

## 1. Points of departure

*The report to be presented here concerns ionising radiation. This may be electromagnetic radiation of high-energy photons (gamma radiation) or electrons, neutrons and protons, or alpha particles emitted from naturally occurring or man-made radioactive materials or else created through a nuclear reaction.*

*Ionising radiation has always implied both benefits and risks. From early observations over a hundred years ago of severe skin damage and deaths connected with radiological work (and high exposures) to intensive research and scientific debate over the last decades on late biological effects such as cancer (as the result of low doses), knowledge of the possibility of negative health effects has grown. Lately, environmental concerns other than human health have also come to the fore. This report, which deals with a policy for radiological protection, focuses more on risks than on benefits, not because benefits are less important but because judgements regarding what is beneficial usually involve social and economic considerations that cannot be specified within the framework of a general radiological protection policy.*

### 1.1. The context

Discussions of radiological risks are known to have started early in several countries, in combination with efforts to improve methods for using ionising radiation for medical purposes including issues on dose measurements and standards. Sweden had its pioneers as well, of whom Rolf Sievert is probably most known today because of a radiation dose unit named after him.

Scientific international co-operation also started early, albeit on a limited scale. The 2<sup>nd</sup> International Congress of Radiology held in Stockholm in 1928 represents a landmark for radiology in general, particularly for radiological protection. The Congress, attended by nearly one thousand experts, approved the establishment of an International X-Ray and Radium Protection Committee, later to become the International Commission on Radiological Protection (ICRP). What is now the International Commission on Radiation Units and Measurements (ICRU) also has its roots in the radiology congress and may be regarded as a sister organisation to the ICRP.

Today in a world where ionising radiation plays a considerably wider role in civil life - particularly for generating energy - and is constantly spreading to new areas of use, there are several other international organisations that may be mentioned such as the International Atomic Energy Agency (IAEA), an autonomous intergovernmental organisation one of whose tasks is to establish and administer radiation safeguards. As its name indicates, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) has a unique international mandate and position as regards scientific assessments of levels and effects of exposure to ionising radiation. The Organisation for Economic Co-operation and Development (OECD) should be seen as another important player in this context and its Nuclear Energy Agency (NEA) has a special Committee on Radiation Protection and Public Health (CRPPH). The OECD, whose membership includes a number of well-developed, mainly Western countries, has wide influence in other parts of the world as well. Finally, when it comes to non-governmental co-operation, it is especially relevant to point to the International Radiation Protection Association (IRPA), which represents national voluntary organisations from many countries.

In the following, the focus will be on the ICRP in particular. This organisation issues recommendations on radiological protection policy in general. These then provide a base for more detailed guidelines issued by organisations such as the World Health Organisation (WHO), the International Labour Organisation (ILO), IAEA, and NEA as well as for regulations issued by national authorities. This holds for the European Union as well (EURATOM).

## **1.2. The Swedish ICRP Project (SwIP) is set up**

The present major ICRP principles for radiological protection (RP for short) are to be found in its Publication no. 60 (ICRP-60), issued in 1991, although much of the thinking behind these principles was developed over the previous decades. In the mid-1990s, CRPPH initiated an overall review of experiences of the RP system which has so far resulted in two publications (NEA 1998; NEA 2000), with further work going on. A move that definitely seems to have got the discussion going world-wide was made in 1999 by the ICRP chairman, Prof. R. Clarke. At that time he published some new ideas on RP policy with the intention of simplifying a system that had begun to be criticised from various points of view (Clarke 1999). At the same time, comments were invited and the initial suggestions have also changed a bit over time as a result of the ongoing debate.

In Sweden, the Analysis Group, which is connected to Kärnkraftsäkerhet och Utbildning AB (Nuclear Training and Safety Centre) KSU, started discussing the issue of possible new ICRP recommendations and also produced some information and views on the subject. In November 2000, the Analysis Group arranged a seminar to explore whether or not there was an interest in setting up a special project to study this matter. As a result, a small project group was formed consisting of four experts who are independent of both industry and national authorities, and what was then called the Swedish ICRP Project (SwIP) was established at the end of the year.

