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**Radiation protection policy towards the Non-Nuclear Industry
in The Netherlands**

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RADIATION PROTECTION POLICY TOWARDS THE NON-NUCLEAR INDUSTRY IN THE NETHERLANDS

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ABSTRACT

This paper contains mainly three items. Firstly, an explanation is given of the systematics of the new Euratom Directive, especially for work activities. Secondly, in short, the current (1997) Dutch legislation towards radiation protection is clarified. Thirdly, an overview is given of the possible development of the Dutch radiation protection policy towards the Non-Nuclear Industry after implementation of the Directive. Regulatory control should be dose-related and effective. Exemption/clearance levels will be developed and work activities will only be subject of control by authorization, not by reporting. It is proposed to handle exemption and clearance levels for handling/use/holding/storage and for disposal/reuse/recycling that are ten times the BSS values from Annex I of the Directive. For emissions to air and water it is not clear yet whether or not exemption/clearance levels will be developed. However, none of these aforementioned proposals has been decided upon yet.

INTRODUCTION

After the adoption of the new Euratom Directive every Member State has to decide how to deal with work activities which, in the presence of natural radiation sources, lead to a significant increase in the exposure of workers or members of the public, and which can not be disregarded from the radiation protection point of view.

The radiation protection policy towards the Non-Nuclear Industry, as outlined in this paper, gives the direction in what way the Dutch authorities may impose regulatory control on work activities of concern. This regulatory control will mainly bear upon non-nuclear industries. Starting point of the Dutch policy is that regulatory control should be dose-related and effective.

Firstly, however, an explanation is given of the systematics of the new Euratom Directive, especially for work activities of concern. Secondly, in short, the current (1997) Dutch legislation towards radiation protection is clarified.

EURATOM DIRECTIVE

In the Euratom Council Directive 96/29 [1] adopted 13 May 1996 the Basic Safety Standards (BSS) for the protection of the health of the general public and of workers against the dangers arising from ionizing radiation are laid down. It should be implemented by the Member States in their national legislation before 13 May 2000.

The BSS make distinction between:

- Exemption levels: *'system in': reporting or authorization*
- Clearance levels: *'system out'*
- Exclusion: *f.e.: radon in dwellings*

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The Directive applies to:

- all practices which involve a risk from ionizing radiation emanating from an artificial source or from a natural radiation source in cases where natural radionuclides are or have been processed in view of their radioactive, fissile or fertile properties;
- work activities which are not covered by the above mentioned practices, but which involve the presence of natural radiation sources and lead to a significant increase in the exposure of workers and members of the public which cannot be disregarded from the radiation protection point of view.

So, in general, the Directive makes distinction between practices, which are in principle functional applications of ionizing radiation and work activities, which are not.

The substances which are involved in production processes of the non-nuclear industries, are not used because of their radioactive properties. Therefore, for the Non-Nuclear Industry the work activities as mentioned in the Directive are of importance.

For practices with radioactive substances the Directive has developed nuclide specific exemption levels on the basis of scenarios in which the criteria of 10 microsievert in one year as an individual dose and 1 mansievert in one year for the collective dose should not be exceeded. Under these levels a practice is exempted, i.e. there is no need for notification or authorization.

A level of some tens of microsieverts in a year is generally considered to be of no significance to individuals. An individual may be exposed to a radiation dose from several exempted practices, it is therefore necessary to ensure that the total dose from the exempted practices does not exceed the trivial dose level. Accordingly, it was considered that the critical group dose from any one exempt practice should be of the order of 10 microsievert per year.

For work activities, the Directive states that the Member States should identify work activities which lead to a significant increase in the exposure of workers and/or members of the public. When identified, the Member States should declare these work activities of concern and subject of control. When a work activity is of concern, corrective measures, if necessary, should be taken to reduce the exposure and radiation protection measures should be imposed.

The radiation protection measures imposed on work activities of concern should be totally or partially the same, as those imposed upon practices by the Directive.

It will be not very practicable if every Member State is going to handle different criteria and measures for work activities. For this reason the EU formulated criteria and guidelines how to identify work activities with a significant increase in exposure to ionizing radiation. Besides that, the EU also initiated studies to actually identify work activities on the basis of the developed criteria.

These studies are grossly divided in two parts: the development of exemption and clearance levels for workers, on one hand, and for members of the public on the other. Before these levels are implemented in national legislation, they are referred to as 'reference levels'.

Furthermore, probably the EU will recommend that levels for exemption and clearance should be equal to each other. The exemption levels should at least not be lower than the clearance levels.

