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**IMPLEMENTATION OF EURATOM DIRECTIVE 96/29:  
THE SITUATION IN THE NETHERLANDS CONCERNING NORM**

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**Abstract**

In developing a policy for regulating NORM in the Netherlands, the following aspects are taken into account. The radiation protection regarding NORM should concern both workers and members of the public. To avoid confusion, the system of clearance and exemption for NORM should be the same for both these groups. For consistency reasons, it is believed that the values for exemption and clearance levels should also be the same. There are different types of NORM, namely NORM as raw material, as material stored and used in industry processing, as residues and as waste. Besides that, it can be discharged in water or emitted in air and NORM is known to contaminate objects. Moreover, the effectiveness of legal instruments, such as reporting and prior authorisation, should be considered. The proposed system for NORM is based on dose criteria. It deals mainly with the radiation protection for members of the public. It contains the following:

- A source is exempted from regulation when the ambient dose due to the materials containing natural occurring radionuclides is not exceeding 1 millisievert per year. Studies conducted by KEMA<sup>2</sup> show that this criterion corresponds with the exemption levels for the specific activity of practices. For handling NORM it is proposed to require reporting if exemption or clearance levels are exceeded. Prior authorisation will be required if the levels are exceeded by more than 10 times.
- For emissions into air and discharges to water it is proposed that clearance levels, in terms of a number of becquerel per year, should be based on the basic dose criteria of 10 microsievert per year for an individual dose and 1 mansievert per year for the collective dose. If exceeding the values for clearance immediately prior authorisation is required.
- For contaminated objects (like tubes, installation parts, etc.) it is suggested to join the policy for practices, and their exemption levels. If these values are exceeded immediately prior authorisation will be required.

**Introduction**

According to the Basic Safety Standards (BSS) as laid down in the Euratom Directive 96/29 [1] for the protection of workers and members of the public against the dangers of ionising radiation, the Member States of the European Community have to identify, by means of research or in any other way, workactivities which give rise to a significant increase of the exposure to workers or members of the public by natural radiation sources. This means that for workactivities the Member States have to develop and implement an adequate system of regulation concerning exposure to ionising radiation from NORM. They should, if necessary, also take measures to reduce these exposures as well as reasonably achievable. This paper highlights the state of policy development in August 1998 concerning NORM in the Netherlands, especially for members of the public. At this moment the proposed system has not yet been decided upon.

**Implementing a system for NORM**

Before the implementation of a system for NORM, certain aspects have to be taken into account. Firstly, radiation protection concerns both workers and members of the public. There should be one system of exemption and clearance for both groups. It would be to complicated for maintenance if there are different criteria for different critical groups. Besides that, it is not always clear which group will be exposed.

Secondly, the exemption levels and clearance levels should have the same values. One of the recommendations from EU was that the basic dose criteria for clearance should be the same as for exemption. In the Netherlands it is considered to be very unpracticable if NORM can be used freely and at the same time prior authorisation is needed to clear material from regulation. This would be the case if clearance levels have values less than those for exemption.

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Thirdly, there are different types of NORM from which members of the public can be exposed. These types can be divided in three groups:

1. raw material, material stored on industry sites and used in processes, residues and waste;
2. discharges in water and emissions to air;
3. contaminated objects.

For each of these different types a set of exemption and/or clearance levels should be developed.

In practice no distinction can be made between residues and raw material, because NORM that leaves one company as a residue, can function as raw material for the receiver. Therefore the values for exemption levels and clearance levels should be the same in the first group. Furthermore, for consistency reasons and reasons of practicality, the values for exemption and clearance for contaminated objects should correspond with those of first group.

For discharges in water and emissions to air containing NORM, separate sets of clearance levels have to be developed because different scenarios are involved.

Last but not least, the other question to be answered after developing exemption and clearance levels, is what legal instrument would be most adequate when exemption and/or clearance levels are exceeded. One aspect to be considered in this respect is that it is important to keep track of NORM that is subject to regulatory control. If that is the case, then the control should also include the receiver of transfer.

