THE WORK OF COMMITTEE 4 OF ICRP

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ABSTRACT

This paper explains the rôle of Committee 4 of ICRP and outlines its current programme of work with the associated timescales. The topic areas are: probabilistic exposures; radiological emergencies; and radon at home and in the workplace.

INTRODUCTION

Committee 4 of the International Commission on Radiological Protection is established to consider the practical application of the Commission's Recommendations. The current programme of work of Committee 4 ICRP has now been running for three years and was established as the new Recommendations of the Commission were nearing completion. The programme therefore focused on three major issues that were emerging and would not be resolved by the time the new Recommendations were published. The Commission endorsed the Committees proposals for work in these three areas and has appointed a Task Group for each.

The first topic relates to the introduction of **potential exposures** in Publication 60. The Commission gives suggests that risk limits are not to be set and proposes **risk constraints** be developed but no guidance is given on how this is to be done.

The second topic is **intervention for protection of the public in a radiological emergency**. The Commission last gave advice in Publication 40 which was prior to the Chernobyl accident. There is a need to update the principles in the light of experiences gained in the intervening years.

The third topic being considered by Committee 4 is **Measures for protection against radon.** This was the last of the topics to be identified and the relevant Task Group has been in existence for a shorter period than the other two. The main thrust of the work relates to the establishment of intervention levels for radon in homes and in the workplace. The terms of reference specifically exclude radon in mines. However, the Commission accepted a recommendation of Committee 4 that it should clarify its position with regard to occupational exposure in mines. It has set up a Task Group of the Main Commission with the intention that the situation should be resolved in a relatively short time.

The work of each of the three Task Groups is considered in turn. The status of the work is as of mid-1991 in this paper. All of the Task Groups will be meeting and producing amended drafts for the next Committee 4 meeting in April 1992. An update of the progress will be given in the presentation at the IRPA meeting.

TASK GROUP ON THE ASSESSMENT AND CONTROL OF RISK FROM POTENTIAL EXPOSURES

This Task Group is chaired by Richard Cunningham of the US Nuclear Regulatory Commission and has as members, Adolf Birkhofer (Germany), Abel Gonzalez (IAEA), Lars Hoeberg (Sweden), and Bert Winkler (South Africa).

Potential exposures may arise from the introduction of any practice and may involve a wide range of consequences. Some practices utilise simple sources and the consequences of accidents may be fairly limited in terms of the numbers of people and areas affected. This may apply to the failure of

interlocks on an irradiation facility, or an accident involving an industrial radiography source. Other practices lead to a complex series of "source terms", such as nuclear installations, where the consequences of an accident may range from the almost negligible to significant social and economic disruption as well as severe health effects. Other effects may arise in the far future such as those from the deep disposal of solid radioactive waste.

The Commission has recommended that a risk limit should not be set on the grounds that it is impossible to regulate such a limit. On the other hand it feasible to set constraints which may be sequence specific depending on the type of practice. The Task Group is considering generalised constraints on probabilistic events along the following lines:

(a) events which result in doses below the dose limits and are treated as part of normal exposure: 10^{-1} to 10^{-2} y^{-1}

(b) events which result in doses above the dose limits but are stochastic in nature: 10^{-2} to $10^{-5} y^{-1}$

(c) events where some radiation effects are deterministic, but not fatal: 10^{-5} to 10^{-6} y^{-1}

(d) events when early death is likely: $< 10^{-7}$ y^{-1}

These figures are intended to illustrate the types of constraint that may be imposed based on judgements of what can be accomplished and could be revised in the light of operational experience gained.

One of the more difficult issues for the Task Group is to try to recommend levels of probability that are sufficiently low as to make the event acceptable, regardless of the consequences. The acceptable level depends on whether the consideration is of justification, optimisation or individual risk.

In **justifying** a practice involving potential exposure there are many considerations other than radiological consequences and some events will be accepted, even if they are severe, because of the benefits expected from the practice. This will lead to a natural acceptance of some low probability events. In deciding on the **optimisation** of the safety of a particular plant, there will be an aggregation of various attributes for the purpose of comparing alternatives. In this case some sequences will not contribute significantly to the aggregated "risk" from the plant and may be ignored. These sequences may be of relatively high probability, but of little consequence, or may be of high consequence, but with negligible contribution to the "risk". In either case there is reason to accept events without further attempt to reduce their probabilities. Finally there will be grounds for accepting an event when the individual health risk is low enough. There are reasons for thinking that a risk of death to an individual of less than 10^{-7} y^{-1} is so low as not to be of concern to the individual.

The work of this Task Group will be of importance to the nuclear safety community as well as to the radiological protection world. However the report must not be written so as to appear dominated by nuclear power, since more accidents occur in the industrial and medical fields.