At the moment a study by the NRPB² (UK) in co-operation with the CEPN³ (F) for the establishment of reference levels for workers is being completed. These levels in this study are formulated in becquerels per gram (Bq/gr).

² NRPB: National Radiological Protection Board.

³ CEPN: Centre d'Etude sur l'evaluation de la Protection dans le domaine Nucleaire.

Results of a study for the establishment of reference levels for members of the public are not expected before the end of 1997.

DUTCH LEGISLATION IN 1997

The Dutch legislation and policy in radiation protection is based upon the three principles:

- justification;
- optimisation (ALARA: as low as reasonably achievable);
- dose limits.

These principles are embodied in the Nuclear Energy Act [2], in force since 1963. For the Non-Nuclear Industry the Radiation Protection Decree [3] under the framework of the Nuclear Energy Act is of importance. This Decree contains exemption levels and dose limits for radiation protection and sets out the rules for authorization and licensing.

As far as the exemption levels are concerned, these are applicable for the more functional practices of ionizing radiation as well as for the work activities in the Non-Nuclear Industry. In general, above the exemption levels a licence is required.

Relevant to the NNI are, besides exemption levels for emissions tot air and for discharges to water, exemption levels for solid substances. These are:

500 Bq/gr for solid natural radioactive substances;

100 Bq/gr for radioactive substances;

The most relevant dose limits of the Radiation Protection Decree are:

- worker:	<i>1 milliSv/year</i>
- exposed worker:	<i>B-worker: 1 - 6 milliSv/year</i> <i>A-worker: 6 - 20 milliSv/year</i>
- member of the public:	<i>1 milliSv/year</i> <i>supposition: exposure to no more than 10 sources</i> <i>per source 0,1 milliSv/year</i>

When the actual dose is above one or more dose limits, a licence will be refused.

AFTER 2000 IN THE NETHERLANDS

As stated before the new Directive need be implemented in national legislation. For the work activities the Dutch policy will seek correspondence with the formulated criteria and guidelines of the EU. Also we have our own legal history and we will try to combine the new Directive and the existing legislation to create a dose-related and effective radiation protection policy for the Non-Nuclear Industry.

It will be clear that currently the Dutch policy towards implementation of the new Directive is in development, especially when work activities are concerned. Therefore, everything that is stated in this paper about future legislation in this respect is formulated as a proposal. Nothing has been decided upon yet.

The Dutch authorities will identify work activities which will, in the absence of regulatory control lead to a significant increase in the exposure of workers and/or of members of the public. Such activity will be declared of concern and corrective measures, if necessary, as well as radiation protection measures will be implemented.

If a Member State declares certain work activities of concern, then a set of exemption and clearance levels should be established. These levels do not have to be the same as the exemption levels

developed for practices, mentioned in Annex I of the new Directive. A Member State can also develop its own dose criteria for establishing exemption and clearance levels for work activities.

Above such exemption levels, reporting or authorization should take place. It is almost certain that The Netherlands will handle only authorization, and not reporting, with respect to work activities. This means that when exemption levels are exceeded, immediately a licence will be required. There are a few reasons for this policy.

Firstly, the non-functional character of the presence of natural radiation sources in the Non-Nuclear Industry and the usually bulk amounts which are processed, makes the dose which is caused by work activities not very amenable to control. A limited set of general rules, generally imposed by reporting, is considered insufficiently effective to reduce the dose. Therefore, if a work activity is of concern, then it is considered important to impose on measures which are effective and necessarily tailor-made, instead of general rules.

Secondly, the general rules imposed by reporting probably add little to already existing legislation for the safety of workers.

ESTABLISHMENT OF EXEMPTION AND CLEARANCE LEVELS FOR WORK ACTIVITIES

From the above, it can be concluded, that the Netherlands are going to establish exemption and clearance levels for certain work activities. Above these levels authorization is required. Exemption and/or clearance levels will be formulated for three categories:

- 1 handling/use/holding/storage
Bq per mass-unit and Bq total
- 2 emissions to air and discharges to water;

Radiotoxicity equivalents (Re) per year (and Re per m³-Re per l)

- 3 disposal/reuse/recycling
Bq per mass-unit and Bq total

To establish exemption and clearance levels two conditions have to be met for each category: dose criteria need to be laid down and realistic scenario's need to be determined.

Ad 1 - handling/use/holding/storage

The handling, use, holding and storage of natural sources can cause an exposure of workers and/or of members of the public. For this category the exemption and clearance levels to be developed should be identical.

