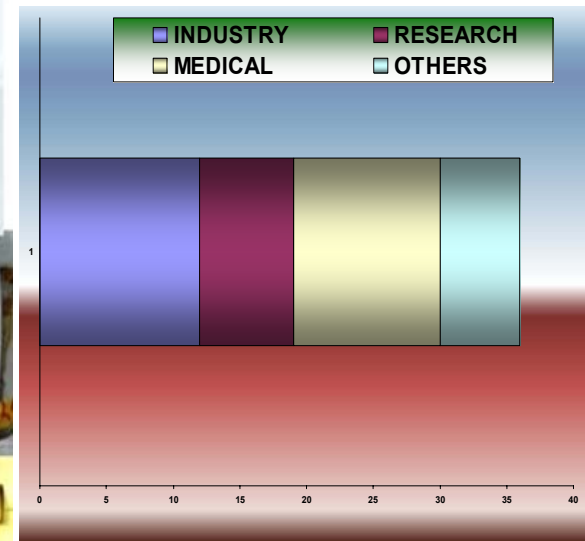
SPANISH EXPERIENCE: THE "PROTOCOL" AND OTHER INITIATIVES



Figure 4 Some results of the orphan sources recovery campaign



Sources recovered by radionuclide



Owners of sources by type of location

2. GENERAL OVERVIEW

2.5. PROTOCOL FOR THE RADIOLOGICAL SURVEILLANCE OF METALLIC MATERIALS

- The content of the “protocol” has been described in Session 2
- Reached a kind of “plateau” of 100 detections per year (see figure 5)
- Seven (7) events caused by the processing of sources up to Dec. 2008
- ENRESA has performed 320 actuations, including 224 to remove the radioactive sources and/or materials found or produced (See figure 6)
- Great diversity of radioactive materials involved, although those containing only radioactivity of natural origin were the majority

