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RADIATION PROTECTION 146

A Review of Consumer Products Containing Radioactive Substances in the European Union

Guidance by the group of experts established under Article 31 of the Euratom Treaty on the basis of a study carried out by

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Foreword

Radioactive substances have been incorporated in a large variety of consumer products for many years. In the course of developing technology the number and the type of consumer products containing radioactive substances has increased considerably. The present study reviews the control exercised by national competent radiation protection authorities with particular emphasis on how the requirements of the new Basic Safety Standards (Directive 96/29 EURATOM) are being applied. The document provides information on different types of consumer products containing radioactive substances and the particular isotopes and amounts of activities used in individual products. The document indicates developments and trends of the placing on the market, the use and arrangements for final disposal of the products. Available information on estimated individual or collective doses resulting from the manufacture, use and disposal of such products are also presented.

The report is structured in such a way that the relevant information on legislation, type testing and trends and developments is presented for each individual country. The publication of this document was considerably delayed because not all countries have submitted the requested information in due time. It should also be noted that the report refers to candidate countries which by the time of publication are now Member States.

The information provided in this document enabled the Commission to award a consecutive contract aimed at establishing guidelines on the regulatory control of radioactive consumer products (published as Radiation Protection Series No. 147). The Radiation Protection Unit would like to thank all experts for their most valuable contribution to this review.

Augustin Janssens

Head of Radiation Protection Unit

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1 GENERAL INFORMATION

1.1 Introduction

The practice of deliberately incorporating radioactive substances in consumer goods has been established for many years. Some of the earliest applications (over 150 years ago) involved the use of uranium compounds in the production of a variety of coloured glazes and glassware. In the early part of the twentieth century the radioluminescent effects of radium were discovered and radioluminous paints were widely incorporated in many consumer products.

In the course of developing technology the number and variety of consumer products containing radioactive substances increased. Some of these products directly utilise the ionising radiation properties of the incorporated radionuclide (for example, americium-241 in ionisation chamber smoke detectors) while other products use some other chemical or physical property of the radionuclide (for example, incandescent gas lantern mantles that incorporate thorium compounds). Over the years some changes have occurred that have led to a reduction in the radiation exposure of the public. For example, the use of radium in radioluminous paint has disappeared, replaced by the lower energy beta emitters tritium and promethium-147. In addition, improved technology has in some cases enabled manufacturers to reduce the amount of radioactive material used in certain products.

As the market for these consumer goods has expanded several international organisations have issued directives and guidance. The aim is to ensure that the radiation exposure of the public arising from the use and disposal of these products is kept as low as reasonably achievable whilst still allowing persons to obtain the benefits offered by them. In some cases, national authorities have prohibited the sale of consumer goods where the addition of radioactive materials could not be justified (i.e. there is considered to be no net benefit). An example of this would be the addition of radioactive materials to toys.

1.2 Definitions, objectives and scope

Throughout this report the term "consumer product" is defined as follows:

a manufactured product or appliance, or miscellaneous source, in which radionuclides are deliberately or intentionally incorporated and which can be supplied to members of the public without special surveillance and control.

It follows that building materials, spa waters, minerals and foodstuffs are not covered by this definition, and are therefore outside the scope of this report. It should also be noted that this definition excludes products and appliances installed in public places that may give rise to radiation exposure of the public, for example exit signs containing gaseous tritium light sources in aeroplanes, theatres, etc. The scope of this report is limited to those products that can be purchased without restriction by the public.

It is recognised that some consumer products are widely used by the general population, for example, ionisation chamber smoke detectors, whereas some are used by specialist groups only, for example weapons sights containing tritium. This has been noted where appropriate in Part 1.3.

It is also recognised that some products containing radioactive material and intended for industrial use only could fall into the hands of the public, perhaps via auction sites on the internet. In such cases, however, it is clear that the suppliers and manufacturers never intended these products to be consumer products. Such products are outside the scope of this study.

The objectives of this study are:

- to review the level of control exercised by the competent radiation protection authorities in the Member States and Candidate States of the European Union (EU), with particular interest in the application of the relevant articles of the Basic Safety Standards Directive 96/29 Euratom;
- to evaluate the requirements imposed by the competent radiation protection authorities in the Member States and Candidate States of the EU, in the following areas of interest;
    - prior authorisation and licensing schemes
    - product testing criteria
    - labelling and product information requirements
    - final disposal
    - exemptions and prohibitions; and,
- to collect all available quantitative data about the number of different types of consumer product obtainable in the Member States and Candidate States of the EU, and the particular radionuclides and activities used in individual products.

In addition, available information on exposures to members of the public, estimation of the individual or collective doses resulting from the manufacture, use and disposal of consumer products has been collected and reported.

The study is an update of an earlier report published in 1995.[1]

[1] Schmitt-Hannig A, Drenkard S and Wheatley J, Study on consumer products containing radioactive substances in the EU Member States, European Commission report EUR 15846 EN, 1995

1.3 Description of consumer products

A brief description of each consumer product is given below. Those products containing deliberately added artificial radionuclides are described first, in parts 1.3.1 to 1.3.6. These are followed by those where naturally occurring radioactive materials have been deliberately added (although not usually for their radioactive properties), in parts 1.3.7 to 1.3.11. Finally, irradiated gemstones are described in Part 1.3.12. This is a special category of consumer product, as their radioactivity arises from deliberate activation, rather than deliberate addition of a radioactive material.

The potential exposure pathways from each product are discussed in Part 1.4.

A summary of the radionuclides used in each product, their activities, possible routes of exposure and potential doses (where an assessment has been made) is given in Annex 2.

1.3.1 Ionisation chamber smoke detectors (ICSD)

An ICSD contains an ionisation chamber in which the air between the electrodes is ionised by a radioactive source. A potential difference applied between the electrodes causes a small current to flow. When smoke enters the chamber some ions will attach themselves to the heavier smoke particles causing a change in the characteristic resistance of the device. The increase in resistance or decrease in current is then used to trigger an alarm.

In modern ICSD, the radionuclide is americium-241 is used almost exclusively, which gives rise to very low external dose rates. Some older ICSD may incorporate krypton-85, radium-226, plutonium-238 or plutonium-239 sources and with these the external dose rates are significantly higher. Although the activity in a modern ICSD source is small, there are great numbers of these devices in use.

1.3.2 Radioluminous products

For many years radioluminous paint has been used in products where the ability to see an indication in the dark was considered useful. More recently, gaseous tritium light sources (GTLS) have also been incorporated into products to provide a source of illumination.

Some examples of widely available radioluminous products are:

- timepieces;
- navigational instruments, e.g. compasses;
- torches;
- novelty items such as key-rings; and,
- fishing floats.

Example of radioluminous products that would only be available to a small number of specialists are:

- weapon sights;
- signs, dials and switches, for example, those installed on boats and aircraft.

1.3.2.1 Radioluminous paints

Radionuclides have been used in the luminous paint industry for many years, the radiation emitted being converted into light by a scintillator (usually zinc sulphide). For much of the twentieth century, radium-226 was the most widely used radionuclide, but in recent years, for various reasons, this has been replaced by tritium and promethium-147.

1.3.2.2 Gaseous tritium light sources (GTLS)

In a GTLS, tritium gas is encapsulated in a hollow glass tube, the insides of which are coated with a phosphor. As the wavelength of the emitted light is dependent on the phosphor, it is possible to manufacture GTLS to emit various colours of light. When compared to products incorporating radioluminous paint, significantly greater activities of tritium gas are required to produce the same degree of brightness.

1.3.3 Fluorescent lamp starters

In a fluorescent lamp a ballast is used to heat an electrode so that an arc will pass from one electrode to the other. The arc then energises the phosphor coated on the inside surface of the lamp and visible light is produced. Some fluorescent lamps incorporate small quantities of radioactive substances in order to provide initial ionisation for the arc. A variety of radionuclides are used but the activities are generally very low. These devices are widely available and are likely to be in most fluorescent lamps purchased by the public.

In addition, thoriated electrodes and thorium iodate are often used in halogen vapor lamps available to members of the public.

1.3.4 Electronic devices

Some electronic components (for example, voltage regulators, current surge protectors, spark gap irradiators and indicator lights) contain small quantities of radioactive materials, usually to cause ionisation and promote the current flow. As with fluorescent lamp starters, there are a variety of radionuclides in use, but the activities are generally very low. These devices are widely available and are likely to be in many electrical products purchased by the public.

1.3.5 Anti-static devices

Static eliminators incorporating alpha particle emitters (usually polonium-210 or americium-241) may be used for removing dust from photographic negatives, vinyl records, camera and spectacle lenses. The radionuclides are in the form of microspheres bound into an epoxy matrix or metallic foil sources. These products are not used by the general public, but are available and may be used by keen amateur photographers or record collectors.

1.3.6 Lightning preventors

In the past, some manufacturers have attached radioactive sources to the ends of lightning conductor rods as a means of increasing their range of attraction by ionisation of the surrounding air. Americium-241 and radium-226 were the radionuclides commonly used for this purpose. However, the effectiveness of these devices was never proved. These devices are no longer widely available and were never generally available to members of the public so it is unlikely that they represent a significant source of radiation exposure.

1.3.7 Thoriated incandescent gas mantles

Gas mantles containing thorium produce incandescence when the mantle is heated by a flame. Thorium nitrate is impregnated into the fabric mesh during manufacture of the mantles. When the mantle is placed in the lamp and pre-burned, the thorium nitrate is turned into thorium oxide, which then produces the incandescence. Although only thorium is initially present in a newly manufactured mantle, the amount of thorium progeny increases with time and may be present in significant quantities. Thoriated gas mantles are now decreasing in number because of the introduction in recent years of non-radioactive alternatives. Although they were widely available a few years ago, they are not any more.

1.3.8 Thoriated lenses

Thorium compounds are sometimes added during the production of glass to change certain optical properties of lenses. They are also used in surface coatings to reduce glare. Thoriated lenses are not widely available and are used only by a small section of the population.

1.3.9 Thoriated tungsten welding electrodes

These electrodes are used in Tungsten Inert Gas (TIG) welding techniques. Up to 4% thorium is incorporated in the electrodes to enable a lower voltage to be used to strike the initial arc. This has the effect of increasing the useful life of the electrode. After repeated strikes, the conical tip of the electrode starts to degrade and it may be reshaped by using a grinding wheel. Thoriated tungsten welding electrodes are available to the public in some places, but as TIG welding equipment is relatively expensive and its use requires some degree of training, it is unlikely that these electrodes are widely used by members of the public.

1.3.10 Glassware, tableware, jewellery and ceramic tiles incorporating uranium

Uranium compounds may be used in the production of fluorescent and iridescent glass. The uranium is incorporated into the glass. Uranium compounds may also be added to the glaze used on the surface of tiles, to produce a variety of colours.

1.3.11 Dental products incorporating uranium

Uranium compounds have been used with cerium to impart fluorescence to dental porcelains. This improves the appearance of false teeth, causing them to appear

like natural teeth under artificial and natural lighting conditions. The uranium is incorporated into the porcelain.

1.3.12 Irradiated gemstones

It has been known for many years that the colour of gemstones may be intensified or altered by irradiation. This process can happen naturally over a long period of time but artificial irradiation to enhance colour, and therefore commercial value, is standard practice.

There are three methods of artificially irradiating gemstones; gamma irradiation (usually) with cobalt-60, irradiation with an electron beam in a linear accelerator, or neutron irradiation in a nuclear reactor. With electron beam and neutron irradiation, artificial radioactive materials known as activation products can be produced within the gem structure.

Among the common processes are the irradiation of pale or colourless topaz to produce a variety of colours, including "London blue" and "Swiss blue"; and the irradiation of diamonds to produce green diamonds and so called "black" diamonds.

It is generally assumed that gems treated in this way are stored for a pre-determined length of time to eliminate short-lived activation products prior to the gems being released on to the open market. However, there have been occasional reports of the availability of gemstones with a high radioactive content. This indicates that at least a few irradiated gemstones containing significant levels of activation products have been released onto the open market.

1.3.13 Antique products

In the earlier part of the twentieth century, radium-226 was used for its supposed beneficial effects in many consumer products, such as radium blankets, radium corsets and radon emanators. This practice died out as the detrimental effects of radium became more fully understood. Radium-226 was also the first radionuclide to be used for luminising clocks, watches and other products, however, its use in consumer products had ceased by the late 1970s within the EU.

Other examples of miscellaneous consumer products that are no longer in use are:

- vending machine coins and bank cheques luminised with carbon-14;
- identity cards and drivers' licenses luminised with promethium-147;
- home luminising kits utilising radium-226 or tritium; and,
- ointments, potions, creams and powders containing natural uranium.

It is possible that some examples of these earlier consumer products are still in circulation on the second-hand and antique market, but the number is now assumed to be very small.

1.4 Potential exposure routes

1.4.1 Ionisation chamber smoke detectors (ICSD)

The potential routes of exposure from the radioactive sources incorporated in ICSD are as follows:

- external exposure during normal use, maintenance and cleaning;
- internal exposure due to inhalation and ingestion of radioactive material released following disposal;
- internal exposure due to inhalation of radioactive material during and after a fire involving the ICSD; and,
- external and internal exposure due to misuse, e.g. mutilation of the source.

A dose assessment carried out by NRPB[2] indicates that effective doses from normal use and disposal are likely to be very low (less than 1 μSv per year), while effective doses from fire and misuse will not exceed 100 μSv per incident.

1.4.2 Radioluminous products

1.4.2.1 Radioluminous paints

The potential routes of exposure from items luminised with radioluminous paint are as follows:

- external exposure during normal use, maintenance and cleaning;
- internal exposure due to inhalation and skin absorption of tritium released from tritiated paint;
- inhalation and ingestion of radioactive material released following disposal; and,
- internal exposure due to removal of the paint, either deliberately or following breakage.

A dose assessment carried out by NRPB[3] in 1992 indicated that effective doses from normal use and disposal of items luminised with paint containing tritium or promethium-147 were likely to be very low (less than 2 μSv per year), while skin dose could be up to 3 mSv per year. This assessment indicated that effective doses from fire and misuse would not exceed 400 μSv per incident.

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[2] Radiological protection standards for ionisation chamber smoke detectors, Documents of the NRPB Volume 3, No 2, 1992, HMSO

[3] Radiological protection standards for radioluminous time measurement instruments, Documents of the NRPB Volume 3, No 2, 1992, HMSO

A more recent NRPB assessment[4] of modern "divers style" watches indicated, however, that the annual effective dose to an adult could be up to 22 μSv, and the annual equivalent dose to the skin of an adult could be up to 10.6 mSv. These assessments were based on measurements made on sample watches.

Some older items luminised with radium are still in circulation and were reported as being available in one of the candidate states. The use of products incorporating radium luminising compounds would result in doses significantly higher than those quoted above. Some of the progeny of radium-226 emit high-energy beta particles and gamma radiation that does not improve the radioluminescent properties of the product, but does result in higher external doses. In addition, although relatively larger quantities of tritium and promethium-147 are required to produce the same luminescent effect as radium-226, the committed dose per unit intake for radium-226 is much higher than that for both tritium and promethium-147. This means that internal doses from disposal and breakage would also be higher than those associated with paint containing tritium or promethium.

1.4.2.2 Gaseous tritium light sources (GTLS)

The potential routes of exposure from items luminised with GTLS are as follows:

- external exposure during normal use, maintenance and cleaning;
- internal exposure due to inhalation and skin absorption of tritium leaking from the GTLS;
- inhalation and ingestion of radioactive material released following disposal;
- internal exposure due to inhalation of radioactive material during and after a fire involving the GTLS; and,
- internal exposure due to breakage of a GTLS.