TASK GROUP ON PRINCIPLES FOR INTERVENTION FOR PROTECTION OF THE PUBLIC IN A RADIOLOGICAL EMERGENCY

This Task Group is chaired by Roger Berry of British Nuclear Fuels and has as members: Larry Chamney (Canada), Frances Fry (UK), Yuri Konstantinov (USSR), Guy Lamaire (France), and Anneli Salo (Finland).

This Task Group is applying the principles of ICRP 60 for **INTERVENTION**. These are:

(a) The proposed intervention should do more good than harm, i.e. the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and costs, including social costs, of the intervention **(JUSTIFICATION)**

(b) The form, scale, and duration of the intervention should be optimised so that the net benefit of the reduction in dose, i.e. the benefit of the reduction in radiation detriment, less the detriment associated with the intervention, should be maximised **(OPTIMISATION)**

Dose limits do not apply in the case of intervention, but Publication 60 states that the application of principles (a) and (b) will lead to dose levels where intervention is appropriate. The major objectives of the work of the Task Group are to develop the techniques of optimisation to be applied to each specific countermeasure. This should help clarify the difference in using individual or collective dose as the variable in the optimisation depending on the countermeasure. It is clear that an optimisation may lead to there still being no net benefit. The optimisation process is most likely to lead to a dose within a **range of doses** between which the intervention is **justified.** The Task Group is planning to use the justification principle to derive levels of dose, well below those at which deterministic effects would be observed, at which intervention is almost always likely to be justified. The resulting intervention levels are shown in Table 1.

There will thus be no lower levels of doses below which the Task Group recommends that intervention is not warranted because of the difficulties in finding common values which apply across a wide range of individual and societal benefits and disadvantages. It still remains clear that the dose limits for normal operation of the practice are not necessarily the correct figures at which to start intervention, although intervention below dose limits must be unjustified.

Table 1

Levels of individual dose at which intervention is almost certain to be warranted

Protective Action	Quantity	Intervention Level (mSv)
Sheltering	Effective Dose	50
Evacuation	Effective Dose Skin Dose	500 5000
Stable Iodine	Thyroid	500
Food Control	Effective Dose	10
Relocation	Effective Dose	Dependent on circumstances

The report will not address the exposure of emergency workers, either those who are involved in the immediate action to control the event, or those who become exposed as a result of the deliberate programme of decontamination. The Task Group will give guidance for the restriction of exposures for those people whose work takes place in a contaminated environment as a result of an accident, but whose work would not otherwise involve radiation exposure.

TASK GROUP ON MEASURES FOR PROTECTION AGAINST RADON

This Task Group is chaired by Richard Osborne (Canada) with members: John Harley (USA), Tony James (USA), Mike O'Riordan (UK), Gun-Astrid Swedjemark (Sweden), and Pierre Zettwoog (France).

The report addresses the situation of radon in dwellings first as that is the area where intervention as described by ICRP is most easily understood. The principles are identical to those referred to above and in this case everyone appears to be quite clear that dose limits for practices do not apply. The Commission has previously given advice in this area, but since then two things have happened. First the risk estimates have increased and second, more importantly, there is a new model of the human respiratory tract under development by a Task Group of Committee 2 of ICRP. This new model gives doses per unit intake that are at present 2 or 3 times greater than those given by the present

lung model. The reasons are that the new model identifies the secretory cells on the bronchi as being the cells at risk rather than the deeper basal cells previously thought to be those at risk. This increases the dose per Bq inhaled. In addition the model apportions the w_T of 0.12 for the lung in the ratio of the natural incidence of lung cancers. These are smoking related, and occur in the major bronchi which leads to a greater weighting being placed on the dose to those bronchi. The Commission has asked its Committee 1 (Biological Effects) to advise on the two features of the new model. The outcome will be of major significance to the work on radon.

The report will deal with the physical and biological fundamentals as well as movement and measurement, followed by remedial and preventive measures.

The more difficult area is the workplace. There will be situations where there is a high radon level in a workplace and intervention may be indicated, but are the workers to be regarded as occupationally exposed with all the associated considerations of monitoring, record keeping and medical examinations. The Commission has rather left this to National Authorities in Publication 60. If that Authority declares that a workplace is affected by radon, then the workers are radiation workers. The Task Group is trying to develop guidance which would help the decision making. Two possible approaches are being considered:

(a) only that exposure to radon that is increased above the general level in the area is regarded as occupational exposure and this additional exposure is subject to control;

(b) where the worker is not involved with handling radioactive materials and the additional exposure to radon is not considered occupational exposure.

The first proposal would treat radon as artificial radiation sources are treated in that natural background radiation is excluded from that for which management has responsibility. The second proposal means that radon at work would be dealt with in exactly the same way as radon at home and intervention alone would apply.

CONCLUSIONS

The three Task Groups of Committee 4 are meeting during the autumn of 1991 and will produce new texts for the Committee 4 meeting in April 1992. The intention is that Committee 4 will submit those three reports after any corrections and amendments, to the Main Commission at its meeting in November 1992. If the Commission adopts any or all of the reports, they should appear in the Annals early in 1993.