Figure 5. Spanish “Protocol” for the Radiological Surveillance of Scrap Metal

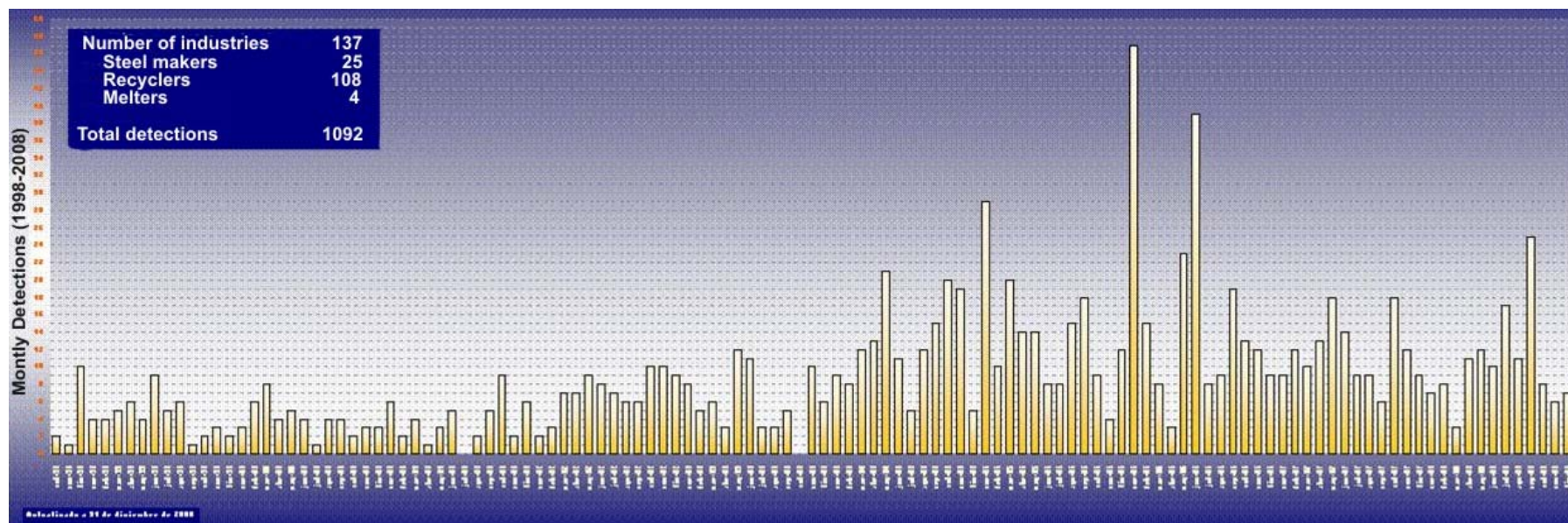
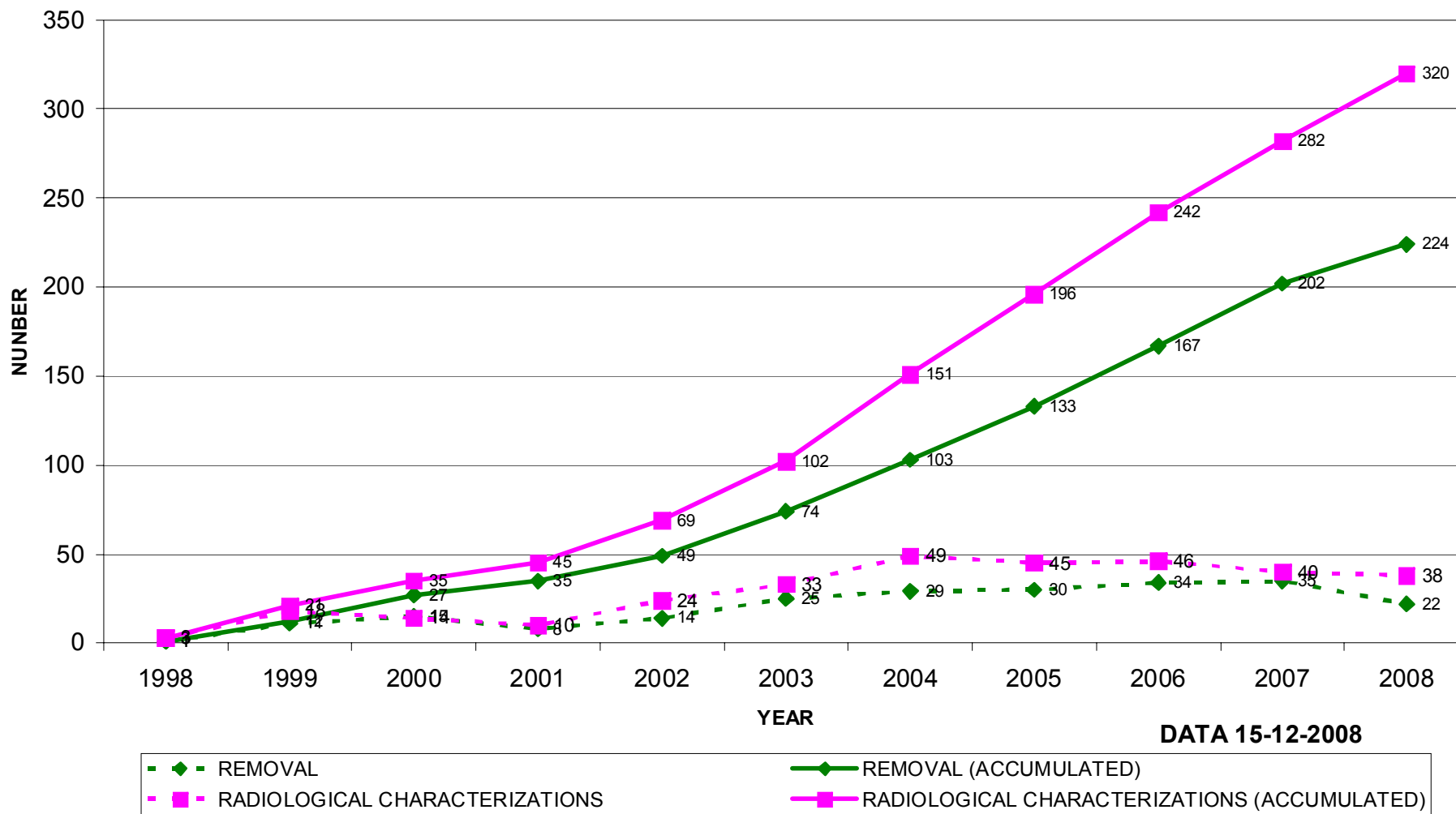


Figure 6 Application of the “Protocol”. ENRESA’s technical actuaciones (Up to Dec. 08)

ENRESA ACTIVITIES



2. GENERAL OVERVIEW

2.6 AUTHORIZATION FOR THE TRANSFER OF RESPONSIBILITY

- It's a well established procedure, used discretionally by the Authorities
- Up to Dec. 2008, more than 200 issued with the removal by ENRESA of some 250 radioactive sources of a variety of radiological importance
- It has proven to be a very useful tool!