The dose per unit intake for tritium gas is much lower than that for tritiated water, and most GTLS contain a maximum of 2% tritiated water, the rest being in the form of tritium gas. Consequently, potential internal doses are lower than from consumer products incorporating radioluminous paint. It should be noted, however, that in the case of a fire, elemental tritium may be rapidly converted into tritiated water, giving a potential for more significant internal doses.

Dose assessments carried out by NRPB[5,6] indicates that effective doses from normal use and disposal of items luminised with GTLS are likely to be very low

[4] Paynter R A, Shaw P V, Dunderdale J, Ely S Y and O'Mahony M T, The use of radioactive materials in the luminising of watches, NRPB Contract Report M-863, November 1997

[5] Radiological protection standards for time measurement instruments containing GTLS, Documents of the NRPB Volume 3, No 2, 1992, HMSO

(less than 2 μSv per year), while skin dose could be up to 0.9 mSv per year. The assessment indicated that effective doses from fire and misuse will not exceed 500 μSv per incident.

1.4.3 Fluorescent lamp starters and other electronic devices

The quantity of radioactive material used in such devices is very small and the potential for external exposure is insignificant. There is some potential for internal exposure following breakage of the devices, either accidentally or on disposal. It is understood that an assessment of radiation dose from all types of electronic device manufactured in Germany was made and estimated doses to members of the public were found to be less than 10 μSv per year. An assessment of doses to users carried out in the Netherlands[7] concluded that annual effective doses would be <1μSv.

1.4.4 Lightning preventors

It is not certain whether these devices are currently available to members of the public. There is a potential for external exposure during normal use, and internal exposure from uncontrolled disposal, fire, breakage and misuse of the devices. The authors are unaware of any assessment of radiation doses arising from the public use of lightning preventors incorporating radioactive sources.

1.4.5 Anti-static devices

External radiation exposure from these devices is minimal, but there is a potential for internal exposure due to breakage, misuse and disposal of the devices. These products are now rarely available to the public. The authors are unaware of any assessment of radiation doses arising from the public use of anti-static devices incorporating radioactive sources.

1.4.6 Thoriated incandescent gas mantles

The potential routes of exposure from thoriated incandescent gas mantles are as follows:

- external exposure during handling of the mantles;
- internal exposure due to inhalation and ingestion of airborne radionuclides released during burning;
- internal exposure due to thoron emanation from the gas mantle;

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[6] Radiological protection standards for compasses containing GTLS, Documents of the NRPB Volume 3, No 2, 1992, HMSO

[7] Eleveld H and Pruppers M J M, Schattingen van de individuele en collectieve doses als gevolg van consumentenproducten waarin radioactieve stoffen zijn verwerkt, Rijksinstituut voor Volksgezondheid en Milieu, RIVM report 610310 005, May 2000

- internal exposure due to ingestion of thorium arising from handling of the gas mantle during changing (especially when it is used and brittle);
- internal exposure due to inhalation and ingestion of radionuclides following disposal; and,
- internal exposure due to misuse, e.g. breakage of a brittle, used gas mantle, or placing the gas mantle in the mouth.

A dose assessment carried out by NRPB[8] indicates that effective doses from normal use and disposal are likely to be up to 140 μSv per year. The most significant route of exposure is inhalation of thorium decay products, which are released during burning (especially the first burning). The assessment indicated that effective doses from misuse will not exceed 10 μSv per incident.

1.4.7 Thoriated lenses

The main radiological hazard to users is external exposure to the lens of the eye from the beta and gamma radiation emitted by the thorium decay products. As the thorium is incorporated into or bonded onto the glass, there is minimal potential for internal exposures. The authors are unaware of any assessment of radiation doses arising from the public use of thoriated lenses.

1.4.8 Thoriated tungsten welding electrodes

External exposure from small quantities of electrodes is minimal. In cases of heavy use, for example in industry, there is a potential for internal exposure by inhalation and ingestion of thoriated dust during grinding of the electrodes, if appropriate measures are not taken to contain the dust. However, it is unlikely that any members of the public would use significant quantities of these specialist welding electrodes. The authors are unaware of any assessment of doses arising from the public use of these electrodes.

1.4.9 Glassware, tableware, jewellery and ceramic tiles incorporating uranium

There is some potential for external exposure from glassware incorporating uranium, arising from the beta and gamma radiation emitted by the uranium decay products. There is minimal potential for internal exposure as the uranium is incorporated into the glass. Uranium compounds may also be added to the glaze used on the surface of tiles, to produce a variety of colours. As with glassware, there is some potential for external exposure. There is also a possibility of internal exposure due to uranium slowly leaching from the glaze. An

[8] Radiological protection standards for thoriated gas mantles, Documents of the NRPB Volume 3, No 2, 1992, HMSO

assessment of doses to users carried out in the Netherlands[9] concluded that annual effective doses would be <1μSv.

1.4.10 Dental products incorporating uranium

There is minimal potential for internal exposure, as the uranium is incorporated into the porcelain. However, there is a potential for external irradiation of the oral epithelium by alpha radiation.

A study carried out by NRPB in 1990[10] concluded that the annual beta dose equivalent to the basal layer of a wearer of the dental porcelain could be up to 7.0 mSv, depending on the uranium content of the porcelain.

1.4.11 Irradiated gemstones

The main exposure pathway is external radiation exposure from wearing items of jewellery containing radioactive gemstones. A report for the UK government Department of Trade and Industry made by NRPB[11] concluded that the annual effective dose to a member of the public would range from <0.01 μSv up to 0.02 μSv for occasional wear, and from 0.04 μSv up to 1.7 μSv for continuous wear, depending on the stones used. Localised skin doses, however, could be range from <1mSv up to 31 mSv for occasional wear and 70 mSv to 3000 mSv for continuous wear.

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[9] Eleveld H and Pruppers M J M, Schattingen van de individuele en collectieve doses als gevolg van consumentenproducten waarin radioactieve stoffen zijn verwerkt, Rijksinstituut voor Volksgezondheid en Milieu, RIVM report 610310 005, May 2000

[10] Lewis J and Paynter R A, Uranium content of dental porcelains, NRPB Contract Report M-247, 1990

[11] Stewart J E, Shaw P V and Robson J C, The radiological hazards associated with gemstones: review and recommendations, NRPB-OS/016/2002

2 RELEVANT LEGISLATION AND GUIDANCE

2.1 Relevant European Union (EU) legislation

2.1.1 Radiation Protection Legislation

All EU Member States are required to comply with Council Directives. Selected extracts from the Council Directive of 13 May 1996 (96/29/Euratom) are included below to provide a basis for comparison with some of the information given in later chapters. The directive states:

"Article 2

1. *This Directive shall apply to all practices which involve a risk from ionizing radiation emanating from an artificial source or from a natural source in cases where natural radionuclides are or have been processed in view of their radioactive, fissile or fertile properties, namely:*

   a) *the production, processing, handling, use, holding, storage, transport, import to and export from the Community and disposal of radioactive substances;……*

   c) *any other practice specified by the Member State..*

2. *In accordance with Title VII it shall also apply to work activities which are not covered by paragraph 1 but which involve the presence of natural radiation sources and lead to a significant increase in the exposure of workers or members of the public which cannot be disregarded from the radiation protection point of view……..."*

"Article 3

1. *Each Member State shall require the carrying out of the practices referred to in Article 2(1) to be reported, except as provided for in this Article.*

2. *No reporting need be required for practices involving the following:*

   a) *radioactive substances where the quantities involved do not exceed in total the exemption values set out in column 2 of Table A to Annex 1 or, in exceptional circumstances in an individual Member State, different values authorized by the competent authorities that nevertheless satisfy the basic general criteria set out in Annex 1[12]: or*

[12] Annex 1 gives the following exemption levels for the radionuclides mentioned in Part A3:

Americium-241: 10^4 Bq or 1 kBq/kg Thorium-232 (sec): 10^3 Bq or 1 kBq/kg

b) radioactive substances where the concentration of activity per unit mass do not exceed the exemption values set out in column 3 of Table A to Annex 1[1] or, in exceptional circumstances in an individual Member State, different values authorized by the competent authorities that nevertheless satisfy the basic general criteria set out in Annex 1: or

c) apparatus containing radioactive substances exceeding the quantities or concentration values specified in subparagraphs (a) or (b) provided that:

(i) it is of a type approved by the competent authorities of the Member State; and,

(ii) it is constructed in the form of a sealed source; and,

(iii) it does not cause, in normal operating conditions, a dose rate exceeding 1 μSv h^{-1} at a distance of 0,1 m from any accessible surface of the apparatus; and

(iv) conditions for disposal have been specified by the competent authorities……"

"Article 4

1. Except as provided for in this Article, each Member State shall require prior authorization for the following practices:…….

c) the deliberate addition of radioactive substances in the production and manufacture of consumer goods and the import or export of such goods;……..

3. Member States may specify that a practice shall not require authorization where:

a) in the case of the practices described in paragraph 1 (a), (c) and (e), the practice is exempt from reporting;……"

"Article 6

1. Member States shall ensure that all new classes or types of practice resulting in exposure to ionizing radiation are justified in advance of being

Tritium:	10^9 Bq or 10^6 kBq/kg	Uranium-238 (sec):	10^3 Bq or 1 kBq/kg
Promethium-147:	10^7 Bq or 10^4 kBq/kg	Polonium-210:	10^4 Bq or 10 kBq/kg

first adopted or first approved by their economic, social, or other benefits in relation to the health detriment they cause.

2. *Existing classes or types of practice may be reviewed as to justification whenever new and important evidence about their efficacy or consequences is acquired.*

3. *In addition, each Member State shall ensure that:*

   a) *in the context of optimization all exposures shall be kept as low as reasonably achievable, economic and social factors being taken into account;*

   b) *without prejudice to Article 12, the sum of the doses from all relevant practices shall not exceed the dose limits laid down in this Title for exposed workers, apprentices and students and members of the public…….*

5. *Member States shall permit neither the deliberate addition of radioactive substances in the production of foodstuffs, toys, personal ornaments and cosmetics nor the import and export of such goods.*

2.2 Relevant legislation in the EU Member States

In this section, information is given on the most important regulatory documents concerning the control of consumer products. Information is also given on the enforcing competent authorities in the fifteen Member States.

A table showing the name and address of each competent authority is given in Annex 3.

2.2.1 Austria

No information was received.

2.2.2 Belgium

The Royal Decree of July 20, 2001 with regard to protection of the population, the workers and the environment against ionising radiation is the primary radiation protection legislation in Belgium.

No further information was received.

2.2.3 Denmark

In Denmark, consumer products are subject to the requirements of the National Board of Health Order no 154 of 6 March 1990 on smoke detectors and consumer products containing radioactive materials, with amendments in orders no 547 of 23 July 1993 and no 793 of 19 October 1999. In addition, Ministry of the Interior and Health Order no 192 of 2 April 2002 sets out the exemptions from reporting

and prior authorisation contained in Council Directive 96/29/Euratom. Article 8 of this Order implements Article 3(2) of the Council Directive and Article 5 implements Articles 4(1) and 4(3) of the Council Directive. The deliberate addition of radioactive substances in the production of foodstuffs, toys, personal ornaments and cosmetics, and the import and export of such goods, is prohibited in Article 2 of Order 192.

The competent authority responsible for enforcing radiation protection legislation in Denmark is the National Institute of Radiation Hygiene, under the National Board of Health.

2.2.4 Finland

In Finland, the basic radiation protection legislation documents are the Radiation Act (592/1991) (amendments 1992, 1994, 1995, 1997, 1998 and 1999) and the Radiation Decree (1512/1991) (amendments 1994, 1998). The Radiation Act and the Radiation Decree implement all the relevant requirements of Council Directive 96/29/Euratom.

The competent authority responsible for enforcing the Radiation Act and the Radiation Decree is the Radiation and Nuclear Safety Authority (STUK).

2.2.5 France

No information was received.

2.2.6 Germany

In the German Radiation Protection Ordinance dated July 2001, addition of radioactive matter to consumer goods and activation are regulated in paragraphs 106 to 110. Conditions are established as to activity concentrations, disposal/return to manufacturer, information of user, export and import. The Ordinance implements all the relevant requirements of Council Directive 96/29/Euratom.

There are different competent authorities for each of the German Bundesländer. Only Bavaria and Saxony are centralised, with one authority responsible for all aspects of licensing, inspection, restrictions on use and transportation. Most other states are broken down into small units with regional occupational safety offices for inspection of premises. Other aspects, such as import and export of consumer goods, are dealt with by federal authorities.

2.2.7 Greece

The Greek Regulations for Radiation Protection (no 216B of 5 March 2001) are the primary radiation protection legislation in Greece. It is understood that these Regulations fully implement all the relevant requirements of Articles 3, 4 and 6 of Council Directive 96/29/Euratom.

The competent authority responsible for the enforcement of the radiation protection legislation in Greece is the Greek Atomic Energy Commission (GAEC).

2.2.8 Ireland

In Ireland, the basic radiation protection legislation documents are the Radiological Protection Act, 1991 and the Radiological Protection Act, 1991 (Ionising Radiation) Order, SI no 125 of 2000. Article 3(1)(a)(iii) of the Ionising Radiation Order confirms that the Order applies to "the production and manufacture of consumer goods and the import or export of consumer goods to which radioactive substances have been deliberately added". Article 4(1) requires the licensing of the practices in Article 3(1), unless they are exempt by virtue of Article 5. The exemptions in Article 5 mirror those in Article 3(2) of Council Directive 96/29/Euratom. Article 4(2) prohibits the deliberate addition of radioactive substances in the production of foodstuffs, toys, personal ornaments and cosmetics, and the import and export of such goods.

The competent authority responsible for enforcing the Ionising Radiation Order and issuing licenses is the Radiological Protection Institute of Ireland.

2.2.9 Italy

In Italy, the primary radiation protection legislation is the Legislative Decree no. 230 of 17 March 1995, amended by Legislative Decrees no. 241 of 26 May 2000 and no. 257 of 9 May 2001. It is understood that these Legislative Decrees fully implement all the relevant requirements of Articles 3, 4 and 6 of Council Directive 96/29/Euratom.

The competent authority responsible for enforcing the radiation protection legislation is APAT, the Agenzia per la protezione dell'ambiente e per i servizi tecnici (Agency for the Protection of the Environment and for Technical Services), formerly known as ANPA.

2.2.10 Luxembourg

In Luxembourg, the primary radiation protection legislation document is the Règlement Grand-Ducal du 14 Décembre 2000 concernant la protection de la population contre les dangers résultant des rayonnements ionisants. Article 1.1 of this regulation confirms that the regulation applies to the production, handling, holding, storage, transport, sale, import, export, recycling and disposal of consumer products. Article 2.1 places establishments conducting these activities into four categories. Article 2.2-1 requires those in categories 1 to 3 to obtain prior authorisation. Those in category 4 are exempt from prior authorisation. The conditions for exemption mirror those in Article 3(2) of Council Directive 96/29/Euratom. If the product contains an activity below the exemption level, notification to the competent authority is not required. If the product is exempt by virtue of Article 2.7-3 (the dose rate at 0.1 m is less than 1 μSv/h and the source is sealed) notification is required. The competent authority also specifies the conditions for disposal in Article 2.7-4.

Article 10.2-4 prohibits both the activation of and the deliberate addition of radioactive substances in the production and manufacture of foodstuffs, toys,

personal ornaments and cosmetics, and the import, export and sale of such goods.