According to the terms of reference, the intention is for the project group to study the available material from the debate on the ICRP risk model, describe the situation and analyse different concrete results and their consequences. Completely new proposals may also be put forward by the group or by individual group members. While the need for the group to approach the various points in a scientific manner is stressed in the terms of reference, it is pointed out that the ICRP risk model and its applications must also be seen as a matter of practical considerations and evaluations. It should therefore be of considerable interest that both present and proposed risk models be evaluated.

The terms of reference also draw our attention to some specific areas that should be studied, such as applications in the field of nuclear power, the management of nuclear waste in the long-term perspective, the occurrence of radon in dwellings, and the medical use of ionising radiation. Some consideration should also be given to a protection policy when applied to comparisons between different risk areas. Another aspect that the group will take into consideration is just how comprehensible the rules of radiation protection are; in other words, how likely is it that decision-makers and the general public can be encouraged to have confidence in them? The full text of the terms of reference is found in **Annex 1**. As is also seen from this Annex, the project is financed by KSU together with Svensk Kärnbränslehantering AB (Swedish Nuclear Fuel and Waste Management Co), SKB.

### **1.3. Methods of work**

The project work has been planned, in general terms, in conjunction with a Reference Group also set up by the KSU Analysis Group. We—the members of the project group—have benefited greatly from the contact we have had with the Reference Group during 2001. However, we have always felt completely free to take our own route and to draw our own conclusions.

The project's terms of reference indicate case studies as an important vehicle for the analysis. Six areas for such studies were identified at an early stage of the work. After extensive planning, at least some of the work could start before the summer of 2001. The case studies have mainly been performed by experts outside our own group. Certain case study results have been directly relevant to our considerations. However, we think that the case studies also have value in themselves although some are rather limited. Other parties may find more information of interest here and should have the opportunity to draw their own conclusions as well.

Besides initiating case studies, we have chosen the traditional approach of first trying to find out as much as possible of what has already been said or written as regards both the present ICRP RP system and the new ideas, views in favour of the system as well as against it, and other potential options. Over and above the information that has been published, we have been able to follow, in an informal way, certain NEA/CRPPH activities. Likewise we have had the opportunity to see comments from IRPA members, presented at their meetings. It has also been important to follow the evolution of Prof. Clarke's original ideas. His proposal, in a modified form, is now also endorsed by the ICRP Main Commission (ICRP 2001). A full list of the literature to which we have had reference or have otherwise used can be found in a separate section at the end of this report.

Seminars and other personal contacts have provided further input to our work. This is especially true of a seminar arranged in the course of the project in August, 2001, in which Prof. Clarke also participated. Preliminary results from case studies were discussed on this occasion, as well as issues of overall relevance to the current debate on the ICRP's RP policy. Fresh information on the current directions of ICRP work was provided by Prof. Clarke as well as some clarifications regarding the new ideas.

It eventually became apparent that if the project's work was to maintain a realistic scope, no comprehensive description and analysis could be given of all the issues that were under debate. We therefore decided to concentrate on certain key issues, beginning with the scientific basis for a radiological protection policy and especially the human health aspects. We did not feel that it was up to us to undertake an in-depth review of the voluminous data available in this context, nor was it our intention to supplant the judgements by respected scientific panels such as UNSCEAR with our own. We have, however, taken a firm position in one important respect and have also attempted to initiate a general discussion regarding uncertainties.

As to other key issues, in agreement with the Reference Group we decided to give some priority to the new ICRP ideas so that we could quickly add our own voices to the ongoing discussion. We also came to focus on some overall requirements with regard to future RP recommendations, and we underscored the need to see radiation risks in a wider context. This has had an influence on our general approach to the task before us. Thus—for example—we have not tried to discuss the present ICRP model as such, with its pros and cons, nor have we

compared the present ICRP system with the new proposals point by point, apart from what was planned in the case studies.

Finally, we would like to underline that this report is a result of a step-by-step process, where our main ambition has been to present interested parties with structured information and a tool for further thinking, in addition to the conclusions and recommendations that we thought would be relevant and helpful. We also stand unanimously behind the report.

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