2.7 POTENTIAL FUTURE ACTIONS

- Probably no need for additional urgent and/or large actions
- Continuation and improvement of the “protocol”, based on the experience
- Maintenance of the authorization for the transfer of responsibility, using the experience of the recent campaign for the “orphan sources”
- Keep care in the replacement of teletherapy equipments
- Pay due attention to the coming enforcement in the application of the regulatory control system to activities using NORM's as well as in the national borders

3. SUMMARY OF EXPERIENCES GAINED WITH THE “PROTOCOL”

3.1 GENERAL

- Figure 7 reflects the general “scheme” of actuations in the “Protocol”

Detection before processing

- Confirm the alarm
- Isolate the load
- Detailed measurement
- Segregate and custody materials
- Notify the Authorities

Detection after processing

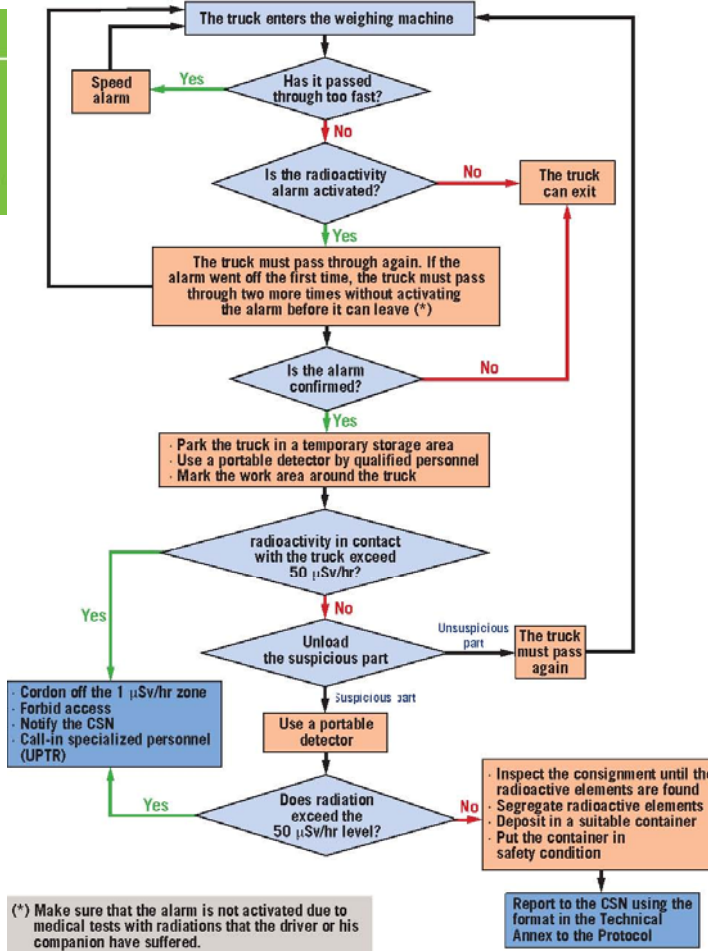
- End processing
- Immediate notification to Authorities
- Assess the radiological situation (specialists)
- Prepare restoration plan with the advise of the CSN and ENRESA

- Agreements established by the Industry for technical support in RP issues
- A “Technical Group” has been established to follow the results and the accumulated experience and to promote and develop the appropriate complementary actions. All organizations signing the “protocol” participate in the Group. Some activities:
 - Practical procedures in case of sources processing
 - Harmonization and optimization of “gate monitors” operation
 - Information and training programmes (a “crucial” aspect)

Figure 7. Basic scheme for the actuations established in the “Protocol”

ACTIONS

- Carefully revise the scrap metal.
- Isolate the suspicious containers or equipment.
- Do not open, nor destroy them under any circumstance, it may be dangerous for you, your fellow workers and the public.