The competent authority responsible for enforcing radiation protection legislation is the Ministry of Health and the technical body is the Radiation Protection Department of the Ministry of Health.

2.2.11 Netherlands

No information was received.

2.2.12 Portugal

Radiation protection legislation in Portugal includes several Law Decrees and Regulatory Decrees, some of which implement parts of Council Directive 96/29 Euratom. The principal documents on radiation protection are the Regulatory Decree 9/90 (15 April 1990) and the Law Decree 165/2002 (17 July 2002). It is understood that this Law Decree implements all the relevant requirements of Articles 3, 4 and 6, with the exception of the conditions for exemption from reporting and licensing. These conditions for exemption are established in the Regulatory Decree 9/90.

The competent authority responsible for enforcing radiation protection legislation in Portugal is the General Directorate of Health in the Ministry of Health. In addition, the Nuclear and Technological Institute are responsible for authorisation and inspection relating to the transport of radioactive materials and the control of sealed sources.

2.2.13 Spain

The basic radiation protection legislation documents in Spain are the Decree on nuclear and radioactive Facilities and the Decree on health protection against the effects of ionising radiation. Article 74 of the first decree requires the deliberate addition of radioactive substances in the production of consumer goods, and the import, export and sale of such goods to be authorised. Article 5 of the second decree prohibits the addition of radioactive material to foodstuff, toys, cosmetics and personal adornments.

The competent authority responsible for proposing enforcement actions in the event of a violation of the radiation protection legislation is the Consejo de Seguridad Nuclear (CSN). In some cases, other executive authorities (for example, the Ministry for Economics and Regional Authorities) may commence an enforcement procedure. These authorities would need a radiation safety report from CSN in order to proceed.

2.2.14 Sweden

In Sweden the primary radiation protection legislation is the Radiation Protection Act. There are also two specific pieces of legislation that relate to consumer products. These are SS1 FS 1992:4 Regulations on Smoke Detectors for

Domestic Use, and SS1 FS 1992:1 Regulations on Compasses and Binoculars containing H-3.

The Radiation Protection Act requires licensing (prior authorisation) for the manufacture, sale, import and export of all consumer products with activities above the exemption limits specified in the Radiation Protection Ordinance. The Swedish Radiation Protection Authority has the power to demand a license even for products below the exemption limits.

The deliberate addition of radioactive substances in the production of toys, foodstuffs, personal ornaments and cosmetics, and the import and export of such goods is prohibited. The irradiation of gemstones, creating activation products, is not considered to fall into this category.

The competent authority responsible for enforcing the radiation protection legislation and the issue of licenses is the Swedish Radiation Protection Authority (SSI).

2.2.15 United Kingdom

In the UK there is no specific legislation governing the manufacture and supply of consumer products. However, any products that are considered to be unsafe can be removed from supply and prohibited by virtue of the General Product Safety Regulations 1994. Under these regulations, a "safe product" is one that under normal or reasonably foreseeable conditions of use does not present any risk, or only the minimum risk compatible with the products use.

The primary radiation protection legislation documents are the Ionising Radiations Regulations 1999 and the Radioactive Substances Act 1993. Although this legislation implements Article 3 of Council Directive 96/29 Euratom, it does not implement all of Article 4 and Article 6.

The enforcing authorities are the Health and Safety Executive and the Environment Agency.

The National Radiological Protection Board has prepared radiation protection standards for some categories of consumer products, but compliance with these is voluntary.

2.3 Relevant legislation in EU Candidate States and EU Accession States

In this section, information is given on the most important regulatory documents concerning the control of consumer products. Information is also given on the enforcing competent authorities in the thirteen Candidate and Accession States.

A table showing the name and address of each competent authority is given in Annex 3.

Although Norway and Switzerland are not member states of the European Union, it was considered useful to include information relating to these countries in this report. Part 2.3.14 gives information on the regulation of consumer products in Norway and Part 2.3.15 gives information on the regulation of consumer products in Switzerland.

2.3.1 Bulgaria

No information was received.

2.3.2 Cyprus

The basic radiation protection legislation document in Cyprus is The Protection from Ionizing Radiation Law of 2002. There is no specific legislation relating to the control of consumer products. It is understood that the Ionizing Radiation Law fully implements all the relevant requirements of Articles 3, 4 and 6 of Council Directive 96/29/Euratom.

The enactment of the Protection from Ionizing Radiation Law on 12 July 2002 appointed the Department of Labour Inspection as the regulatory authority for radiation protection, radioactive waste management and nuclear safety.

2.3.3 Czech Republic

A new amendment of the Czech Atomic Act has introduced a requirement for licensing of manufacture, import and export of consumer products. The amendment also enforces a ban on the deliberate addition of radioactive substances to foodstuffs, toys, personal ornaments and cosmetics, and a ban on the import and export of such goods.

The regulatory body responsible for the enforcement of the Act is the State Office for Nuclear Safety.

2.3.4 Estonia

The primary radiation protection legislation in Estonia is the Radiation Act (1997, as amended). Included in the Act are exemption levels, and consumer products with activity below the relevant level would not require reporting or prior authorisation. Any consumer products with activity above the exemption levels would be subject to the Act, which implements the requirements of Council Directive 96/29/Euratom. Information about any such products is kept by the

Estonian Radiation Protection Centre. General safety of consumer products is regulated by the Consumer Protection Act (1994).

The authorities responsible for the supervision of safety of consumer goods are the Consumer Protection Board and the Health Protection Inspectorate (Ministry of Social Affairs), the Technical Inspectorate and the Police Board.

2.3.5 Hungary

No information was received.

2.3.6 Latvia

In Latvia the basic radiation protection legislation document is entitled Protection against Ionising Radiation (09/04/02). This implements the requirements of Council Directive 96/29/Euratom. There is also a document entitled The Cabinet of Ministers Regulations on Activities involving Ionising Radiation Sources, which do not require a Special Permit (No 288, 03/07/01). This document sets out the conditions for exemption of some products from the requirement for licensing.

The basic regulations prohibit the deliberate addition of radioactive substances in commodities or products such as toys and personal jewellery or adornments.

The competent authority responsible for enforcing the radiation protection legislation in Latvia is the Radiation Safety Centre (RDC).

2.3.7 Lithuania

The primary radiation protection legislation is the Lithuanian Hygiene Standard HN73:2001 "Basic Standards of Radiation Protection" approved on 21 December 2001 by the Order No 663 of the Minister of Health. It is understood that this Hygiene Standard implements all the relevant requirements of Articles 3, 4 and 6 of the Council Directive 96/29/Euratom.

The general provisions on radiation protection are given in the Law on Radiation Protection. Its Article 8 states: "It shall be prohibited to add intentionally radioactive substances to foodstuffs, toys, jewellery, cosmetics and to market, import and export such products".

General requirements on safety of consumer products are given in the Law on Product Safety, though no direct reference to radiation or radioactivity is made in this document.

The fact that all the requirements of the Council Directives are transposed into Lithuanian radiation protection legislation has been confirmed by Swedish experts in the framework of the Phare Twinning Project "Creation of radiation protection infrastructure and developing of supporting services".

The competent authority responsible for enforcing the radiation protection legislation in Lithuania is the Radiation Protection Centre.

2.3.8 Malta

In Malta consumer products are subject to the requirements of The Product Safety Act 2001, for non-food products.

No further information was received.

2.3.9 Poland

The ordinance issued by the President of the National Atomic Energy Agency on 28 August 1997 (Polish Journal of Law no 59, item 567) sets out the criteria for authorisation of practices involving ionising radiation in Poland. On 6 August 2002 a further government regulation was issued (Polish Journal of Law no 137, item 1153). This sets out the requirements for reporting and authorisation of certain practices, including the exemptions from these requirements, and fully implements the relevant requirements of Council Directive 96/29/Euratom

The competent authority responsible for enforcing the radiation protection legislation in Poland is the National Atomic Energy Agency (NAEA) with the president of the NAEA named in the legislation as "the central organ of the governmental administration, competent for nuclear safety and radiological protection matters". The president of NAEA reports to the Minister for environmental matters.

2.3.10 Romania

In Romania, the primary radiation protection legislation is the Law no 111/10 October 1996, on the Safe Deployment of Nuclear Activities, with amendments, published in Official Gazette of Romania no 267 on 29/10/96. Article 38 of this Law requires the Ministry of Health and Family to authorise "the introduction into the social and economic circuit for utilisation by the population, of products that have been subject to irradiation or which contain radioactive material". This was augmented by the Radiological Safety Fundamental Norms/ 24 January 2000, published in Official Gazette no 404 on 29/8/00. This regulation implements the requirements of the Council Directive 96/29/Euratom, including the prohibition of deliberate addition of radioactive substances to foodstuffs, toys, personal ornaments and cosmetics. There is no specific legislation relating to consumer products at present, although a regulation setting out the criteria for authorisation of consumer products is planned.

The competent authority responsible for enforcing radiation protection legislation in Romania is the National Commission for Control of Nuclear Activities.

2.3.11 Slovak Republic

Act No 470 of 5 December 2000 and Regulation No 12 of 13 December 2000 on requirements for securing radiation protection form the radiation protection legislation in the Slovak Republic. Section 17(g) of Act 470 requires the production, storage, transport, import, export and disposal of consumer products to be reported unless the product meets specified exemption criteria (identical to those in Council Directive 96/29/Euratom). Part 9, Section 27 of Act 470 requires

prior authorisation for the production. manufacture, import and export of consumer products. The deliberate addition of radioactive substances in the production of foodstuff, toys, personal ornaments and cosmetics, and the import and export of such goods is prohibited under Section 17(f) of the Act.

The competent authority responsible for enforcing radiation protection legislation in the Slovak Republic is the Ministry of Health.

2.3.12 Slovenia

In Slovenia the primary radiation protection legislation is the Act on protection against ionising radiation and on nuclear safety (Official Gazette of the Republic of Slovenia, No. 67/02). The Act came into force on 1 October 2002. It is expected that new regulations relating to consumer products will be prepared under Article 90 of the Act later in 2003. The Act implements the requirements of Council Directive 96/29/Euratom, as detailed below.

Article 9 of the new Act requires the reporting of various practices, including the production, handling, holding, storage, transport, import, export and disposal of consumer products containing artificial radioactive sources, unless specified exemptions are met. Article 11 requires prior authorisation for the same practices and Article 89 prohibits the deliberate addition of radioactive substances in the production of foodstuffs, toys, personal ornaments and cosmetics, and the import and export of such goods.

The competent authority responsible for enforcing the radiation protection legislation was the Health Inspectorate of the Slovenian Republic, but since October 2002, the licensing and control of consumer products is the competence of the Slovenian Nuclear Safety Administration.

2.3.13 Turkey

The primary radiation protection legislation in Turkey is the Radiation Safety Regulation OJ23999, revised 24/3/00, Art.5. There is no specific legislation relating to the control of consumer products.

No further information was received.

2.3.14 Norway

In Norway the primary radiation protection legislation is the Act of May 12 2000 no 36 relating to radiation protection and the use of radiation. Norway is in the process of producing new regulations under this Act. There are three existing regulations under the previous Act, but these will be obsolete by the end of 2003.

The competent authority responsible for enforcing the radiation protection legislation is the Norwegian Radiation Protection Authority (NRPA).

2.3.15 Switzerland

In Switzerland the Radiological Protection Act of 22 March 1991 and the Radiological Protection Ordinance of 22 June 1994 are the basic radiation protection legislation documents. The legislation is based around the

International Commission on Radiation Protection (ICRP) principles of justification, optimisation and dose limitation as recommended in ICRP Publication 60.

The enforcing authority for all non-nuclear activities is the Swiss Federal Office of Public Health (SFOPH). Under certain conditions, the SFOPH can approve installations that emit ionising radiation and radioactive sources. This means that the handling by the end-user is not subject to licensing.

2.4 Guidance by international organisations

The purpose of this section is to give brief details of some of the relevant documents prepared by international organisations.

2.4.1 International guidance on specific products containing radioactive substances

2.4.1.1 Radiation Protection Standards for Gaseous Tritium Light Devices (GTLD) NEA/OECD, 1973

The intention of these standards was to provide a method of promoting a uniform approach to manufacture, import, use and ultimately disposal of GTLD in Member States of the Organisation. Use of the standard ensured that adequate protection of the user and the population as a whole was provided.

The document includes information on:

a) Principal considerations on the use of GTLD

b) Requirements for:

(i) manufacture;

(ii) import;

(iii) use;

(iv) marking and labelling.

c) Administrative control procedures

d) Surveillance by competent national authorities

e) Prototype tests

f) Radiation protection considerations

g) Technical data on Gaseous Tritium Light Sources (GTLS).

2.4.1.2 Recommendations for Ionization Chamber Smoke Detectors (ICSD) in Implementation of Radiation Protection Standards. NEA/OECD, 1977.

This document was intended to provide guidance to national authorities intending to establish practices and procedures to ensure that radiation doses to members of the public from the use of ICSD are as low as reasonably achievable.

The document includes information on:

a) Principal considerations for ICSD

b) Requirements for:

(i) manufacture;

(ii) import;

(iii) use;

(iv) marking and labelling.

c) Administrative control procedures

d) Surveillance by competent national authorities

Annex – Prototype tests

Appendix 1 – Evaluation of benefit and risk

2.4.2 General International Guidance on Consumer Products Containing Radioactive Substances

2.4.1.3 Radiation Protection of the Public in Respect of Consumer Goods Containing Radioactive Substances. CEC, 1984.

The purpose of this document is to provide competent authorities with guidance on consumer products containing radioactive substances and to identify the actions to be taken with respect to legal provisions, recommendations, information etc.

The intent of the document was not for it to be used as a set of regulations but rather as guidance drawn up by specialists and approved by scientific experts. The document is based around the International Commission on Radiological Protection (ICRP) principles of justification, optimisation and dose limitation. Using these principles to assess the total detriment to the public it recommends that the exposures to both users and non-users of a product are considered. Doses from normal use, misuse, accidents and disposal should be taken into account.

The following subjects are discussed in detail

a) General criteria for control

b) Special problems of consumer products

c) Requirements for manufacturers and importers

d) Criteria for authorisation

e) Advice to national authorities

f) Exchange of information within the European Community

g) Labelling and other information addressed to the public

h) Product testing requirements

i) Leak test methods

2.4.1.4 A Guide for Controlling Consumer Products Containing Radioactive Substances. NEA/OECD, 1985.

The guide provides National Authorities with a series of recommendations that define the policy and basic radiation protection principles to be followed when controlling consumer products. The guide defines consumer products as products that can be supplied to individuals of the general public after which they are essentially beyond further control for the purpose of radiation protection by the competent national authority.

As in the CEC document described in the preceding section, the guide is based on the ICRP principles of justification, optimisation and dose limitation. To ensure compliance with these principles, the guide recommends that a product is authorised by the national authority before it is made available to the general public.

When considering the detriment to users it is considered that higher doses are acceptable from products contributing to the safety of persons than from those products that do not.

The guide discusses the following subjects in detail:

a) Justification of the practice (justified uses, orders of benefit, unjustified uses and non-radioactive alternatives)

b) Optimisation of protection

c) Individual dose restrictions (users and non-users)

d) Accidents and misuse

e) Disposal

f) Prior authorisation (assessment, documentation, testing and quality control and labelling)

g) Post licensing surveillance

The guide also includes 2 annexes.

Annex 1 contains two tables that give information on consumer products currently available (Table 1) and products that were available in the past (Table 2). There may be some overlap of information contained in the two tables.