### **Situation in the Netherlands**

In the Netherlands much attention has already been paid to the processing industry in the last decade, concerning workactivities in relation to radiation protection. Therefore, a fairly good overview of categories that cannot be disregarded from the radiation protection point of view is already available. At the moment the relevant sources known, are:

1. Phosphate industry
2. Primary iron and steel production
3. Cement industry
4. Handling of mineral sands
5. Oil- and gasproduction

Studies of the RIVM<sup>3</sup> have shown that the first two categories are responsible for about 90% of the additional collective dose for members of the public caused by emissions to air and discharges to water due to NORM. Also, the individual doses caused by these industries are relatively high. Moreover, these companies produce usually substances for possible reuse/recycling and/or waste with clearly enhanced concentrations of natural occurring radionuclides. In industries handling mineral sands external radiation is the main cause of elevated exposure levels for members of the public. In the oil and gasproduction contaminated drilling equipment (deposition in tubes and in parts of installations) and waste streams (sludge and discharges of production water) cause the major problems.

Besides the categories mentioned other workactivities exist which could be of importance, like the coarse ceramic industry and aviation. Aviation is not discussed in this paper, because it is mainly a problem for workers and not for members of the public.

### **Dose criteria for workactivities**

Operational criteria (exemption and clearance levels) for determining whether or not companies or materials are subject to regulatory control are based on dose criteria. Before establishing exemption and clearance levels agreement is needed on these dose criteria.

In Euratom Directive 96/29 the dose criteria for exemption levels for practices are an individual dose in the order of 10 microsievert or less per year and no more than about 1 mansievert per year for collective dose or an assessment of the optimisation of protection shows that exemption is the optimum option. For practices, additional doses are usually considered. As explicitly stated by the EU, for workactivities only the significant increase of doses for workers and members of the public should be taken into account. When, for example, the external radiation of a storage of

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ores is considered, only the extra radiation with respect to natural background is taken into account.

In establishing the levels of the basic dose criteria, distinction can be made between different exposure pathways. Table 1 shows the dose criteria as proposed in the Netherlands. In determining exemption and clearance levels, both the criteria for individual and collective dose have to be met.

**Table 1: Basic dose criteria, proposed for Dutch system (Aug. '98).**

Exposure pathway	Collective dose	Individual dose
	Mansievert/year	Members of the public Microsievert/year
1. External radiation		
exemption	-	1000 (ambient dose <sup>4</sup> )
clearance	-	1000 (ambient dose <sup>4</sup> )
2. Discharges to water	1	10
3. Emission to air	1	10
4. Contaminated objects		
exemption	-	10
clearance	-	10

### External radiation

For members of the public, external radiation derived from NORM is only relevant when storing bulk amounts of supplies on a company site and when reusing bulk amounts of residues (for land fill, in construction for roads and dikes, in pavement, etc.). Generally, maybe with the exception of some types of reuse, the collective dose plays no role of importance for these applications. This is the reason that primarily only the individual dose is taken into account.

The natural radiation background in the Netherlands due to terrestrial radiation gives rise to an ambient dose of about 0.3 millisievert per year. This figure varies between 0.06 and 0.4 millisievert per year [2]. This is rather low, compared with values occurring in the rest of Europe [3]. To establish a dose criterion for direct external radiation, a significant increase of additional doses is needed to have a relevant effect which clearly measurable. For the situation in the Netherlands a doubling of the maximum terrestrial background value would result in such an effect. Therefore a dose criterion for external radiation of about an extra 1 millisievert per year as an ambient dose seems reasonable.

This dose criterion (an ambient dose of 1 millisievert/year) should be translated into exemption levels for handling NORM and into clearance levels for the reuse/recycling and waste disposal of NORM in terms of specific activity (Bq/g). Preliminary results from studies conducted by KEMA have shown that using this criterion of 1 millisievert/year, exemption and clearance levels correspond with the exemption levels in Bq/g for practices, as laid down in the Euratom Directive 96/29.

When dealing with the reuse/recycling and waste disposal of NORM, one other aspect should be considered. The dose criterion can refer to conditional or unconditional clearance. When referring to unconditional clearance, the clearance level should be based on the most critical exposure pathway.

### Emissions to air and discharges to water

For discharges in water and emissions to air containing NORM clearance levels are developed in terms of radionuclide specific amounts per year (Bq/a) for natural occurring radionuclides, based on dose criteria of an individual dose of 10 microsieverts per year and a collective dose of 1 mansievert.

<sup>4</sup> With 'ambient dose' in Table 1 is meant the effective dose in 24 hours/day.

Provisional results of studies made by RIVM show that the values for clearance are in the order of 0,01 to 1000 GBq per year. They are calculated for mothernuclides with their shortlived daughters. For Po-210, for instance, which is a nuclide that often been emitted to air by heat driven processes and has a relative high dose conversion coefficient, the expectation is that the clearance level would be 10 GBq/year. Above this level a company will immediately be subject to prior authorisation.