Communications must be addressed to

Tf.: 91 346 01 00 - Fax: 91 346 05 88

E-mail: marcha@csn.es

3. SUMMARY OF EXPERIENCES GAINED WITH THE “PROTOCOL”

3.2 SUMMARY OF ACTUATIONS AND RESULTS (INCIDENTS NOT INCLUDED)

- General data have been provided in figures 5 and 6 before
- ENRESA has controlled a total of 2320 pieces of radioactive material with 268 being true “radioactive sources” (shielded or unshielded)
- 63% of the total pieces were removed and the rest were incorporated in the process after full radiological characterization (never “true sources”)
- Figure 8 shows the distribution by isotope and origin of the 268 “true sources” detected
- Figure 9 shows the distribution by content of the 2320 pieces controlled
- Figure 10 shows examples of radioactive sources and materials detected
- 30 training courses (different levels) with 622 participants. 7 more courses planned for 2009, including 2 to present the results of the R&D project to harmonize and optimize the operation of the gate monitors

Figure 8. Application of the "Protocol". Distribution by isotope and by origin of the sources detected and removed (Up to Dec. 08)

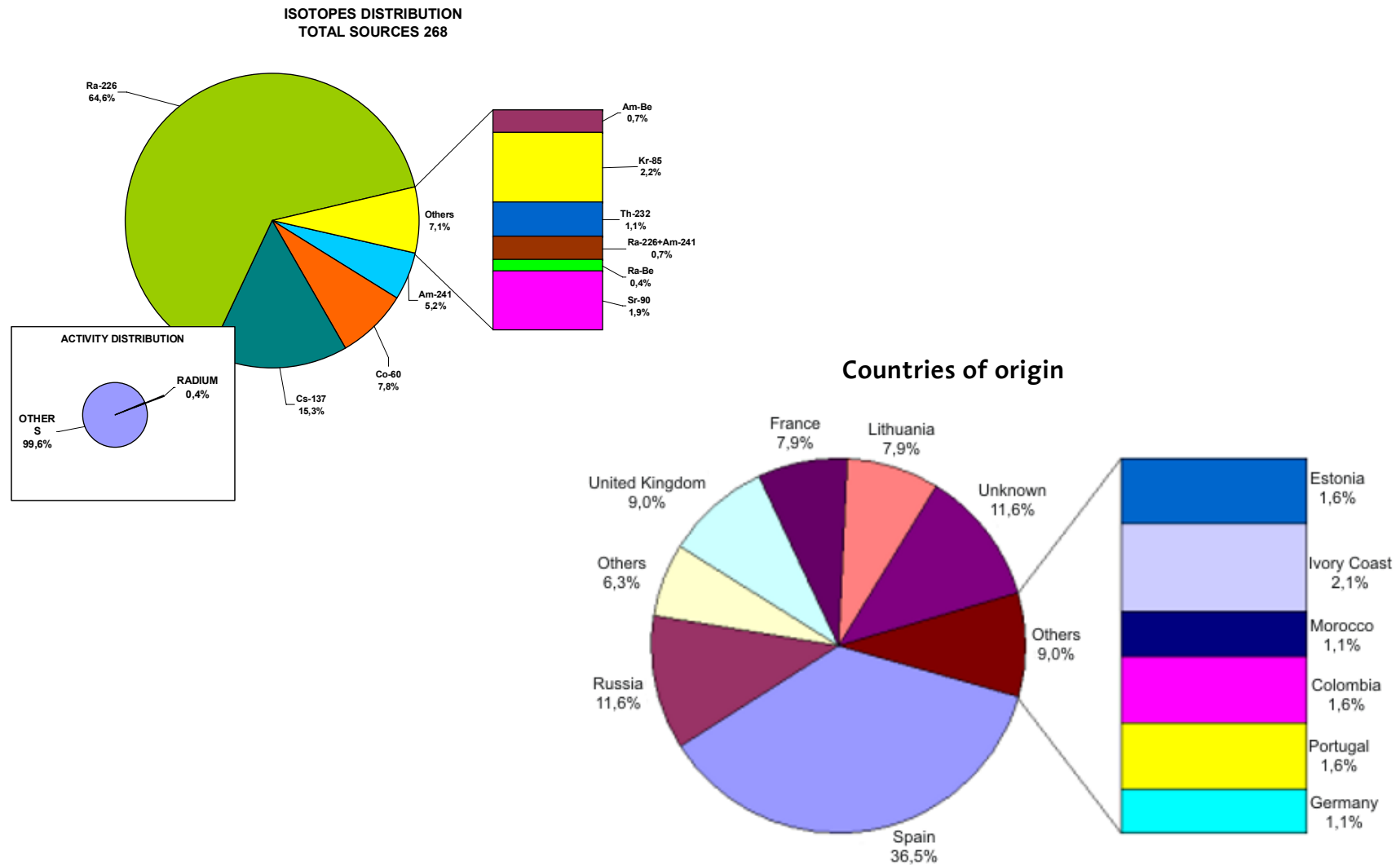
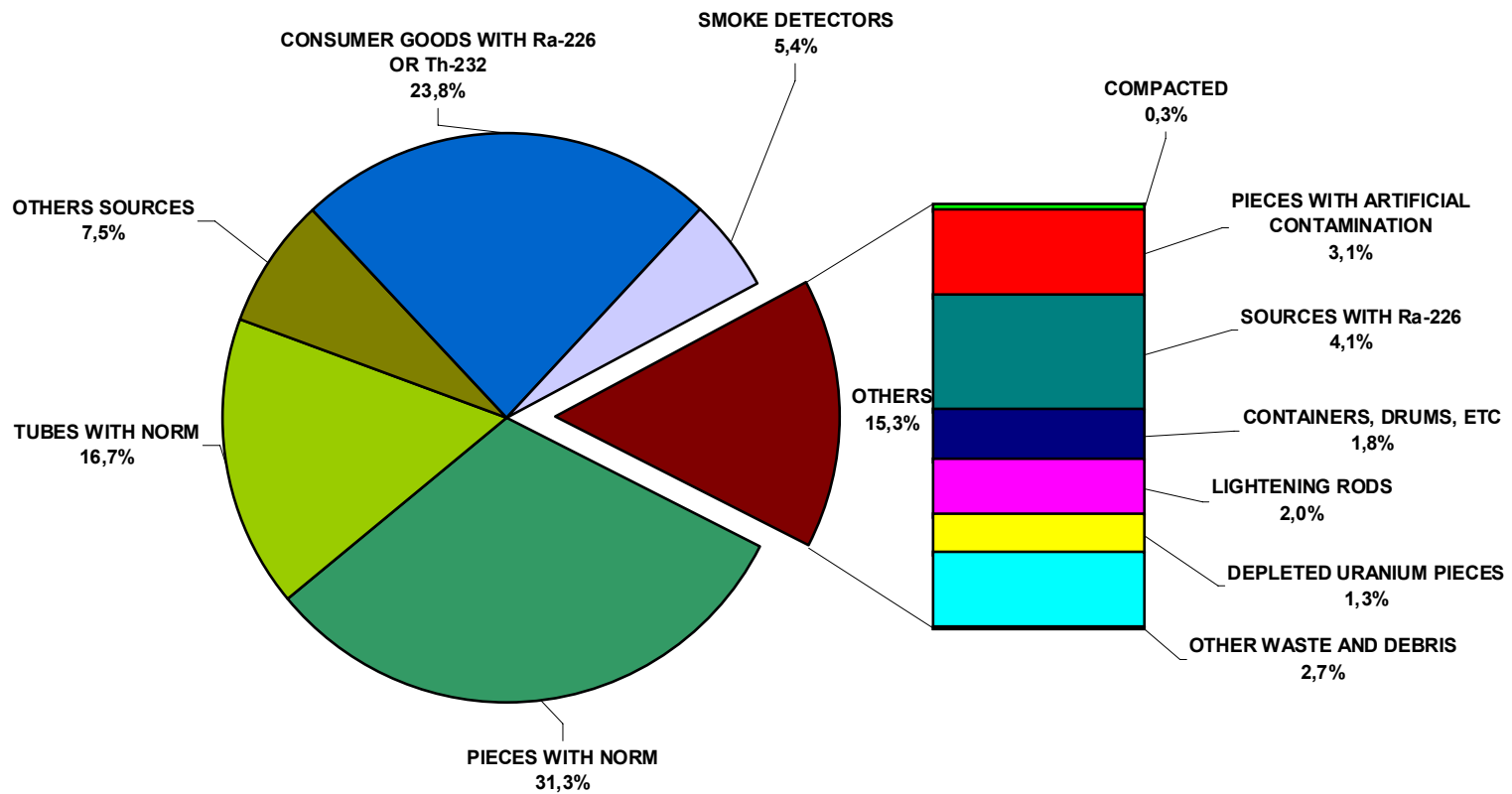


Figure 9. Application of the "Protocol". Distribution by content of the total radioactive materials detected and controlled (Up to Dec. 08)