Annex 2 includes information on the prototype tests carried out on ionisation chamber smoke detectors. This is a more up to date version of the recommended tests specified in the NEA/OECD publication given in part 2.4.1.2.

3 INFORMATION ON AVAILABLE PRODUCTS AND NATIONAL CONTROLS

3.1 Procedures for obtaining information

Detailed questionnaires were sent to experts at the competent authorities in each of the 15 EU Member States and 13 Candidate and Accession States. In addition, the same questionnaire was sent to Norway and Switzerland. Information was requested in three areas:

- national requirements for licensing, testing and labelling;
- product data (radionuclides used and typical activities); and,
- numbers of products produced and imported.

The quality of the responses varied considerably, with some respondents giving only sparse information or none at all. Where it was felt that further information was needed, the questionnaires were followed up by letter and telephone.

The information from EU member states and candidate states is summarised in Parts 3.2 and 3.3, and tabulated in Annex 1.

In addition, representative manufacturers of consumer products were selected and sent a detailed questionnaire. Information was requested in three areas:

- product data (radionuclides used and typical activities);
- numbers of products distributed per annum, and countries to which they are exported; and,
- availability of products on the internet.

The information supplied in the first two areas is summarised in Part 3.4 and tabulated in Annex 1. Internet sales are dealt with in Part 4.

3.2 National practices in EU Member States

This section gives a country by country summary of the replies to the questionnaires concerning national practices related to the control of consumer products.

A product-by-product summary, giving information on the radionuclides used, activities and numbers manufactured and imported, is given in Table 1 of Annex 1.

3.2.1 Austria

No information was provided by Austria.

3.2.2 Belgium

No information was provided by Belgium.

3.2.3 Denmark

The following information was supplied by a representative from the National Institute of Radiation Hygiene and represents their opinion of the situation in Denmark.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- surge voltage protectors containing up to 5 MBq tritium;
- thoriated ophthalmic lenses; and,
- thoriated tungsten welding electrodes.

Prohibited products

The following products were reported to be prohibited:

- irradiated gemstones; and,
- toys and novelties containing radioactive material.

Products that are subject to licensing

It was reported that the following products are, or would be subject to licensing for import and manufacture:

- ICSD;
- compasses and timepieces incorporating radioluminous paint;
- timepieces, compasses, fishing floats, torches, telephone dials and emergency signs incorporating gaseous tritium light sources (GTLS);
- surge voltage protectors;
- anti-static devices;
- thoriated gas mantles;
- thoriated camera lenses;
- thoriated ophthalmic lenses; and,
- thoriated tungsten welding rods;

Products that are subject to testing

The respondent indicated that:

- ICSD are subject to testing at NIRH and must meet the standards ISO 1677 and ISO 2919; and,
- surge voltage protectors are also subject to type testing.

Products that are subject to labelling

It was reported that labelling is required for:

- ICSD; and,
- surge voltage protectors.

Products that are subject to controlled disposal

The respondent indicated that ICSD are subject to limited control on disposal in that each consumer can dispose of three smoke detectors with normal household waste every month. Otherwise there are no controls on disposal of consumer products.

3.2.4 Finland

The following information was supplied by a representative from the Radiation and Nuclear Safety Authority (STUK) and represents their opinion of the situation in Finland.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- compasses and timepieces incorporating radioluminous paint; and,
- thoriated gas mantles.

It was also noted that the following products might well be in use in Finland, but that STUK had not encountered them and hence did not have reliable information on their availability:

- fluorescent lamp starters and surge voltage protectors;
- thoriated lenses, and;
- irradiated gemstones.

The respondent noted that the following products are also known to be available in Finland, but by their nature are used for limited professional purposes only:

- compasses and other bearing equipment incorporating gaseous tritium light sources (GTLS);
- emergency signs incorporating GTLS (in aeroplanes);
- anti-static devices; and,
- thoriated tungsten welding rods.

Prohibited products

It was reported that the use of radioactive materials in foodstuffs, cosmetics, toys and similar consumer products is prohibited.

ICSD would also be prohibited from sale to members of the public if the source activity was greater than 37 kBq americium-241. No such cases have yet been identified by STUK.

Products that are subject to licensing

It was reported that the following products are, or would be subject to licensing:

- ICSD if imported or traded wholesale;
- trade in timepieces and compasses containing radioluminous paint, if the activity is more than 400 MBq tritium or more than 8 MBq promethium-147; and,
- trade in compasses incorporating gaseous tritium light sources (GTLS) of activity greater than 10 GBq.

Products that are subject to testing

The respondent indicated that new types of ionisation chamber smoke detector are subject to inspection, but the only requirement stated is that the source activity must be less than 37 kBq. Otherwise, no radiation safety testing is required.

Products that are subject to labelling

The respondent indicated that labelling is required for ICSD.

Products that are subject to controlled disposal

The respondent indicated that no consumer products require controlled disposal.

3.2.5 France

No information was provided by France.

3.2.6 Germany

The following information was supplied by a representative from the Bayerisches Landesamt für Umweltschutz (LFU) and represents their opinion of the situation in Germany. It was noted, however, that the LFU acts as licensing and inspecting authority for Bavaria only, and therefore might not be aware of consumer products used and distributed in other parts of Germany.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- compasses and timepieces incorporating radioluminous paint;
- timepieces incorporating gaseous tritium light sources (GTLS);
- fluorescent lamp starters;
- surge voltage protectors;
- discharge and metal vapour lamps;
- thoriated gas mantles;
- thoriated tungsten welding rods;
- glassware and tableware incorporating uranium and thorium; and,
- ceramic tiles incorporating uranium and thorium.

It is also known that 766 binoculars or telescopes each containing up to 100 GBq of tritium were sold to the public from former GDR army. Some of these could be seized and the sources removed. These products would be prohibited because of their activity and the fact that their use is not justified.

It was noted that the following products might be in use in Germany, but that LFU had not encountered them and hence did not have reliable information on their availability:

- compasses, torches and telephone dials incorporating GTLS;
- thoriated ophthalmic lenses and thoriated lenses in x-ray cameras; and,
- irradiated gemstones.

Finally, the respondent noted that the following products are also known to be available in Germany, but by their nature it is considered that these will be used for limited professional purposes only:

- emergency signs incorporating GTLS (mainly in aircraft);
- instrument dials incorporating radioluminous paint in aeroplanes, ships etc;
- weapons sights incorporating GTLS (authorised for police use only); and,

- thoriated mirrors for lasers.

Prohibited products

The following products were reported to be prohibited:

- timepieces incorporating radioluminous paint where the total activity exceeds 250 MBq tritium, 5 MBq promethium-147 or 50 kBq radium*;
- compasses incorporating radioluminous paint where the total activity exceeds 250 MBq tritium, 5 MBq promethium-147 or 400 MBq radium*;
- products incorporating GTLS where the total activity exceeds the exemption level of 1 GBq;
- dental products containing uranium; and,
- glassware and tableware incorporating uranium where certain conditions are not met. It is probable that the production and import of such items will not be granted licenses in the future as the use of them is not considered to be justified.

*these exemption levels relate to older radiation protection legislation but are still in force for consumer products purchased before the new regulations (implementing the exemption levels from the EC directive) were published.

It is also possible that the production and import of irradiated gemstones will not be permitted as the use of these is not considered to be justified.

It was noted that a recent incident had occurred where a member of the public in Bavaria had purchased "glowrings" containing GTLS from Traser, and then offered them for sale on the internet auction site eBay. These items would be prohibited in Germany as they lack a proper justification, and their total activity is above the exemption level.

Products that are subject to licensing

It was reported that the following products are, or would be subject to licensing:

- production and import of all consumer products;
- ICSD (importing and installation only, otherwise these are type approved);
- surge voltage protectors and electronic valves if the activity exceeds the relevant exemption limits;

Products that are subject to testing

The respondent indicated that ICSD require type testing.

Products that are subject to labelling

The respondent indicated that labelling is required for the following products:

- ICSD; and,
- surge voltage protectors and non-exempt electronic valves.

Fluorescent lamp starters and discharge/metal vapour lamps are supplied with information about the radioactive content in the instruction booklet.

Products that are subject to controlled disposal

The respondent indicated that the following products must be returned to the supplier or disposed of as radioactive waste:

- ICSD;
- compasses incorporating radioluminous paint; and,
- surge voltage protectors and electronic valves.

In addition, the licence granted for timepieces incorporating GTLS requires products to be returned to the supplier if the annual dose from their unregulated disposal could exceed 10 μSv per annum. It is proposed to initiate the same system for the following products:

- thoriated gas mantles;
- fluorescent lamp starters; and,
- discharge and metal vapour lamps.

3.2.7 Greece

The following information was supplied by a representative from the Greek Atomic Energy Commission (GAEC) and represents their opinion of the situation in Greece.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- fluorescent lamp starters containing up to 70 Bq thorium-232;
- thoriated gas mantles;
- camera lenses containing thorium;
- thoriated tungsten welding electrodes;
- glassware and tableware incorporating uranium and thorium; and,
- irradiated gemstones (no information on radionuclides and activities).

The respondent stated that there is no available information on thoriated opthalmic lenses, ceramic tiles containing uranium or thorium, badges and cloisonné jewellery containing uranium or thorium, and dental products containing uranium. These products may be available.

Prohibited products

The respondent indicated that toys and novelties containing radioactive materials are prohibited. Thoriated gas mantles and thoriated welding electrodes are under review and may be prohibited in the future.

Products that are subject to licensing

The respondent indicated that owners of thoriated camera lenses require authorisation for a specific use of this equipment (for example, collecting them as a hobby).

Products that are subject to testing

The respondent stated that thoriated camera lenses must be analysed by gamma spectroscopy. This is also recommended for irradiated gemstones, though not mandatory.

Products that are subject to labelling

The respondent indicated that no consumer products require labelling.

Products that are subject to controlled disposal

The respondent stated that controlled disposal is required for thoriated camera lenses.

3.2.8 Ireland

The following information was supplied by a representative from the Regulatory Service of the Radiological Protection Institute of Ireland (RPII) and represents their opinion of the situation in Ireland.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD); and,
- thoriated tungsten welding electrodes.

It was also noted that aircraft exit signs and weapons sights containing GTLS might be available to collectors buying via the internet.

Following the initial survey, it was found that a company supplying watches and other items incorporating gaseous tritium light sources (GTLS) had opened a distribution centre in Ireland.

Prohibited products

The following were reported to be prohibited:

- toys and novelties containing radioactive materials; and,
- lightning preventors.

The respondent noted that lightning preventors containing radioactive sources are no longer permitted into the country as they have not been shown to be more effective than non-radioactive alternatives. However, it is unlikely that they were ever available to members of the public as most were used in industry.

Products that are subject to licensing

The respondent stated that licensing would be required for compasses and timepieces incorporating radioluminous paint if the activity in the paint exceeds that specified in the licensing order, The Radiological Protection Act, 1991 (Ionising Radiation) Order S.I. No. 125 of 2000. All other products are likely to be exempt from licensing under the terms specified in Article 5(1) of this Order.

Products that are subject to testing

The respondent indicated that no consumer products were subject to testing.

Products that are subject to labelling

The respondent stated that labelling is required for ICSD, which must be labelled with the radionuclide, activity and trefoil symbol.

Products that are subject to controlled disposal

It was reported that ICSD must be returned to the supplier.

3.2.9 Italy

The following information was supplied by a representative from the Agency for the Protection of the Environment and for Technical Services (APAT) and represents their opinion of the situation in Italy.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- timepieces incorporating radioluminous paint for "special use";
- compasses incorporating radioluminous paint;
- fluorescent lamp starters;
- surge voltage protectors; and,
- electronic valves.

Prohibited products

The following were reported to be prohibited:

- timepieces incorporating radioluminous paint, intended for general use;
- lightning preventors;
- anti-static devices;
- thoriated gas mantles;
- badges or cloisonné jewellery incorporating uranium or thorium;
- irradiated gemstones; and,
- toys and novelties containing radioactive material.

The respondent commented that although timepieces incorporating radioluminous paint, are prohibited, such goods can be found in local markets. These are often imported from Russia or from Asia, and usually contain tritium, or occasionally radium.

Products that are subject to licensing

The respondent indicated that licensing is required for timepieces incorporating radioluminous paint for "special use" with the higher activities specified above.

Products that are subject to testing

The respondent indicated that no consumer products require testing.

Products that are subject to labelling

It was reported that labelling is required for:

- ICSD; and,
- timepieces incorporating radioluminous paint.

Products that are subject to controlled disposal

The respondent indicated that no consumer products are subject to controlled disposal.

3.2.10 Luxembourg

The following information was supplied by a representative from the Division de la radioprotection, Direction de la Santé and represents their opinion of the situation in Luxembourg.

Products available

The respondent indicated that although no consumer products are manufactured in Luxembourg, the following are available:

- thoriated opthalmic and camera lenses.

The comment was made that although it was thought that other products were not available, the free movement of all goods within the EC means that systematic control is difficult. In particular, although the sale of ICSD is prohibited in Luxembourg, they can be bought in supermarkets in Belgium near the Luxembourg border. Another possibility is that citizens of Luxembourg might travel to other countries and purchase boats or aeroplanes with emergency signs containing gaseous tritium light sources (GTLS). However, such cases would be relatively infrequent and Luxembourg boat owner generally keep their craft in foreign ports.

The respondent also noted that very recently a Luxembourg fisherman had contacted the Department of Health to notify them that he had purchased fishing floats containing GTLS from the UK via the internet.

Prohibited products

The following were reported to be prohibited:

- ICSD;
- lightning preventors containing radioactive sources; and,
- thoriated gas mantles.

Lightning preventors containing radioactive sources are no longer available, but some 30 to 40 years ago, many were owned by members of the public.

Products that are subject to licensing

The respondent indicated that licensing would be required for:

- ICSD (although prohibited, may be licensed in special circumstances, but no requests received since 1994);
- timepieces incorporating radioluminous paint (licence would probably not be granted as use deemed unjustified); and,
- emergency signs containing GTLS, although it is recognised that this would be hard to administer as persons buying equipment in foreign countries may not be aware that they contain radioactive material.

Products that are subject to testing

The respondent indicated that no consumer products require testing.

Products that are subject to labelling

The respondent stated that labelling is required for any licensed sources.

Products that are subject to controlled disposal

The respondent indicated that no consumer products are subject to controlled disposal. It is noted however that disused ICSD must be returned to the supplier or transferred to another country with a radioactive waste disposal facility. The same applies to old lightning preventors containing radioactive sources.

3.2.11 Netherlands

The following information was supplied by a representative from the Ministry of the Environment and represents their opinion of the situation in the Netherlands.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- emergency signs incorporating gaseous tritium light sources (GTLS);
- fluorescent lamp starters; and,
- ceramic tiles incorporating various naturally occurring radioactive materials.

This is a general overview of the situation in the Netherlands, and the respondent commented that it was based on her knowledge and might not be a comprehensive list.

Prohibited products

The following were reported to be prohibited:

- fishing floats incorporating gaseous tritium light sources (GTLS);
- lightning preventors;
- anti-static devices;
- thoriated incandescent gas mantles;
- thoriated tungsten welding electrodes; and,
- dental products containing uranium.

It was noted that the sale of ICSD to the general public will be prohibited by January 2006.

Products that are subject to licensing

The respondent indicated that the storage and sale of ICSD require licensing, unless the devices meet specified exemption requirements and no more than 50 are stored.

Products that are subject to testing

The respondent stated that ICSD must meet specified requirements, and a list of ICSD types meeting these requirements is regularly published.

