SOME EXPERIENCES FROM THE PRACTICAL APPLICATION OF ALARA PRINCIPLE

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1. INTRODUCTION

One of the basic principles of the ICRP Recommendation,Publication 26 is well known requirement that each exposure to ionizing radiation should be kept as low as reasonably achievable. This requirement is known as the ALARA principle,which serves as the background,for the optimization of radiation protection.(1).This optimization must be applied to both,technical and organizational measures.As such ALARA principle is incorporated,with some modifications, into the radiation protection legislature of the majority of countries where sources of ionizing radiation are being used.

In this paper we discuss incorporation of ALARA principle into Yugoslav radiation protection legislature,as well as an example of its practical application for radiation sources used in metallurgy.

2. ALARA PRINCIPLE IN YUGOSLAV RADIATION PROTECTION LEGISLATURE

Yugoslav legislation which regulates radiation dose limitation consists of two parts: A Law for Protection against ionizing radiation and particular safety measures in nuclear energy use,and B.Regulations.

The law,which is voted by the Federal Parlament,treats problems of radiation protection in a rather general sense,defining radiation protection goals,sources of ionizing radiation,general measures and actions in the practice of radiation protection, etc. Part of the law deals with safety of nuclear instalations and nuclear materials. As far as the ALARA principle is concerned it is nowhere explicitly stated in the law, but it could be recognized in few articles of the law.

In fourteen regulations, which are defined by the law, in details are regulated different aspects of radiation protection in all variety of the use of radiation sources. As far as ALARA principle is concerned the most important of these regulations is one titled "Limits above which population at large and individuals working with sources of ionizing radiation must not be exposed ....". In article 5 of this Regulation it stands:

"Dose for individuals working with the sources of ionizing radiation,members of the public and population at large, from all individual radiation sources,or from all sources which are being used in any practice,are limited by:

1) Justification of the application of a given type of radiation source and justification of use of radiation sources in a given practice.

2) Optimization of the protection from ionizing radiation.

3) Limits of the effective equivalent dose for an individual.

This article elaborated further in the mentioned Regulation, as well as in all other Regulations,serves as the bases for all measures and actions which are to be undertaken in practical work in the field of radiation protection in Yugoslavia.

3. AN EXAMPLE OF THE PRACTICAL APPLICATION OF ALARE PRINCIPLE

In the text to fallow it will be elaborated one example of the practical application of ALARA principle. The example is concerned with radiation protection optimization in the use of radiation sources in metallurgy,where,as it is known,are being used different radiation sources in a considerable number.

One,firstly,has to go through the justification procedure, which in our case is being done according to the following procedure: One first identifies all sources and whose application should be justified. The second step in the process of justification is to consider and meet all general requirements of radiation protection, after which one estimates the price one has to pay due to use of the radiation source in the considered application. This estimation includes nonradiation protection too. In the estimate of total benefit one consideres measurables as well as nonmeasurable social benefits. If one finds that net benefit 0 then application of the source is justified and oposite. Even if 0, one has to do still another step before deciding about justification of the source use-it is nessary to carry out so called relative estimate of the practice, comparing justification of the alternative,nonradiation,practice,with the same benefit.

Step 1. Application which is to be optimized

- Level measurers (137-Cs);
- Thickness measurers (241-Am);
- Thickness measurers with X-ray generators;
- X-ray generators for industrial radiography;
- Ionization smole detectors;
- Neutron sources.

Step 2. Parameters of Optimization Identification

- Shielding (statical and portable);
- Shape of the source container;

- Planing of the operational procedure;
- Definition of the time one spends near the source (regulated by internal regulation and for each working place separately);
- Establishement of the controled areas and limitation of time one can spend in them;
- Automatization of operation,and manipulation from the distance;
- Excercise of the procedure without source;
- Adequate management of the source layout and of the radioactive wastes.

Step 3. Estimate of the Optimal Protection

Two approaches are to be used: a)quantitative and b)qualitative.

(a) One, by the established procedures, carries out an estimate of the equivalent dose below which it is not justified to go with any further reduction.

(b) This approach is applied in those cases where we already have operation with mounted sources. On the bases of Regulations, experience and subjective judgement one estimates the optimization protection.

Step 4. Selection of the Optimal Protection

On the bases of the so far discussed steps one selects the optimal radiation protection for a given use of radiation source.

By using the shown optimization procedure it was possible to reduce considerably the doses of irradiation for individuals employed in a steel plant we treated separately. With smaller modifications this optimization proceudre could be used in many other applications of the sources of ionizing radiation.

4. REFERENCE

1. ICRP Publication 26,Pergamon Press (1977).
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3. M.M.Ninković, Effects of New ICRP Recommendation on Current Radiation Protection Practice, Kernenergie, Bd.26.H.9 (1983).