MATERIALS REVIEW BY ENRESA
TOTAL PIECES 2320



DATOS A 15-12-2008

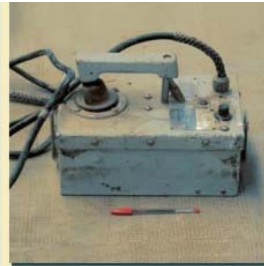
SPANISH EXPERIENCE: THE "PROTOCOL" AND OTHER INITIATIVES



Figure 10. Application of the "Protocol" Examples of different types of sources and other radioactive materials detected and controlled (Up to Dec. 08)



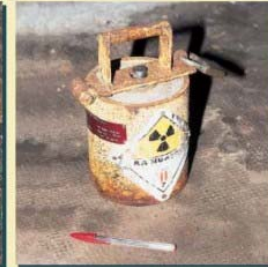
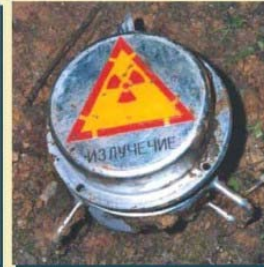
Ionic smoke detectors



Indicators with luminous paints



Lenses or alloys with Th-232



Unshielded sources

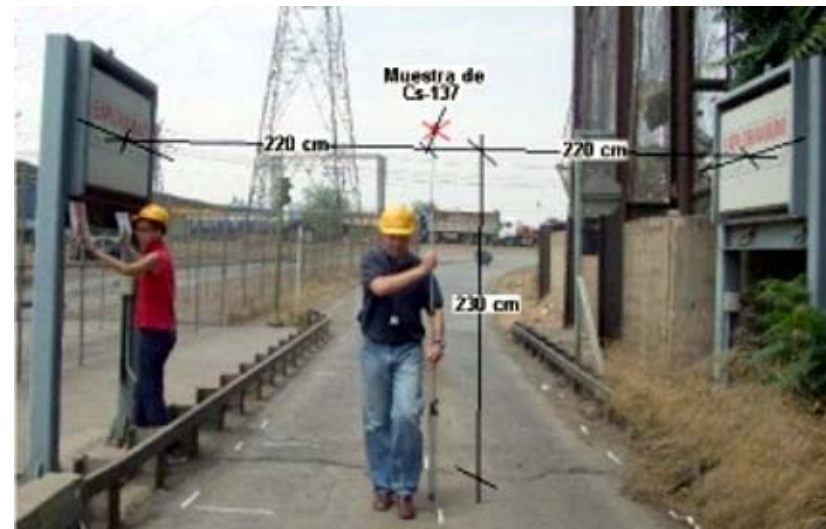
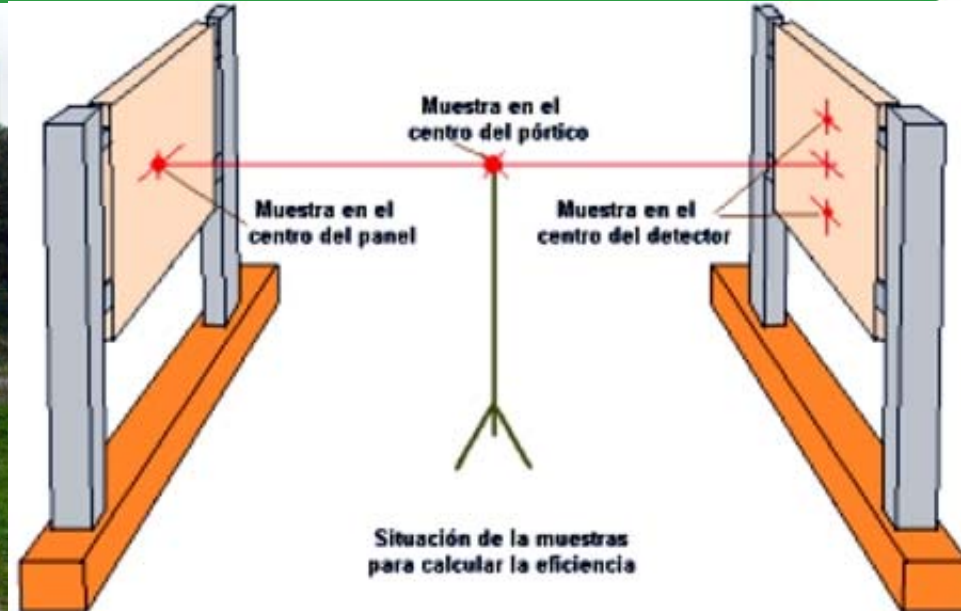
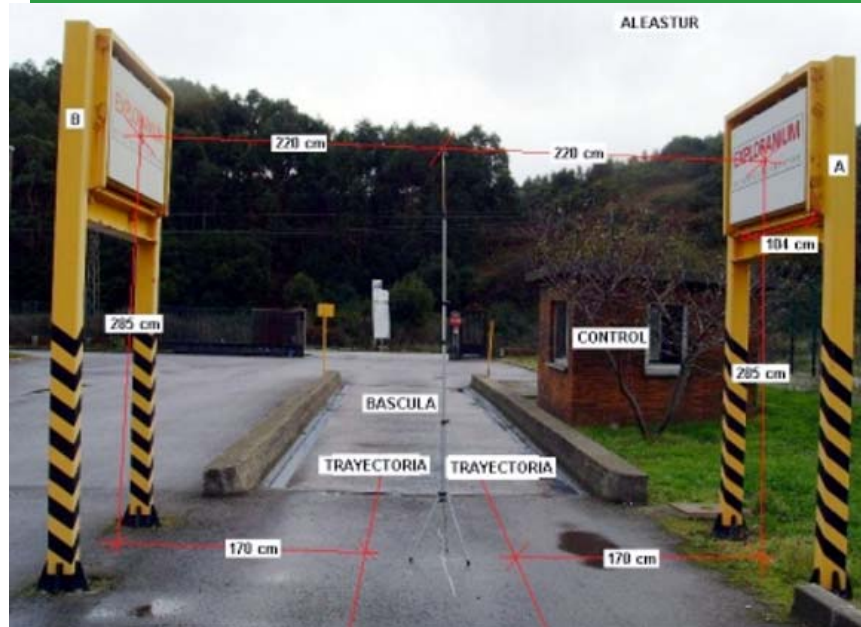