Products that are subject to labelling

It was reported that ICSD must be labelled on the outside, and a radiation warning trefoil symbol must be visible when the device is opened up.

Products that are subject to controlled disposal

The respondent stated that along with other electrical applicances, ICSD must be collected for disposal by a recognised disposal organisation.

3.2.12 Portugal

The following information was supplied by a representative from the Nuclear and Technological Institute and represents their opinion of the situation in Portugal.

Products available

The response to the questionnaire indicated that no consumer products were manufactured in Portugal, but that some were imported. These are thought to include:

- ionisation chamber smoke detectors (ICSD); and,
- various radioluminous items.

The response also indicated that in the past, thousands of ICSD and lightning preventors containing radioactive sources were imported every year. However, the number of ICSD imported has reduced considerably and they are being replaced by the non-radioactive optical type. Lightning preventors containing radioactive sources are no longer permitted.

Prohibited products

The following were reported to be prohibited:

- the deliberate addition of radioactive substances in the production of foodstuffs, toys, personal ornaments and cosmetics; and,
- lightning preventors.

Products that are subject to licensing

The respondent indicated that the national legislation requires prior authorisation for the import and sale of all products that do not meet the conditions for exemption.

Products that are subject to testing

No information supplied.

Products that are subject to labelling

No information supplied.

Products that are subject to controlled disposal

No information supplied.

3.2.13 Spain

The following information was supplied by a representative from the Consejo de Seguridad Nuclear (CSN) and represents their opinion of the situation in Spain.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- fishing floats incorporating gaseous tritium light sources (GTLS);
- thoriated gas mantles; and,
- thoriated tungsten welding electrodes.

The respondent also noted that from time to time CSN hears of other goods being sold (for example, luminous watches). In most cases it is found that the supplier is not aware that the product contains radioactive materials, or that regulations exist. This is usually resolved by writing to the supplier to give information on the regulations and requesting either a cessation of the supply if the product is prohibited, or proper application of the licensing procedure if the product is not prohibited.

Prohibited products

The following were reported to be prohibited:

- lightning preventors;
- irradiated gemstones; and,
- toys and novelties containing radioactive materials.

Products that are subject to licensing

The respondent indicated that all products would be subject to licensing. Spanish regulations require authorisation to manufacture or sell any product containing radioactive substances, even when the product contains a quantity below the exemption levels. So far, the manufacture and sale of ICSD is the only activity that has been authorised in Spain. Usage of ICSD is exempt from licensing under a type approval scheme.

Products that are subject to testing

The respondent indicated that testing is required for ICSD, which must pass tests specified by the NEA.

Products that are subject to labelling

It was reported that labelling is required for ICSD. The labelling content is specified in the regulations.

Products that are subject to controlled disposal

The respondent indicated that no consumer products are subject to controlled disposal.

3.2.14 Sweden

The following information was supplied by a representative from the Swedish Radiation Protection Authority (SSI) and represents their opinion of the situation in Sweden.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- timepieces incorporating radioluminous paint;
- compasses incorporating gaseous tritium light sources (GTLS);
- emergency signs incorporating GTLS, authorised in aeroplanes only;
- telescopic sights for weapons incorporating GTLS;
- fluorescent lamp starters;
- surge voltage protection devices;
- electronic valves;
- thoriated incandescent gas mantles;
- thoriated ophthalmic lenses;
- thoriated camera lenses;
- thoriated tungsten welding electrodes; and,
- irradiated topaz.

Prohibited products

It was reported that toys and novelties containing radioactive materials are prohibited.

Products that are subject to licensing

The respondent indicated that ICSD are subject to licensing if imported or manufactured; and that compasses incorporating GTLS are subject to licensing on manufacture, import and sale.

It was also stated that a license is required for telescopic sights containing tritium, as well as for the weapon on which it is fitted.

Irradiated gemstones must be licensed, with a condition that the activity level must be below a set exemption level (70 Bq/g) before transfer to the consignee.

Products that are subject to testing

The respondent indicated that ICSD are subject to testing of both the design of the item and the source holder. They receive a certificate of performance of function testing.

Compasses containing GTLS are subject to testing of both the design of the item and the securing of the source.

Products that are subject to labelling

It was reported that labelling is required for:

- ICSD;
- compasses incorporating GTLS; and,
- telescopic sights for weapons incorporating tritium.

Products that are subject to controlled disposal

The respondent indicated that the following must be returned to the supplier:

- compasses incorporating GTLS; and,
- telescopic sights for weapons incorporating tritium.

With regard to the disposal of ICSD, fluorescent lamp starters, surge voltage protectors and electronic valves, it was reported that there is a problem in collecting a large number of items, which has yet to be resolved.

3.2.15 United Kingdom

The following information was supplied by a representative from the National Radiological Protection Board (NRPB) and represents their opinion of the situation in the UK.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- timepieces and compasses incorporating radioluminous paint;
- timepieces and compasses incorporating gaseous tritium light sources (GTLS);
- other items containing GTLS, for example fishing floats, torches and keyrings (known as "glowsticks");
- fluorescent lamp starters;
- antique glassware containing uranium;
- antique ceramic tiles glazed with uranium; and,
- irradiated gemstones.

Prohibited products

It was reported that no products are specifically prohibited.

Products that are subject to licensing

The respondent indicated that in general, products are not subject to licensing for sale and import. Retail premises, however, would require a certificate of registration (essentially a licence) if more than 500 single station ICSD were held on the premises.

Products that are subject to testing

It was reported that testing is not compulsory for any consumer product.

Products that are subject to labelling

The respondent indicated that labelling was not compulsory for any consumer product.

Products that are subject to controlled disposal

The respondent indicated that no consumer products are subject to controlled disposal.

3.3 National practices in EU Candidate and Accession States

This section gives a country by country summary of the replies to the questionnaires concerning national practices related to the control of consumer products.

A summary of the information provided by Norway and Switzerland is also given in this section.

A product-by-product summary, giving information on the radionuclides used, activities and numbers manufactured and imported, is given in Table 2 of Annex 1.

3.3.1 Bulgaria

No information was provided by Bulgaria.

3.3.2 Cyprus

The following information was supplied by a representative from the Department of Labour Inspection, which has been recently appointed as the regulatory authority for radiation protection and represents their opinion of the situation in Cyprus.

Products available

The respondent had little information about the availability of consumer products in Cyprus. It is known that the following have been available in the past, but are no longer on sale:

- ionisation chamber smoke detectors (ICSD); and,
- lightning preventors.

It was reported that most of these devices have been removed from buildings and are kept in storage.

The respondent had no information is available about other products, but it is thought that they are not used in Cyprus, or, if they are, their number and activity is "very limited". The Department of Labour Inspection hopes to conduct a detailed survey of consumer products available in the future.

Prohibited products

No information available.

Products that are subject to licensing

The respondent indicated that no consumer products are subject to licensing.

Products that are subject to testing

The respondent indicated that no consumer products require testing.

Products that are subject to labelling

The respondent indicated that no consumer products require labelling.

Products that are subject to controlled disposal

No information available.

3.3.3 Czech Republic

The following information was supplied by a representative from the State Office for Nuclear Safety and represents their opinion of the situation in the Czech Republic.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- anti-static devices; and,
- glassware and tableware containing uranium or thorium.

It was also reported that some old product might still be in the public domain, for example, domestically produced ICSD incorporating radium-226 sources, ICSD imported from Russia incorporating plutonium-238 sources and lightning preventors . However, these older products are no longer available for the public to purchase.

Prohibited products

It was reported that toys and novelties containing deliberately added radioactive materials are prohibited.

Products that are subject to licensing

It was reported that the manufacture, import and export of all consumer products is subject to authorisation from the State Office for Nuclear Safety. With regard to ICSD, the user is also obliged to report if they have more than 20 ICSD.

Products that are subject to testing

The respondent indicated that type testing was required for ICSD, which must meet the requirements of ISO 2919, ISO 9978 and the NEA Recommendations of 1997.

Products that are subject to labelling

The respondent indicated that labelling is required for ICSD.

Products that are subject to controlled disposal

It was reported that ICSD were subject to controlled disposal, although there was no indication of how this was achieved.

3.3.4 Estonia

The following information was supplied by a representative from the Estonian Radiation Protection Centre (ERPC) and represents their opinion of the situation in Estonia.

Products available

As far as ERPC is aware, there are no consumer products manufactured in Estonia. Ionisation chamber smoke detectors (ICSD), were reported to be available to the public. ERPC has no information about any other available products.

Prohibited products

It was reported that deliberate addition of radioactive substances in the production of foodstuffs, toys, personal ornaments and cosmetics, and the import or export of such goods is prohibited.

Products that are subject to licensing

It was reported that licensing is required for consumer products if the activity is above the relevant exemption level.

Products that are subject to testing

It was reported that type testing would be required for ICSD, however, no details of the test requirements were given.

Products that are subject to labelling

The respondent indicated that labelling is required for products with an activity above the relevant exemption level.

Products that are subject to controlled disposal

The respondent stated that controlled disposal (in a radioactive waste facility) would be required for products with an activity above the relevant exemption level.

3.3.5 Hungary

No information was provided by Hungary.

3.3.6 Latvia

The following information was supplied by a representative from the Radiation Safety Centre and represents their opinion of the situation in Latvia.

Products available

As far as the Radiation Safety Centre is aware, there are no consumer products manufactured in Latvia. The following were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD); and,
- thoriated welding electrodes.

Older ICSD containing between 0.37 and 37 MBq plutonium-239 are reported to be still in use in the industrial sector, but it is thought that they are not available to members of the public. Since 1994 efforts have been made to stop the use of these ICSD in Latvia.

The import of consumer products is controlled by the requirement to license products containing activities greater than the licensing limits (see below). Radiation detection devices are installed at twenty border crossing points, although these would not necessarily detect the very low levels of external radiation associated with most consumer products. The comment was made that there may have been some import of unknown consumer products "with a rather small content of radioactive materials".

Prohibited products

The respondent indicated that no consumer products are prohibited.

Products that are subject to licensing

It was reported that licensing is required for:

- ICSD if total activity of one detector exceeds 74 kBq, or total number exceeds 100; and,
- thoriated welding electrodes if the thorium concentration exceeds 5% and the amount of rods used during a year exceeds 1000 kg.

Products that are subject to testing

The respondent indicated that no consumer products require testing.

Products that are subject to labelling

It was reported that labelling is required for ICSD, which must be labelled with the source information and trefoil symbol.

Products that are subject to controlled disposal

The respondent stated that controlled disposal is required for ICSD. There is a limit on the total activity in a disposal site.

3.3.7 Lithuania

The following information was supplied by a representative from the Radiation Protection Centre (RSC) and represents their opinion of the situation in Lithuania.

Products available

The respondent indicated that no consumer products were manufactured in Lithuania, and that none are currently available to the public. Ionisation chamber smoke detectors (ICSD) are available for industrial and other uses, but members of the public can only buy non-radioactive smoke detectors.

Prohibited products

The following were reported to be prohibited:

- irradiated gemstones; and,
- toys and novelties containing radioactive materials.

Although irradiated gemstones are not given in the list of forbidden products, the following is stated in the Lithuanian Hygiene Standard HN73:2001 "Basic Standards of Radiation Protection": "it shall be prohibited to intentionally add radioactive substances to foodstuffs, toys, jewellery or to cosmetics and to market, import and/or export such products)".

Products that are subject to licensing

The respondent indicated that all the following would be subject to licensing if the dose rate at 0.1 m from the accessible surfaces exceeded 1μSv/h:

- ICSD;
- timepieces and compasses incorporating radioluminous paint;
- timepieces, compasses, fishing floats, torches, telephone dials and emergency signs incorporating gaseous tritium light sources (GTLS);
- fluorescent lamp starters;
- surge voltage protectors;
- electronic valves;
- lightning preventors; and,
- anti-static devices.

The respondent indicated that all the following would be subject to licensing if the thorium activity exceeded 1 kBq:

- Thoriated incandescent gas mantles;
- Thoriated opthalmic lenses;

- Thoriated camera lenses;
- Thoriated tungsten welding rods;
- Glassware and tableware incorporating uranium or thorium;
- Ceramic tiles incorporating uranium or thorium; and
- Badges or cloisonné jewellery incorporating uranium or thorium.

In general, the approach given in Council Directive 96/29/Euratom is used to determine what practices and sources need licensing.

Products that are subject to testing

The respondent indicated that no consumer products require testing, unless they are subject to licensing.

Products that are subject to labelling

It was reported that labelling would be required for all those products that are subject to licensing.

Products that are subject to controlled disposal

The respondent stated that controlled disposal would be required for all those products that are subject to licensing.

3.3.8 Malta

No information was provided by Malta.

3.3.9 Poland

The following information was supplied by a representative from the National Atomic Energy Agency, Department for Radiation and Nuclear Safety and represents their opinion of the situation in Poland.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- gun sights containing GTLS; and,
- irradiated gemstones.

It was reported that there has been only one documented case of the use of products containing GTLS and the relevant authorisation for installation of GTLS in gun sights was issued in July 2002. The best evidence is for ICSD, as the manufacturers and installers of these products in Poland have been under very good regulatory control for more than 10 years. The respondent commented that this information was based on the evidence available to the competent authority. In addition to the products listed, there may well be others available, which the competent authority has no knowledge of. It is possible for products containing radioactive materials below the exemption levels given in Council Directive 96/29/Euratom to be imported without reporting.

Prohibited products

The following were reported to be prohibited:

- older ICSD containing plutonium-238 and plutonium-239;
- ICSD containing americium-241 if the product does not fulfil the criteria for exemption from reporting given in Article 3 of Council Directive 96/29/Euratom; and,
- irradiated gemstones if activity in a single item exceeds 10 kBq.

Products that are subject to licensing

The following were reported to be subject to licensing:

- the manufacture and distribution of ICSD;
- the manufacture and distribution of products containing GTLS; and,
- the manufacture and distribution of irradiated gemstones.

Products that are subject to testing

It was reported that ICSD are subject to testing to ensure that they meet the requirements of Polish standard PN-86/J-02000, which is the equivalent of ISO 2919-1980.

Products that are subject to labelling

The respondent indicated that labelling is required for ICSD, which must be labelled in Polish with the information that the product contains a radioactive source.

Products that are subject to controlled disposal

The respondent indicated that no consumer products used by the public would require controlled disposal.

3.3.10 Romania

The following information was supplied by a representative from the National Commission for Nuclear Activities Control (CNCAN) and represents their opinion of the situation in Romania.

Products available

The response to the questionnaire indicated that no consumer products were available in Romania, and this was later confirmed by CNCAN.

Prohibited products

The respondent stated that the deliberate addition of radioactive substances in the production of foodstuffs, toys, personal ornaments and cosmetics is prohibited.

Products that are subject to licensing

It was reported that the national regulations require the supply of all consumer products to be authorised. The criteria for specific consumer products are to be provided in a new regulation.

Products that are subject to testing

According to the questionnaire, all consumer products would require testing.

Products that are subject to labelling

According to the questionnaire, all consumer products would require labelling.

Products that are subject to controlled disposal

According to the questionnaire, all consumer products would require controlled disposal. Consumer products would be returned to the supplier or the national radioactive waste repository.

3.3.11 Slovak Republic

The following information was supplied by a representative from the State Health Institute of the Slovak Republic and represents their opinion of the situation in the Slovak Republic.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- timepieces and compasses incorporating radioluminous paint;
- clock faces on car fascia incorporating radioluminous paint;
- timepieces, compasses, fishing floats, torches, telephone dials and emergency signs incorporating gaseous tritium light sources (GTLS);
- fluorescent lamp starters; and,
- surge voltage protectors.