Workers

In this category a dose criterion of 1 milliSv in one year for workers will be handled. Studies, commissioned by the Dutch government, have shown that, when the same scenario's as for the establishment of the BSS exemption levels for practices are applied, a tenfold of these BSS values in general will not exceed the criterion of 1 milliSv in one year for workers.

This implies, that if the exemption levels for concentration as well as for total activity are exceeded by more than ten times the BSS values, then a work activity of concern should be licensed.

Members of the public

To establish dose criteria for members of the public it is the intention to distinguish between two relevant types of natural sources, namely:

- bulk amounts, who are for a shorter or longer period in the vicinity of a member of the public and who are in fact partly sheltering of the natural background radiation. Proposed criteria are in the range of 0,3 milliSv in one year (the average natural background in The Netherlands) up to 1 milliSv in one year.
- smaller sources (of no more than 1 m³), which can be for a shorter or longer period in the vicinity of a member of the public. The proposed criteria here is 0,1 milliSv in one year. Consumer goods are not included in this type of natural sources.

The first results of the studies underway indicate that, at least for the bulk amounts, a tenfold of the BSS values will never exceed a dose of 1 milliSv in one year and will in most cases be much lower.

Ad 2 - emissions to air and discharges to water

Emissions to air and discharges to water are only considered relevant for members of the public and not for workers.

One of the issues in developing Dutch policy is whether or not to use a limit for such emissions and discharges, above which authorization should take place. If so, this limit can act as an exemption as well as a clearance level.

If it will be decided upon that no exemption/clearance level for emissions and discharges are needed, then the emissions and discharges will be subject to authorization when the work activity is already subject to control by authorization due to exceeding exemption levels because of handling natural radiation sources. In this case an emission or a discharge alone is no reason for authorization.

If, on the other hand, it will be decided upon that there will be an exemption/clearance level, then criteria have to be determined for an individual dose as well as for a collective dose.

Such an exemption/clearance level can be formulated as a load per year or a concentration, or as a combination of both. For the moment preference is given to a load per year, as it will be mainly the load, and not the concentration, that will eventually determine the dose.

If the choice is made to handle an exemption/clearance level, it will have the dimension of Radiotoxicity equivalents (Re's). This unit gives an indication of the dose impact of emissions and discharges by multiplying the emitted or discharged amount of activity of a nuclide with the dose conversion coefficient (DCC) of the same nuclide. See formula (1).

$$X = \sum A_N \cdot DCC_N \quad (1)$$

X = Total number of Radiotoxicity equivalents (Re's)

A_N = Activity of nuclide N

DCC_N = Dose Conversion Coefficient of nuclide N

Dependent on whether it will be an emission to air or a discharge to water, the DCC for respectively ingestion and inhalation should be used.

The total number of Re's of an emission to air or a discharge to water is calculated by summing up the Re's of every nuclide that is emitted or discharged.

Ad 3 - disposal/reuse/recycling

Disposal/reuse/recycling will not be subject of authorization when certain clearance levels are not exceeded. These clearance levels have to be established on the basis of appropriate realistic scenario's and relevant dose criteria.

If, on the other hand, clearance levels are exceeded, then the disposal/reuse/recycling of materials resulting from work activities such as the non-nuclear industries only need licensing in the case authorization is already required for the work activity itself.

For disposal/reuse/recycling the same clearance levels can be handled as those for handling/use/holding/storage. There are two reasons for this: the scenario's for handling/use/holding/storage include also disposal and reuse/recycling require no other scenario's than the scenario's for 'normal' natural radiation sources.

These values are a tenfold of the BSS values listed in Annex I of the Euratom Directive.

DISCUSSION AND CONCLUSION

The starting point of the Dutch radiation protection policy towards the Non-Nuclear Industry is that regulatory control should be dose-related and effective.

In the view of the Netherlands the policy will be effective when non-nuclear industries of concern are only subject to control by means of authorization, not by reporting. This implies that the most effective measures can be imposed, dependent on the work activity and it's specific situation.

The regulatory control should also be dose-related. This means that the Dutch authorities will establish exemption and clearance levels for non-nuclear industries of concern on the basis of relevant dose criteria and realistic scenario's.

The values of exemption/clearance levels for work activities proposed in this paper (10 times the BSS values from Annex I of the Euratom Directive) for handling/use/holding/storage on one hand and disposal/reuse/recycling on the other, indicate how the Dutch authorities think to cope with these problems. However, this approach has not been decided upon yet.

For emissions to air and discharges to water it has yet to be decided whether or not The Netherlands are going to use exemption or clearance levels, before actual values can be developed.

REFERENCES

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