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# THE IMPLEMENTATION OF THE 1990 RECOMMENDATIONS OF THE ICRP IN KOREA

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ABSTRACT

Over the last three years, the new Recommendations of the International Commission on Radiological Protection(ICRP-60) brought some controversies in radiation protection field. In the course of preparation for implementation of the new Recommendations in Korea, some main issues were critically reviewed including the reduction of dose limits for occupational exposures, the introduction of the concept of dose constraints for proposed practices, and the description of radiological protection system using the concept of practice and intervention. Not only scientific meaning of dose limits but also socio-political impact in different countries must be considered for implementation to the regulatory system. How-to-communicate with the general public on the radiation risk would be more difficult task for specialists than how-to-meet the lower limits. A considerable amount of costs and resources will be required for implementing the new Recommendations. The most dominant portion of the resources would be needed in the education program including the training of personnel in radiation protection field. Education of the general public on the underlying concept of the new system of radiological protection is also important to prevent any unfavorable disturbance on the public acceptance.

## I. Introduction

The International Commission on Radiological Protection(ICRP) issued the new Recommendations, ICRP Publication 60 and 61 in 1991. These were approved by the Commission in November 1990, after a substantial period of interactive elaboration, dissemination for comments to each time wider audiences, reviewing and consolidation. The Recommendations prescribes the fundamentals of radiation protection, which include the philosophy of radiation protection, basic quantities, a system of radiation protection, and guides for the implementation of the Recommendations.

In the 1990 Recommendations, significant changes were made to the conceptual framework of radiation protection. Some minor changes may be adopted without any difficulties, but it is expected that considerable efforts and costs will be required to implement the major changes.

In this paper, the main issues of the 1990 Recommendations will be reviewed briefly, with the additional comments on the implications of some major changes. The opinions on the implementation of the new Recommendations in Korea will be discussed in the section follows.

## II. Implications of the 1990 Recommendations

There are numbers of changes in the new Recommendations compared to the previous one, ICRP Publication 26 : redefinition of dose quantities; establishment of two contrasting concepts of practice and intervention; consideration of potential exposures;

reduction of dose limits; introduction of constraints; and so on. Among these changes, the most significant changes recommended are the reduction of dose limits and the introduction of the concept of constraints for proposed practices.

In the ICRP 60, the Commission recommended a limit on effective dose of 20 mSv per year for the occupational exposure averaged over 5 years, with the further provision that the effective dose should not exceed 50 mSv in any single year. For the exposure of the general public, the limit of 1 mSv per year remains valid but the condition, "averaged over 5 years", has been deleted. To justify the new limits, the Commission provided very detailed biological background and risk estimates. With that information of the revised risk estimates, the Commission may have been uneasy in doing nothing because of public concern about radiation risk. Decisions of the ICRP are determined by not only scientific information but also socio-political considerations. This would be quite natural if the fact that radiation causes not only biological effects but also socio-political impacts is taken into account. Furthermore, as the most prominent, authoritative and influential organization, the Commission should maintain continuity and consistency in its Recommendations. In this regard, it should have suffered hot internal debates to give birth to the new dose limits.

The Commission placed a new condition called constraint in the system of radiological protection as an integral part of optimization. The dose constraints will be applied to the source-related exposures, and the risk constraints to potential exposures. In fact, the concept is not new to ICRP, although the early formulations were far from explicit. The essence of a constraint is that it provides a restriction on the inequity that can result from the balancing of detriments and benefits from a particular source of operation when the detriment and the benefit are received by different people or are differently distributed through the population. A constraint differs in its objective from a dose limit, which is concerned with restricting the detriment to an individual, and the progeny, regardless of benefits. A dose constraint as understood by ICRP is not a subsidiary limit on the dose to individuals, nor is it a form of investigation level. It is a prospective tool forming an integral part of the procedure of the optimization of protection.

For the existing source of exposure, particularly to the public, an intervention should be introduced based upon justification that it would do more good than harm, and upon optimization that the form, scale, and duration of the intervention have been chosen so as to optimize the protection. Two long-term problems, radon in dwellings as well as radioactive residues from previous events and emergencies resulting from accidents, are highlighted as situations calling for intervention.

Departing from the previous Recommendations, the Commission stressed the implementation of the Commission's Recommendations in ICRP 60. It emphasizes the importance of the operational level of radiological protection and shows how the level should be developed from the requirements of regulatory agencies and the Recommendations of the Commission. A logical sequence of stages for implementation is established. The stages are allocation of responsibility, implementation of the Recommendations of the commission, requirements of regulatory agencies, management requirements, and finally validation of performance. The definition and placement of responsibility, the authority needed to meet the responsibility, and the accountability are clearly stated. Emphasis is placed on the necessity of providing adequate resources for the education and training of future professional and technical staff in radiological protection.