Prohibited products

It was reported that toys and novelties containing radioactive materials were prohibited.

Products that are subject to licensing

The respondent indicated that no consumer products are subject to licensing.

Products that are subject to testing

The respondent indicated that no consumer products require testing.

Products that are subject to labelling

The respondent indicated that no consumer products require labelling.

Products that are subject to controlled disposal

The respondent indicated that no consumer products are subject to controlled disposal.

3.3.12 Slovenia

The following information was supplied by a representative from the Health Inspectorate of the Slovenian Ministry of Health (HIRS) and represents their opinion of the situation in Slovenia.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- timepieces and compasses incorporating radioluminous paint; and,
- telescopic sights for guns incorporating gaseous tritium light sources (GTLS).

It was reported that around ten years ago the "Josef Stefan" Institute near Ljubljana produced large quantities of ICSD (approximately 200 000 in total) for the Yugoslav market. The Health Inspectorate for the Republic of Slovenia (HIRS) has records and control over approximately 25 000 ICSD in Slovenia. A further 19 000 ICSD are in a storage facility for low and medium radioactive waste at the Research Reactor Centre of the "Josef Stefan" Institute. These are managed by the Agency for Radioactive Waste (ARAO).

The respondent commented that items incorporating radioluminous paint and GTLS are rare in Slovenia.

It was also noted that items containing thorium and uranium are not produced in Slovenia but a few hundred grams of imported thorium is stored at ARAO. More than ten years ago it was used in the optical industry.

HIRS does not have any information about electronic devices containing radioactive material.

Prohibited products

The following were reported to be prohibited:

- ICSD incorporating radium-226, or those where the dose rate at 0.1 m is more than 1.0 μGy/h;
- timepieces and compasses incorporating radioluminous paint containing soluble tritium or soluble promethium-147; and,
- the deliberate addition of radioactive substances in the production of foodstuffs, toys, personal ornaments and cosmetics.

Products that are subject to licensing

The following were reported to be subject to licensing:

- ICSD if the individual activity exceeds 3.7 kBq;
- timepieces and compasses incorporating radioluminous paint if the activity exceeds 74 MBq tritium or 7.4 MBq promethium-147; and,
- telescopic sights for weapons if the activity exceeds 74 MBq tritium.

Products that are subject to testing

The following were reported to be subject to periodic dose rate measurements and wipe tests by an approved health physics service:

- ICSD; and,
- timepieces and compasses incorporating radioluminous paint.

Products that are subject to labelling

It was reported that labelling is required for:

- ICSD (inside the detector); and,
- timepieces and compasses incorporating radioluminous paint.

Products that are subject to controlled disposal

The respondent indicated that the following products must be returned to the supplier or sent to the national radioactive waste storage facility:

- ICSD;
- timepieces and compasses incorporating radioluminous paint; and,
- telescopic sights for weapons.

3.3.13 Turkey

The following information was supplied by a representative from the Turkish Atomic Energy Authority (TAEK) and represents their opinion of the situation in Turkey.

Products available

The respondent indicated that no consumer products are manufactured in Turkey, but the following are imported:

- ionisation chamber smoke detectors (ICSD).

Prohibited products

The following were reported to be prohibited:

- timepieces and compasses incorporating radioluminous paint;
- timepieces, compasses, fishing floats, torches, telephone dials and emergency signs incorporating gaseous tritium light sources (GTLS);
- lightning preventors;
- anti-static devices;
- thoriated incandescent gas mantles;
- thoriated ophthalmic and camera lenses;
- thoriated tungsten welding electrodes;
- glassware, tableware, tiles, badges, cloisonné jewellery and dental products incorporating uranium or thorium;
- irradiated gemstones; and,
- toys and novelties containing radioactive materials.

Products that are subject to licensing

The respondent indicated that no consumer products are subject to licensing.

Products that are subject to testing

The respondent indicated that no consumer products require testing.

Products that are subject to labelling

The respondent indicated that no consumer products require labelling.

Products that are subject to controlled disposal

It was reported that ICSD must be returned to the supplier.

3.3.14 Norway

The following information was supplied by a representative from the Norwegian Radiation Protection Authority (NRPA) and represents their opinion of the situation in Norway.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD);
- night sights in guns and telescopes containing gaseous tritium light sources (GTLS);
- thoriated gas mantles;
- thoriated tungsten welding rods; and,
- glassware and tableware incorporating uranium.

The competent authority has never received an application for a licence to import timepieces containing radioluminous paint, so it is thought that they are not available in Norway. It is recognised that such items might be imported without the knowledge of the competent authority, but their discussions with the trade indicate that such products are not common in Norway.

Prohibited products

The respondent indicated that no consumer products are prohibited.

Products that are subject to licensing

It was reported that licensing is required for:

- ICSD (must be approved by fire-technical laboratory);
- timepieces incorporating radioluminous paint (must conform to ISO 3157), but see above;
- import and sale of night sights containing GTLS; and,
- import of uranium oxide.

The respondent commented that glassware and tableware containing uranium oxide is not recognised as a radiation source, so a licence is not required for production or import. Norway's major producer of such glassware did require a licence for the import of the uranium oxide, and imported this from the UK up to 2000. Since then, uranium oxide has apparently been difficult to get hold of and the company is looking for alternatives.

Products that are subject to testing

It was reported that testing is required for:

- timepieces incorporating radioluminous paint (must conform to ISO 3157); and,
- night sights containing GTLS (ANSI classification required).

Products that are subject to labelling

It was reported that labelling is required for:

- ICSD; and,
- night sights containing GTLS.

Products that are subject to controlled disposal

The respondent indicated that controlled disposal is required for night sights containing GTLS. ICSD are part of an established system for the recycling of electroproducts. ICSD may thus be returned to any store selling similar products, after which they are sent to an approved storage site.

3.3.15 Switzerland

The following information was supplied by a representative from the Swiss Federal Office of Public Health and represents their opinion of the situation in Switzerland.

Products available

The following products were reported to be available to the public:

- ionisation chamber smoke detectors (ICSD, provided that they are part of an installed system;
- timepieces incorporating radioluminous paint that conform to ISO 3157 and 4168;
- compasses incorporating radioluminous paint;
- timepieces incorporating gaseous tritium light sources (GTLS);
- surge voltage protectors;
- lightning preventors;
- thoriated tungsten welding electrodes (until 31 December 2003); and,
- irradiated gemstones.

Prohibited products

The following were reported to be prohibited:

- single stand-alone ICSD;
- thoriated incandescent gas mantles;
- glassware, tableware, tiles, badges and cloisonné jewellery incorporating uranium or thorium;
- surge voltage protectors incorporating radium;
- irradiated gemstones with activation products in excess of the exemption levels;
- lightning preventors containing radium-226*;
- anti-static devices; and,
- toys and novelties containing radioactive materials.

* some lightning preventors have been installed in the past, but will be disposed of in the near future.

The respondent commented that the main criterion for prohibition is that there is no justification for these products as suitable alternatives exist.

Products that are subject to licensing

Thoriated tungsten welding electrodes are no longer approved by the Swiss Federal Office of Public Health (SFOPH) which means that they are subject to licensing from 1 January 2004. The reason is that non-radioactive alternatives that give the same result are available.

Products that are subject to approval

It was reported that the following must be approved by the Swiss Federal Office of Public Health (SFOPH):

- ICSD;
- all consumer products incorporating GTLS; and,
- all electronic devices containing radioactive materials.

Products that are subject to testing

It was reported that the following must be tested by accredited or national laboratories, otherwise they are tested by the SFOPH:

- ICSD;
- all consumer products incorporating GTLS; and,
- all electronic devices containing radioactive materials.

Products that are subject to labelling

The respondent indicated that:

- each ICSD must be marked with the radionuclide, activity and the radiation warning symbol;
- timepieces incorporating GTLS must be marked on the case with "H-3" and the activity;
- labelling of other consumer products incorporating GTLS would be given case by case consideration;
- thoriated tungsten welding electrodes must have a radiation warning symbol on the packet; and,

- labelling of electronic devices containing radioactive materials would be given a case by case consideration.

Products that are subject to controlled disposal

It was reported that the following products must be returned to the supplier:

- ICSD; and,
- surge voltage protectors incorporating radium-226.

It was reported that the following products should be returned to the supplier:

- all consumer products incorporating GTLS; and,
- all electronic devices containing radioactive materials.

The respondent indicated that lightning preventors incorporating radioactive sources must be delivered to the federal collecting point for radioactive waste.

3.4 Information provided by suppliers and manufacturers of consumer products

This section gives a summary of the replies to the questionnaires concerning the manufacture and distribution of consumer products. The information is also summarised in Table 3 of Annex 1.

3.4.1 Company A

Company A is an undertaking based in Ireland that assembles and supplies ionisation chamber smoke detectors (ICSD). A summary of the information provided is given below.

Product

ICSD containing 30 to 37 kBq americium-241.

Country of manufacture of components

The americium-241 sources are manufactured in the USA.

Quality assurance in manufacture

ISO 9000:2000 (ISO2919, ISO1677, ISO 77 8 2-15-92)

Number of products manufactured per year

2 000 000 ICSD are produced each year. This number has increased during the last five years.

Number of products exported per year

180 000 ICSD are exported each year. This number has also increased during the last five years.

EU Member States and Candidate States exported to

The company exports to the following Member States and Candidate States:

- Finland;
- Greece;
- Netherlands;
- Sweden; and,
- United Kingdom.

Type testing required

Type testing of the products is not requested by any of the Member States or Candidate States that the company exports to.

Labelling of product

Labelling of the product is not requested by any of the Member States or Candidate States that the company exports to.

Controlled disposal required

ICSD supplied to the domestic market in Ireland are returned to the company for disposal.

Point of sale

The company does not supply products direct to the public and does not sell via the internet.

3.4.2 Company B

Company B is an undertaking based in Switzerland that assembles and supplies items incorporating gaseous tritium light sources (GTLS). A summary of the information provided is given below.

Products

- Timepieces incorporating GTLS containing up to 1GBq tritium;
- compasses incorporating GTLS containing 300 MBq to 7.4 GBq tritium;
- fishing floats incorporating GTLS containing up to 17.5 GBq tritium;
- weapon sights incorporating GTLS containing 74 MBq to 740 MBq tritium; and,
- GTLS for "glow rings" containing up to 17.5 GBq tritium (see Part 4.1).

Country of manufacture of components

Timepieces and weapon sights are manufactured in Switzerland. The GTLS for the other products are manufactured in Switzerland, but the non-radioactive components are produced elsewhere.

Quality assurance in manufacture

Internal test procedures as specified in ANSI 42.3

Number of products manufactured per year

- 100 000 timepieces incorporating GTLS (increase during last five years);
- 20 000 compasses incorporating GTLS (unchanged during last five years);
- 20 000 fishing floats incorporating GTLS (unchanged during last five years);
- 400 000 weapon sights incorporating (increase during last five years); and,
- 50 000 GTLS for "glow rings" (increase during last five years).

Number of products exported per year

- 90 000 timepieces incorporating GTLS (increase during last five years);
- 20 000 compasses incorporating GTLS (unchanged during last five years);
- 20 000 fishing floats incorporating GTLS (unchanged during last five years);
- 390 000 weapon sights incorporating (increase during last five years); and,

- 50 000 GTLS for "glow rings" (increase during last five years).

EU Member States and Candidate States exported to

The company exports to the following Member States and Candidate States:

- France (timepieces and compasses);
- Sweden (timepieces, compasses and weapon sights); and,
- United Kingdom (timepieces, compasses, fishing floats and "glow rings").

Type testing required

As the type testing requirements vary from country to country, the company performs as a minimum a 100 % leak test. The following are the maximum permissible leak rates:

- 185 kBq per item in a 24 hour period for timepieces incorporating GTLS;
- 1850 kBq per GTLS in a 24 hour period for compasses, weapon sights and "glow rings" incorporating GTLS;

The permissible leak rate for fishing floats was not specified by the company.

Labelling of product

Labelling is required only for timepieces incorporating GTLS. They are marked with "T" on the dial, and "1 GBq H-3 mbm" on the case bottom.

Controlled disposal required

No conditions for disposal are specified for these products.

Point of sale

The company supplies products direct to the public and via the internet. However, internet sales are restricted in that the company will only supply to members of the public in a country where its products have been approved.

3.4.3 Company C

Company C is an undertaking based in the UK that supplies various electrical items, some of which incorporate radioactive materials. A summary of the information provided is given below.

Products

- Ionisation chamber smoke detectors (ICSD) incorporating up to 37 kBq americium-241; and,
- telecommunications equipment incorporating surge voltage protectors that contain up to 3 kBq tritium.

It was noted that the majority of the telecommunications product range has moved from gas surge voltage protectors containing tritium to semiconductors. Only a small percentage of the company's telephone outlets are of the 'old' design and this will probably continue to decrease.

Country of manufacture of components

The radioactive sources in the ICSD are imported from China. The origin of the surge voltage protectors is unknown, but they are thought to originate in the Far East. The telephone socket outlets in which they are installed come from China.

Quality assurance in manufacture

The ICSD are manufactured to ISO 9002 & BS 5446/1:2000. The standards ISO 9001 & BS6312 part 2 apply to the manufacture of the telecommunications equipment.

Number of products manufactured per year

- 70 000 ICSD (this is a new product introduced a year ago); and,
- a few tens of thousands of items containing surge voltage protectors (decrease during last five years).

Number of products exported per year

- A few tens of thousands of items containing surge voltage protectors are exported every year, although this has decreased during the last five years. ICSD are not exported and are sold in the UK only.

EU Member States and Candidate States exported to

The company gave no information about the countries exported to.

Type testing required

It was reported that none of the company's products require type testing (the testing of ICSD is not required in the UK).

Labelling of product

Each source within an ICSD is labelled with the trefoil and the source type. (Am-241). Items containing surge voltage protectors are not labelled.

Controlled disposal required

No conditions for disposal are specified for the company's products. For ICSD, the return at 'end of life' is not encouraged.

Point of sale

The company supplies products wholesale only and does not supply direct to the public.

3.4.4 Company D

Company D is an undertaking based in Finland that manufactures and supplies navigational equipment, some of which is radioluminised.

A summary of the information provided is given below.

Products

Compasses incorporating gaseous tritium light sources (GTLS)

Country of manufacture of components

This information was not given, although it was noted that 3690 GTLS with a total activity of 9 TBq were imported during 2002.

Quality assurance in manufacture

This information was not given.

Number of products manufactured per year

This is not clear from the response given, although it was noted that the amount of radioactive material used is decreasing.

Number of products exported per year

It was stated that 1335 pieces with a total activity of 2.2 TBq were exported during 2002.

EU Member States and Candidate States exported to

The company gave no information about the countries exported to.

Type testing required

This information was not given.

Labelling of product

This information was not given.

Controlled disposal required

This information was not given.

Point of sale

This information was not given.

4 INTERNET SALES

4.1 Description of some consumer products sold via the internet

Since the reduction in the cost and widespread availability of personal computers the use of the Internet for access to goods that are either lower in cost or not widely available has increased dramatically in recent years. It is estimated that use of the Internet accounted for some 40% of the total spend by the UK population alone during the build up to Christmas 2002. It is forecasted that this percentage will increase in time.

A simple search reveals the widespread availability of consumer goods containing radioactive substances through the Internet shopping pages. As the web-site addresses are in the public domain some examples are given below. The Internet gives sellers a wider audience to promote their wares and buyers can take advantage of shopping for particular goods from the convenience of their own homes. Apart from convenience, product availability and cost are considered to be the reasons for buying goods in this way.