3. SUMMARY OF EXPERIENCES GAINED WITH THE “PROTOCOL”

3.3 HARMONIZATION AND OPTIMIZATION OF “GATE MONITORS” OPERATION

- More than 300 “gate monitors” are in operation
 - Objectives of the R&D project funded by CSN and ENRESA (2006-2008)
 - Establish practical procedures for their operation
 - Establish procedures to harmonize their detection capabilities (regardless of location)
 - Recommend “reference alarm levels” consequently
 - Main results so far:
 - Three basic and simple “testing processes” to be performed
 - . Initial installation (supplier with “common” output)
 - . Periodic verification (static test)
 - . Annual calibration (Static and dynamic tests)
- } Detailed procedures
being produced
(See figure 11)
- Training courses are foreseen during 2009 to help in their implementation

Figure 11. Portal monitors Static and dynamic tests



3. SUMMARY OF EXPERIENCES GAINED WITH THE “PROTOCOL”

3.3 HARMONIZATION AND OPTIMIZATION OF “GATE MONITORS” OPERATION

- A new R&D project has been launched funded by CSN and ENRESA (2009-2010)
 - Detection for a wider range of γ , β emitters
 - Optimization of the response for the “latest generation” of gate-monitors, with detection in several energy ranges and possibility to identify isotopes
 - State of the art analysis (γ spectrometry; neutron detection, etc) and consideration of all types of applications and uses (fixed and portable)

3. SUMMARY OF EXPERIENCES GAINED WITH THE “PROTOCOL”

3.4. KEY LESSONS LEARNED IN 10 YEARS

- Detection and removal is technically feasible. Several agents need to cooperate
- The key goal must nevertheless be “prevention”
 - Plenty of room to internationally coordinated actions
 - The regular commercial procedures used in the scrap metal global market must play a significant role
- In general, radiological characterization of the materials detected is not difficult. The case of NORM’s merits special attention
- It remains extremely difficult the return of materials detected to the country of origin. This point merits attention at international level, including the particular case of NORM’s
- Open information, due training and in general, the direct implication of the workers in the industry has proven very useful
- In Spain, the “non-prescriptive” nature of the “protocol” has also proven very useful
- Detection must be followed by operational actions to remove and properly manage the materials detected

And last, but in no way least, there will always be financial implications which must be fully addressed, as part of any national system.