III. Study for Implementation of the New Recommendations

Although the Recommendations given in the ICRP 26 of 1977 have been accepted by many countries, they were adopted only recently. Other countries have still not been introduced to the regulations. It should be noted that the changes included in the ICRP 26 were as significant as the changes in its successor. Considering the wide range of practices in different countries, we can easily assume that the impact of the changes in the ICRP 60 will differ from country to country.

For developing countries like Korea, the Recommendations of the Commission may not be considered as either refutable or negligible ones simply because they cannot repeat the same kind of risk estimates to establish their own limits due to lack of resources and capabilities. It seems to be a mandatory process for regulatory bodies of developing countries being aware of public concern to reflect the Commission's Recommendations in their radiation protection legislation system. They have to rely on the Recommendation of the Commission with little choice and pay a formidable cost, even though their society may not be ready to accept.

In the course of implementation of the new Recommendations of ICRP, both of scientific meaning of radiation protection system and socio-political impact on the different countries must be considered. Particularly, the introduction of the concept of constraint calls for attention. It is recommended that the constraints should be set up on the national or local level. Implementation of the concept of constraint, however, will not be easy in reality. Since constraints are fundamentally source-related matters and since varieties of practices are not bounded by nature, it will require a considerable amount of efforts to implement the concept of constraint in the regulatory procedures. Although it need not be based on the result of optimization, a good deal of experiences are required to figure out appropriate values of constraint for a given group of practices or sources of exposure.

Another problem lies in the enforcement of the constraint. Constraint is a relatively broad term and will not be appropriate to be defined in laws or regulations. Laws and regulations should define the minimum norm and should be applied equally to all practices. Since the constraints imposed on each practice could be different from practice to practice, it is not proper to prescribe them in a simple fashion in the regulations. Therefore, it is expected that constraints will be issued as regulatory guides, which are more flexible than laws or regulations. They can be applied at the licensing stage of a proposed practice together with the optimization process.

The most significant change would be the reduction of dose limits for occupational exposures. It has been recognized that most radiation workers received doses far less than the previous limit, 50 mSv a year and the distribution of doses among workers is known to have a log-normal shape so that very small portion of workers receive doses higher than 20 mSv a year. For example, only 0.2 percent of the Korean nuclear plant workers received more than 20 mSv in 1992. If we reduce the limit from 50 mSv to 20 mSv, the tail part at high dose will be pushed downward. Therefore, a simple reduction of dose limits will only eliminate the small number of workers who get a dose higher than a few tens of mSv a year, but will result in only a small saving in collective dose. The fundamental question is if the public feels safe with lowering the limits. Unfortunately, the further we reduce the limits, the more the public concern about radiation.

Consideration of protection cost leads to necessity of evaluation of monetary value of

radiation dose averted, which is a fundamental element to be quantified for optimization processes. The monetary value should be determined by reflecting the socio-economical environment where practices exist or are planned. It varies very widely from country to country and from one to another who evaluates it. All the same, it is low in the developing countries and high in the developed countries which implies, if translated, that people in poor countries are forced to or willing to tolerate higher risk. It could be a common sense but hardly be admitted by the public in developing countries.

It should be pointed out that a considerable amount of costs and resources will be required for implementing the new Recommendations. The most dominant portion of the resources would be needed in the education program for all the individuals involved in radiation protection. As the system of radiation protection becomes complicated more and more, a highly qualified staff of experts will be required for the successful implementation. A very intensive program should be developed and implemented especially for training dosimetry personnel and health physicists.

The importance of training calls for active involvement of the competent authorities in the training program. Nevertheless, it will take time for us to get ready to implement all the new concepts and guidelines prescribed in the Recommendations. For moderation of the impact of the proposed changes, a period of time is needed for preparation before beginning implementation. During this period, we should concentrate on the training of personnel while drafting revisions to the regulations. Training courses organized by appropriate international bodies such as the International Atomic Energy Agency will be helpful for enhancing the infrastructure for radiation protection in developing countries and eventually promote international harmonization of the protection standards.

## IV. Concluding Remarks

A study project for the practical application of the new Recommendations of ICRP in Korea was launched in 1992 by the Korea Institute of Nuclear Safety(KINS). The KINS, as a technical subsidiary for the regulatory body, plays an important role to develop the regulations on the radiation protection system. As discussed above, socio-political impact as well as background details of the new concepts in the 1990 Recommendations should be considered for implementation to regulatory system so that the new system could be reasonably understood by the licensees and the general public. As the public concerns about radiation risk has increased after the accident in Chernobyl, public education program on the underlying concept of the new system of radiological protection becomes very important to prevent any unfavorable disturbance on the public acceptance. It should not be overlooked that the social cost of nuclear energy, which is related either directly or indirectly to public acceptance, has rapidly increased over past two decades.

## References


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