If convenience, availability and cost are major advantages then there are also major disadvantages particularly with respect to consumer goods containing radioactive substances. A major disadvantage is that Internet shopping breaks down the normal barriers of trade and goods can by-pass any legal restrictions placed on them. There is no onus placed on the seller to prevent sale of goods to countries where their possession and use may be prohibited. In many cases, a proviso in the sale agreement places the responsibility on the buyer to ensure that the purchase complies with local regulatory requirements. Notwithstanding the above, there have been moves by some more responsible sellers to restrict supply of goods to the country in which they are located where the regulatory requirements are known.

Internet shopping is a growing market. It is possible to purchase a range of items from watches and night-vision binoculars/monoculars/gunsights containing gaseous tritium light sources (GTLS), to antique items such as vaseline glass containing uranium oxide. These types of products are traded openly on the Internet and can be purchased with little or no control by local regulatory enforcement bodies.

One interesting example of a new product is the "glowring", produced by a company called Traser. This is a key-ring consisting of a single GTLS inside a transparent plastic case. A variety of colours is available, including yellow, purple, green and blue, encouraging the consumer to buy more than one. Information provided by the supplier of the GTLS indicates that each GTLS contains up to 17.5 GBq tritium. The way this product is marketed, and customer feedback on the websites that sell it, indicate that it falls into the category of a "novelty". Examples of websites supplying this product are given in 4.1.1 below.

4.1.1 Examples of websites selling consumer products

These are just some examples of the many websites offering consumer products to buy online:

www.findmeagift.com supplies personal and corporate gifts, but also sells an ionisation chamber smoke detector known as a FireAngel online. Orders may be delivered to anywhere in the world.

www.survivalunlimited.com supplies thoriated gas mantles and will ship anywhere in the world.

www.traser.co.uk supplies various items containing gaseous tritium light sources, including watches, compasses, torches and "glowrings". As well as listing stockists in the UK, Ireland and Denmark, it is possible to buy these items online. Most items can be delivered anywhere in the world, but a note on the site states that "glowrings" can only be delivered to the UK "due to international regulatory differences regarding the use of GTLS". The site also contains links to other websites such as:

www.made4men.co.uk, which delivers traser watches worldwide; www.adventurekit.co.uk and www.iwantoneofthose.com, both of which will deliver traser watches and "glowrings" to most overseas destinations.

www.firebox.com sells gifts and gadgets, including traser "glowrings". However, the delivery information states that these can only be delivered within the UK.

www.03.bhphotovideo.com is an example of a photographic equipment supplier in the USA that supplies anti-static brushes containing polonium-210. These can be delivered directly to countries within the EU.

www.ptnightsights.com supplies night sights for weapons, which contain GTLS. This is another site based in the USA, but there appears to be no restriction on delivery to overseas countries, including those in the EU. Another US site, www.arizonagunrunners.com sells similar products and there are probably many more.

www.theglassman.co.uk specialises in collectable glass pieces, including "vaseline glass" containing uranium oxide. There are no restrictions on delivery stated, and it appears that goods ordered could be shipped to anywhere in the world.

5 ASSESSMENTS MADE OF PUBLIC DOSES FROM CONSUMER PRODUCTS

Most countries have not made any assessment of doses to the public from the use, misuse or disposal of consumer products. The assessments that have been made are summarised below.

5.1 Greece

Dose assessments would be made on a case by case basis as thought necessary. Some assessments have already been made, but these relate to building materials and are outside the scope of this report.

5.2 Netherlands

An assessment of individual and collective doses to members of the public from the storage, trade, use and disposal of some common consumer has been made. A report of the assessment was published in May 2000[13].

5.3 Spain

Two dose assessments have been prepared in Spain. These are related to the use of lightning preventors and the disposal of ionisation chamber smoke detectors. Further details on the conclusions of these assessments were not provided.

5.4 United Kingdom

Assessments of doses to members of the public from the use, misuse and disposal of the following consumer products were made in 1992:

- ionisation chamber smoke detectors;
- radioluminous time measurement instruments;
- time measurement instruments containing gaseous tritium light sources (GTLS);
- compasses containing GTLS; and,
- thoriated gas mantles.

These assessments were published in a report that also set out criteria of acceptability for the products listed above and other consumer products[14]. This advice is due to be revised.

[13] Eleveld H and Pruppers M J M, Schattingen van de individuele en collectieve doses als gevolg van consumentenproducten waarin radioactieve stoffen zijn verwerkt, Rijksinstituut voor Volksgezondheid en Milieu, RIVM report 610310 005, May 2000

In addition, NRPB has published assessments of radiation doses from irradiated gemstones[15] and GTLD watches[16] under contract to the UK government Department of Trade and Industry. An assessment of doses from uranium in dental porcelain was also made by NRPB in 1990[17]

5.5 Cyprus

The competent authority in Cyprus intends to carry out an assessment of doses to the public from consumer products in the future.

5.6 Latvia

An assessment of doses from consumer products has been made indirectly, based on methods described in the EU and IAEA recommendations concerning re-use of materials and releases to the environment.

5.7 Poland

Every year the estimated value of the average annual effective dose to members of the public is published in the National Atomic Energy Agency annual report. The estimates are performed by the Polish Central Laboratory for Radiological Protection but include only a rough estimate of the contribution from consumer products.

[14] Board statement on approval of consumer goods containing radioactive substances, Documents of the NRPB Vol 3, No 2, 1992, HMSO

[15] Stewart J E, Shaw P V and Robson J C, The radiological hazards associated with gemstones: review and recommendations, NRPB-OS/016/2002

[16] Paynter R A, Shaw P V, Dunderdale J, Ely S Y and O'Mahony M T, The use of radioactive materials in the luminising of watches, NRPB Contract Report M-863, November 1997

[17] Lewis J and Paynter R A, Uranium content of dental porcelains, NRPB Contract Report M-247, 1990

6 CONCLUSIONS

The objectives of this study are stated in Part 1.2. The following sections summarise the findings of the study in relation to these objectives.

6.1 Application of relevant articles of Council Directive 96/29/Euratom

- With the exception of the UK, all EU Member States, Candidate States and Accession States report that they have fully implemented the relevant articles of Council Directive 96/29/Euratom.
- What is not certain, however, is whether the requirements are effectively enforced.

6.2 Requirements imposed by EU Member States, Candidate States and Accession States

6.2.1 Product testing

- Mandatory product testing is rare and generally it appears that only ICSD are tested to confirm that they conform to standards.
- The product standards available (NEA/OECD) are now thirty years old and require updating.

6.2.2 Labelling requirements

- Mandatory labelling of consumer products is rare and in most countries where labelling is required this only applies to ICSD.

6.2.3 Disposal requirements

- More than half of the countries indicated that controlled disposal (return to the supplier or to the national waste repository) is required for certain products, particularly ICSD. The rest allow disposal of consumer products with the normal household waste.

6.2.4 Prohibitions

- There are major differences between the different countries. Some countries do not prohibit any consumer products. Others prohibit, or are planning to prohibit even established products like ICSD.

- This approach may cause problems with respect to free trade in Europe, and it is considered that harmonisation of licensing and prohibition is required.

6.3 Type and numbers of products available

- This information is summarised in Annex 1. It is interesting to note the variation in what is reported as being available in the different countries.
- The rise of internet sales means that it is difficult for competent authorities to be aware of every product available in their country.

6.4 Dose assessments made

- There were not many dose assessments reported. Only the Netherlands, Spain and the UK appear to have made specific assessments of doses to the public from the use and disposal of consumer products.

ANNEX 1

SUMMARY OF PRODUCTS AND AVAILABILITY

The information provided in the questionnaires returned by EU Member States Candidate States, and Accession States; and by the manufacturers of consumer products is summarised here in table form.

Table 1 Products and their reported availability in EU Member States

Product	Reported to be available in these Member States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
ICSD	Denmark	Americium-241	15 - 40 kBq	No information	No information	270 000 (2001)	Decrease
	Finland	Americium-241	3 - 37 kBq	0	Unchanged	250 000	Unchanged
	Germany	Americium-241	3 kBq to 555 kBq	15000	Decrease	8000	Decrease
		Radium-226	3 kBq				
	Greece	Americium-241	No information	0	Unchanged	No information	No information
	Ireland	Americium-241	33.3 - 37 kBq	2 000 000	Unchanged	2 000 000	Unchanged
	Italy	Americium-241	20 - 185 kBq	No information	No information	No information	No information
	Netherlands	Americium-241	up to 37 kBq	0	Unchanged	400 000	Increase
	Portugal	Americium-241	No information	No information	No information	No information	No information
	Spain	Americium-241	up to 37 kBq	No information	No information	200 000	Increase
	Sweden	Americium-241	20 - 30 kBq	0	Unchanged	700 000	Increase
	UK	Americium-241	up to 40 kBq	0	Unchanged	4 000 000	Unchanged

Product	Reported to be available in these Member States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
Timepieces incorporating radioluminous paint	Finland	No information	No information	0	Unchanged	No information	No information
	Germany	Tritium	5 to 250 MBq	a few hundred	Decrease	A few hundred	Decrease
		Promethium-147	0.05 to 5 MBq				
		Radium	5 to 50 kBq				
	Italy	Tritium	up to 925 MBq	No information	No information	No information	Decrease
		Promethium-147	up to 18 MBq				
	Portugal	No information	No information	0	Unchanged	No information	No information
	Sweden	Tritium	No information	0	Unchanged	No information	No information
		Promethium-147	No information				
	UK	Tritium	up to 185 MBq	0	Unchanged	270 000	Unchanged
		Promethium-147	up to 3.7 MBq	0	Unchanged	30 000	Unchanged
Compasses incorporating radioluminous paint	Finland	No information	No information	No information	No information	No information	No information
	Germany	Tritium	5 to 250 MBq	Not known	Decrease	Not known	Decrease
		Promethium-147	0.05 to 5 MBq				
		Radium	up to 400 MBq				
	Italy	Tritium	No information	No information	No information	No information	No information
	Portugal	No information	No information	0	Unchanged	No information	No information

Product	Reported to be available in these Member States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
Timepieces incorporating GTLS	Germany	Tritium	up to 1 GBq	No information	No information	No information	No information
	UK	Tritium	up to 1 GBq	0	Unchanged	7500	Unchanged
Compasses incorporating GTLS	Sweden	Tritium	up to 13 GBq	500	Decrease	No information	No information
	UK	Tritium	up to 10 GBq	0	Unchanged	10 000	Unchanged
Fishing floats incorporating GTLS	Germany	Tritium	0.1 GBq to 28 GBq	No information	No information	No information	No information
	Spain	Tritium	No information	No information	No information	No information	No information
	UK	Tritium	No information	No information	No information	No information	No information
Torches incorporating GTLS	UK	Tritium	No information	No information	No information	No information	No information
Telephone dials incorporating GTLS	None						
Emergency signs incorporating GTLS	Netherlands	Tritium	No information	No information	No information	No information	No information
	Sweden (in aircraft only)	Tritium	No information	No information	No information	No information	No information
Weapons sights incorporating GTLS	Sweden	Tritium	0.3 - 10 GBq	0	Unchanged	300	Decrease

Product	Reported to be available in these Member States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
Fluorescent lamp starters	Germany	Tritium	No information	1 000 000	Increase	Approx 1 000 000	Increase
		Krypton-85	50 to 200 Bq				
	Greece	Thorium-232	up to 70 Bq	0	No information	No information	No information
	Italy	No information	No information	No information	No information	No information	No information
	Netherlands	Tritium	up to 11 kBq	? 5 000 000 extant	Decrease	No information	No information
	Sweden	No information	No information	No information	No information	No information	No information
	Finland	No information	No information	No information	No information	No information	No information
	UK	No information	Up to 10 kBq	0	Unchanged	2 000 000	Unchanged
Surge voltage protectors	Denmark	Tritium	up to 5 MBq	No information	No information	No information	No information
	Germany	Tritium	5 MBq to 3 GBq	100	No information	No information	No information
		Radium-226	No information				
	Italy	No information	No information	No information	No information	No information	No information
	Sweden	No information	No information	No information	No information	No information	No information
	Finland	probably tritium	No information	No information	No information	No information	No information
Electronic valves	Italy	No information	No information	No information	No information	No information	No information
	Sweden	No information	No information	No information	No information	No information	No information
Discharge/metal vapour lamps	Germany	Krypton-85 Th-232	0.75 to 15 kBq 5 to 3500 Bq	100 000	Increase	No information	No information

Product	Reported to be available in these Member States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
Lightning preventors	Luxembourg (around 20 remaining)	Americium-241 Radium-226	2.2 - 35 MBq 11 - 33 MBq	0	No information	No information	No information
Anti-static devices	None						
Thoriated incandescent gas mantles	Finland	Thorium	No information	0	No information	No information	No information
	Germany	Thorium	0.5 to 4 kBq	No information	No information	No information	No information
	Greece	Thorium	No information	0	No information	No information	No information
	Luxembourg	Thorium	No information	0	No information	No information	No information
	Spain	Thorium	No information	No information	No information	No information	No information
	Sweden	Thorium	No information	No information	No information	No information	No information
Thoriated opthalmic lenses	Denmark	Thorium	up to 500 kBq	No information	No information	No information	No information
	Luxembourg	Thorium	No information	No information	No information	No information	No information
	Sweden	Thorium	No information	No information	No information	No information	No information
Thoriated camera lenses	Greece	Thorium	up to 2 kBq	0	No information	No information	No information
	Luxembourg	Thorium	No information	No information	No information	No information	No information
	Sweden	Thorium	No information	No information	No information	No information	No information
	Finland	Thorium	No information	No information	No information	No information	No information

Product	Reported to be available in these Member States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
Thoriated tungsten welding rods	Denmark	Thorium	1 - 4%	No information	No information	No information	No information
	Germany	Thorium	30 to 170 Bq/g	100 tonnes approx	Decrease	100 tonnes approx	Decrease
	Greece	Thorium	No information	No information	No information	No information	No information
	Ireland	Thorium	1 - 4%	No information	No information	No information	No information
	Spain	Thorium	No information	No information	No information	No information	No information
	Sweden	Thorium	No information	No information	No information	No information	No information
Tableware incorporating U or Th	Germany	Uranium / thorium	Up to 10%	No information	Decrease	No information	Decrease
	Greece	Uranium / thorium	up to 0.5 Bq/g	0	No information	No information	No information
	UK	Uranium	No information	No information	No information	No information	No information
Ceramic tiles incorporating U or Th	Germany	Natural uranium	0.1 to 2 mg/cm^2	No information	Decrease	No information	Decrease
	Netherlands	Radium-226	25 - 80 Bq/kg	100 000 000	No information	>100 000 000	No information
		Thorium-232	50 - 70 Bq/kg				
		Uranium-238	60 - 80 Bq/kg				
		Potassium-40	200 - 400 Bq/kg				
Badges or cloisonne jewellery incorporating U or Th	None						

Product	Reported to be available in these Member States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
Dental products containing uranium	None						
Irradiated gemstones	Greece	No information	No information	0	No information	No information	No information
	Sweden	No information	No information	No information	No information	No information	No information
	Finland	No information	No information	No information	No information	No information	No information
	UK	Various activation products	Possibly up to 2 kBq/g	1 - 1.5 tonnes per year	No information	No information	No information
Toys and novelties	UK	Tritium	up to 17.5 GBq	0	Unchanged	No information	No information