### Contaminated objects

Expected is that contaminated objects are to be found in some parts of the processing industry like oil/gasproduction and the chemical industry, which are already likely to be in the regulatory system due to external radiation, emissions to air or discharges to water. Contaminated objects will also appear in scrap metal.

Usually contaminated objects contain fairly limited, good controllable amounts of NORM, which can be compared with objects used for practices. Also the scenarios involved are comparable. Furthermore, in practice a distinction can hardly be made for scrap metal derived from the processing industry (like contaminated tubes) or derived from the fission cycle. For these reasons it is proposed to handle the same exemption levels for contaminated objects as is being used for practices. Because contaminated objects can be transferred from one user to the other, the values for exemption can also function as values for clearance.

Beside these exemption and clearance levels, it is also proposed to develop an extra clearance level for objects with surface contamination in terms of Bq per cm<sup>2</sup>.

### Conclusions

According to the Basic Safety Standards (BSS) as laid down in the Euratom Directive 96/29 Members States of the EC have to establish workactivities which give rise to a significant increase of the exposure to workers or members of the public by natural radiation sources. To meet this obligation, the following system is proposed for the Netherlands:

- for different exposure pathways (direct external radiation, emissions to air and discharges to water, contaminated objects) dose criteria are established;
- exemption and clearance levels for specific activities, discharge and emission levels and surface contamination are derived from the dose criteria;
- if exemption and clearance levels for bulk amounts of NORM are exceeded, then reporting is required. If levels are exceeded 10 times, then prior authorisation will be required;
- if clearance levels for emissions to air or discharges to water are exceeded, then immediately prior authorisation will be required.

if exemption or clearance levels for contaminated objects are exceeded, then immediately prior authorisation will be required

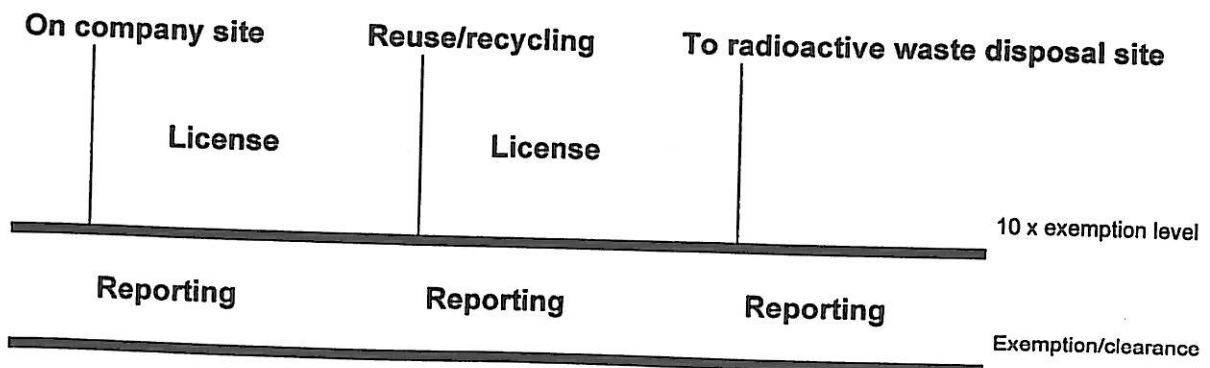


Figure 1: Scheme of the proposed system of regulation in the Netherlands (Aug. '98)

Once exemption and clearance levels are developed, it is the intention to draft an indicative list of workactivities of which can be expected to exceed the exemption and clearance levels. These workactivities will be subject to regulatory control. Based on this list, industries can be identified. This paper deals mainly with possible radiation exposure to members of the public due to workactivities. As far as workers are concerned, the sets of exemption and clearance levels should also apply for workers. If there are other workactivities identified, them the indicative list can be extended.

## References

- [1] Euratom Directive 96/29: Council Directive 96/29/Euratom of 13 May 1996 laying down the basic safety standards for the protection of the health of workers and the general public against the dangers rising from ionising radiation.
- [2] Publication series radiation protection nr. 1992/56. Radiation exposure in the Netherlands in 1988. Ministry of Housing, Spatial Planning and the Environment, The Hague, The Netherlands.
- [3] Green, B.M.R., Hughes, J.S., Lomas, P.R.; Radiation Atlas, Natural sources of ionizing radiation in Europe. NRPB. Commission of the European Communities, EUR 14470.