Table 2 Products and their reported availability in EU Candidate States

Product	Reported to be available in these Candidate and non-EU States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
ICSD	Czech Republic	Americium-241	3 - 30 kBq	550 000	Increase	700	Decrease
	Estonia	Americium-241	3.5 kBq	0	No information	0	No information
		Plutonium-239	175 kBq/175 MBq	0	No information	0	No information
	Latvia	Americium-241	35 - 74 kBq	No information	No information	100	Decrease
	Poland	Americium-241	3.7 - 40 kBq	50 000 (2001)	Decrease	7470 shipments	Increase
	Slovak Republic	Americium-241	50 - 400 kBq	No information	No information	30	Decrease
	Slovenia	Americium-241	20 kBq - 2.67 MBq	0	Unchanged	0	Decrease
	Turkey	Americium-241	No information	No information	No information	No information	No information
	Norway	Americium-241	37 kBq	16 000	Decrease	250 000	Unchanged
	Switzerland (installed systems only)	Americium-241	up to 37 kBq	No information	Decrease	No information	Decrease
Timepieces incorporating radioluminous paint	Slovak Republic	Radium-226	No information				
	Slovenia	Tritium	0.3 - 0.9 GBq				
		Promethium-147	0.6 - 18.5 MBq				
	Switzerland	Tritium	up to 277 MBq				
		Promethium-147	up to 5.5 MBq				

Product	Reported to be available in these Candidate and non-EU States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
Compasses incorporating radioluminous paint	Slovak Republic Switzerland	Radium-226 Tritium Carbon-14	No information Up to 220 MBq Up to 3.5 MBq				
Clock faces in car fascias incorporating radioluminous paint	Slovak Republic	Radium-226	No information	No information	No information	No information	No information
Timepieces incorporating GTLS	Slovak Republic Switzerland	Tritium Tritium	No information Up to 1 GBq	No information No information	No information Unchanged	No information No information	No information Unchanged
Compasses incorporating GTLS	Slovak Republic	Tritium	No information	No information	No information	No information	No information
Fishing floats incorporating GTLS	Slovak Republic	Tritium	No information	No information	No information	No information	No information
Torches incorporating GTLS	Slovak Republic	Tritium	No information	No information	No information	No information	No information
Telephone dials incorporating GTLS	Slovak Republic	Tritium	No information	No information	No information	No information	No information
Emergency signs incorporating GTLS	Slovak Republic	Tritium	No information	No information	No information	No information	No information

Product	Reported to be available in these Candidate and non-EU States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
Weapons sights incorporating GTLS	Poland	Tritium	up to 1.85 GBq	No information	No information	No information	No information
	Slovenia	Tritium	up to 1 GBq	0	Unchanged	1000	Unchanged
	Norway	Tritium	0.1 - 3.7 kBq	0	Unchanged	100	Increase
Fluorescent lamp starters	Slovak Republic	Krypton-85	20 - 50 Bq	No information	No information	No information	No information
Surge voltage protectors	Slovak Republic	Krypton-85	20 - 50 Bq	No information	No information	No information	No information
	Switzerland	Tritium	up to 20 MBq	No information	Decrease	No information	Decrease
		Promethium-147	up to 300 kBq				
Electronic valves	None						
Lightning preventors	Cyprus	No information	No information	No information	No information	No information	No information
Anti-static devices	Czech Republic	Americium-241	No information	No information	No information	No information	No information
Thoriated incandescent gas mantles	Norway	Thorium	up to 1 kBq	No information	No information	No information	No information
Thoriated opthalmic lenses	None						
Thoriated camera lenses	None						

Product	Reported to be available in these Candidate and non-EU States	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number imported per year	Reported trend in previous five years
Thoriated tungsten welding rods	Latvia	Thorium	No information	0	Decrease	No information	No information
	Norway	Thorium	0.1 - 1 kBq	No information	No information	No information	No information
Tableware incorporating uranium or thorium	Czech Republic	Natural uranium	No information	No information	No information	No information	No information
	Norway	No information	No information	No information	Decrease	No information	No information
Ceramic tiles incorporating uranium or thorium	None						
Badges or cloisonne jewellery incorporating uranium or thorium	None						
Dental products containing uranium	None						
Irradiated gemstones	Poland	Tantalum-182	75 kBq/kg	150 kg	No information	No information	No information
	Switzerland	No information	No information	No information	No information	No information	No information
Toys and novelties	None						

Table 3 Information provided by consumer products manufacturers

Product	Supplied by	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number exported per year	Reported trend in previous five years	Countries exported to
ICSD	Company A, Ireland	Americium-241	30 to 37 kBq	2 000 000	Increase	180 000	Increase	Finland Greece Netherlands Sweden United kingdom
	Company C, United Kingdom	Americium-241	up to 37 kBq	70 000	Increase	0		
Timepieces incorporating GTLS	Company B, Switzerland	Tritium	Up to 1 GBq	100 000	Increase	90 000	Increase	France United Kingdom
Compasses incorporating GTLS	Company B, Switzerland	Tritium	300 MBq to 7.4 GBq	20 000	Unchanged	20 000	Unchanged	France Sweden United Kingdom
	Company C, Finland	Tritium	Not reported - approx 2 GBq from information given?	No information	Decrease	1 335	No information	No information

Product	Supplied by	Radionuclides reported	Activities reported	Reported number manufactured per year	Reported trend in previous five years	Reported number exported per year	Reported trend in previous five years	Countries exported to
Fishing floats incorporating GTLS	Company B, Switzerland	Tritium	Up to 17.5 GBq	20 000	Unchanged	20 000	Unchanged	United Kingdom
Weapons sights incorporating GTLS	Company B, Switzerland	Tritium	74 MBq to 740 MBq	400 000	Increase	0		
GTLS for "glowrings"	Company B, Switzerland	Tritium	Up to 17.5 GBq	50 000	Increase	50 000	Increase	United Kingdom
Surge voltage protectors	Company C, United Kingdom	Tritium	Up to 3 kBq	>10 000	Decrease	>10 000	Decrease	No information

ANNEX 2

REPORTED PRODUCT DETAILS

Details of each consumer product reported, including the radionuclides used and reported activities. Where an assessment of radiation doses to the public from use or disposal has been made, this is noted.

Table 4 Reported products

Product	Radionuclides reported	Activities reported	Potential annual individual doses from use	Potential annual individual doses from disposal
ICSD	Americium-241	15 kBq to 2.7 MBq	<1 μSv effective dose from 40 kBq source [18,19]	<1 μSv effective dose[18]
	Radium-226	3 kBq		
	Plutonium-239	175 kBq to 175 MBq		
Timepieces incorporating radioluminous paint	Tritium	5 to 925 MBq	<1 μSv effective dose and ≤2.9 mSv equivalent dose to skin[18] ≤ 22 μSv effective dose and ≤10.6 mSv equivalent dose to skin[20]	<1 μSv effective dose[18]
	Promethium-147	0.05 to 18 MBq	<1 μSv effective dose and ≤0.35 mSv equivalent dose to skin[18]	<1 μSv effective dose[18]
	Radium	5 to 50 kBq		
Compasses incorporating radioluminous paint	Tritium	5 to 250 MBq		
	Promethium-147	0.05 to 220 MBq		
	Radium	up to 400 MBq		
	Carbon-14	up to 3.5 MBq		

[18] Board statement on approval of consumer goods containing radioactive substances, Documents of the NRPB Vol 3, No 2, 1992, HMSO

[19] Eleveld H and Pruppers M J M, Schattingen van de individuele en collectieve doses als gevolg van consumentenproducten waarin radioactieve stoffen zijn verwerkt, Rijksinstituut voor Volksgezondheid en Milieu, RIVM report 610310 005, May 2000

[20] Paynter R A, Shaw P V, Dunderdale J, Ely S Y and O'Mahony M T, The use of radioactive materials in the luminising of watches, NRPB Contract Report M-863, 1997

Product	Radionuclides reported	Activities reported	Potential annual individual doses from use	Potential annual individual doses from disposal
Clock faces in car fascias incorporating radioluminous paint	Radium-226	No information		
Timepieces incorporating GTLS	Tritium	up to 1 GBq	<1 μSv effective dose and ≤0.9 mSv equivalent dose to skin[18] <1 μSv effective dose[17]	<1 μSv effective dose[18]
Compasses incorporating GTLS	Tritium	up to 13 GBq	<1 μSv effective dose and ≤4 μSv equivalent dose to skin[18]	<1 μSv effective dose[18]
Fishing floats incorporating GTLS	Tritium	0.1 GBq to 28 GBq		
Torches incorporating GTLS	Tritium	No information		
Telephone dials incorporating GTLS	Tritium	No information		
Emergency signs incorporating GTLS	Tritium	No information		

Product	Radionuclides reported	Activities reported	Potential annual individual doses from use	Potential annual individual doses from disposal
Weapons sights incorporating GTLS	Tritium	0.1 kBq to 1.85 GBq		
Fluorescent lamp starters	Tritium	up to 11 kBq	<1 μSv effective dose[19]	
	Krypton-85	20 to 200 Bq	<1 μSv effective dose[19]	
	Thorium-232	up to 70 Bq		
Surge voltage protectors	Tritium	up to 3 GBq		
	Krypton-85	20 to 50 Bq		
	Promethium-147	up to 300 kBq		
	Radium-226	No information		
Electronic valves	No information	No information		
Discharge/metal vapour lamps	Krypton-85	0.75 to 15 kBq		
	Th-232	5 to 3500 Bq		
Lightning preventors	Americium-241	2.2 - 35 MBq		
	Radium-226	11 - 33 MBq		
Thoriated incandescent gas mantles	Thorium	0.5 to 4 kBq	≤130 μSv effective dose depending on age[18] <1 μSv effective dose[19]	<1 μSv effective dose[18]
Thoriated opthalmic lenses	Thorium	up to 500 kBq		

Product	Radionuclides reported	Activities reported	Potential annual individual doses from use	Potential annual individual doses from disposal
Thoriated camera lenses	Thorium	up to 2 kBq		
Thoriated tungsten welding rods	Thorium	30 to 170 Bq/g		
Tableware incorporating U or Th	Uranium / thorium Uranium / thorium	Up to 10%; or up to 0.5 Bq/g		
Ceramic tiles incorporating U or Th	Natural uranium Radium-226 Thorium-232 Uranium-238 Potassium-40	0.1 to 2 mg/cm^2 25 - 80 Bq/kg 50 - 70 Bq/kg 60 - 80 Bq/kg 200 - 400 Bq/kg	1 µSv effective dose[19] <1 µSv effective dose[19]	
Irradiated gemstones	Various activation products	Possibly up to 2 kBq/g	≤1.7 µSv effective dose and ≤3000 mSv effective dose to skin[21]	
Toys and novelties	Tritium	up to 17.5 GBq		

[21] Stewart J E, Shaw P V and Robson J C, The radiological hazards associated with gemstones: review and recommendations, NRPB-OS/016/2002

ANNEX 3

NAMES AND ADDRESSES OF COMPETENT AUTHORITIES

Table 5 EU Member States

Member State	Name and address of competent authority
Austria	No information provided
Belgium	No information provided
Denmark	National Board of Health National Institute of Radiation Hygiene (NIRH) Knapholm 7 DK-2730 Herlev Denmark Tel: +45 4454 3454 Fax: +45 4454 3450
Finland	Radiation and Nuclear Safety Authority (STUK) PO Box 14 FIN-00881 Helsinki Finland Tel: +358 9 7598 8243 Fax: +358 9 7598 8248
France	No information provided
Germany	Different competent authorities for each of the German Bundesländer
Greece	Greek Atomic Energy Commission PO Box 60092 153 10 Agia Paraskevi Attikis Greece Tel: +30 10 6506779 Fax: +30 10 650 6748
Ireland	Radiological Protection Institute of Ireland 3 Clonskeagh Square, Clonskeagh Road Dublin 14 Ireland Tel: + 353 1 269 7766 Fax: + 353 1 269 7437

Member State	Name and address of competent authority
Italy	Agenzia per la protezione dell'ambiente e per i service tecnici (APAT) Via Vitaliano Brancati n 44 Roma Italy
Luxembourg	Ministère de la Santé Division de la Radioprotection Allée Marconi Villa Louvigny L-2120 Luxembourg Tel: +352 478 5670 Fax: +352 467 522
Netherlands	The name of the competent authority was not confirmed, but other information for this report was provided by: Ministry VROM Postbus 30945 2500 GX Den Haag The Netherlands Tel: +31 70 339 4966 Fax: +31 70 339 1314
Portugal	General Directorate of Health Ministry of Health; and; Instituto Tecnologico e Nuclear Pç Duque de Saldanha, 31 R/c 1°, 2°, 3°, e 5° 1069 - 013 Lisboa Portugal
Spain	Consejo De Seguridad Nuclear (CSN) Technical Direction for Radiation Protection Justo Dorado, 11 28040 Madrid Spain Tel: +34 91 346 0623 Fax: +34 91 346 0588
Sweden	Swedish Radiation Protection Authority (SSI) SE-171 16 Stockholm Sweden Tel: +46 8 729 7100 Fax: +46 8 729 7108
United Kingdom	Health and Safety Executive (various offices around the UK) www.hse.gov.uk and; Environment Agency (various offices around the UK) www.environment-agency.gov.uk

Table 6 EU Candidate States and EU Accession States

Candidate or Accession State	Name and address of competent authority
Bulgaria	Bulgarian Nuclear Regulatory Agency (NRA) www.bnsa.bas.bg
Cyprus	Department of Labour Inspection Ministry of Labour and Social Insurance, 12 Apelli Street CY-1480 Lefkosia (Nicosia) Cyprus Tel: +35 722 300340 Fax: +35 722 663788
Czech Republic	State Office for Nuclear Safety CZ-11000 Praha 1, Senovazne Namesti 9 Phone: +420 221 624 255 Fax: +420 221 624 710
Estonia	Various regulatory authorities. Information for this report was provided by: Estonian Radiation Protection Centre Ministry of Environment Estonia Tel: +372 660 3336 Fax: +372 660 3352
Hungary	No information provided
Lithuania	Radiation Protection Centre Kalvariju st. 153, LT-2042 Vilnius Lithuania Tel: +370 2 763633 Fax: +370 2 754692
Malta	No information provided
Poland	National Atomic Energy Agency (NAEA) ul. Krucza 36, 00-921 Warszawa Poland Tel: +48 22 695 9804
Romania	National Commission for Control of Nuclear Activities Blvd. Libertatii, No 14, PO Box 42-4 District 5 Bucharest 761061 Romania Tel: +40 1 410 3476 Fax: +40 1 411 1436

Candidate or Accession State	Name and address of competent authority
Slovak Republic	State Health Institute of the Slovak Republic Trnavska 52 826 45 Bratislava Slovak Republic Tel: +421 2 4445 5178 Fax: +421 2 4437 2619
Slovenia	Slovenian Nuclear Safety Administration Železna Cesta 16, SI-1000 Ljubljana Slovenia Tel: +386 280 3804 Fax: +386 280 3808
Turkey	The name of the competent authority was not confirmed, but other information for this report was provided by: Turkish Atomic Energy Authority Radiological Health and Safety Department Tel: +90 312 287 1529 Fax: +90 312 285 4284

Table 7 Non EU States included in this report

State	Name and address of competent authority
Norway	Norwegian Radiation Protection Authority (NRPA) PO Box 55 N-1322 Osterås Norway Tel: +47 6714 2500 Fax: +47 6716 7407
Switzerland	Swiss Federal Office of Public Health (SFOPH) Division of Radiation Protection CH-3003 Bern Switzerland Tel: +41 31 323 0254 Fax: +41 31 322 8383