Comments on the Draft for Consultation of the 2005 Recommendations of the ICRP

Following are the comments from the Health Physics Society.

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General Comments

The Health Physics Society appreciates the opportunity to offer comments on the Draft 2005 Recommendations of the ICRP.

The rationale and supporting basis for these recommendations need to be strengthened. The publication of this guidance document should be postponed until the necessary supporting technical documents have been fully reviewed and published. The proposed dose constraints require a full justification and scientific basis.

The ICRP needs to provide a very persuasive argument regarding the potential benefits of the proposed changes in radiological protection. Implementation of any changes in protection practice, particularly regarding regulatory issues, is likely to incur significant expense from public and private sources.

The Health Physics Society disagrees with the establishment of a numerical dose constraint of 20 mSv (2 rem) per year for occupationally exposed individuals. The current dose limit of 50 mSv (5 rem) per year, not to exceed 100 mSv (10 rem) in 5 years together with the framework for optimizing dose to individuals is working. Instead, we recommend that any new ICRP recommendations add flexibility. Small groups of specialized workers who perform high dose jobs should be permitted to receive up to 50 mSv (5 rem) per year provided their lifetime risk is controlled by limiting the lifetime exposure, as is done in the recommendations of the NCRP in the US. Optimization should place special emphasis on developing equipment, processes, and procedures to lower the dose received in these high dose jobs.

Specific Comments

Summary:

Paragraph (S5) states that a *dose constraint*, "is used to provide a level of protection for the most exposed *individuals* within a class of exposure." The term

"level" needs qualification, an *acceptable* level, a *suitable* level, a *minimal* level, a *minimally acceptable* level. Which is it?
The term, "class of exposure" needs to be defined.

Paragraph (S6) The requirement for optimization is the concern of workers and other stakeholders as well as management and national authorities.

Paragraph (S7) A dose constraint is a value at which action to reduce doses is justified (S5). The purpose of qualifying the recommended constraints as "maximum" is not clear. These seem to be identical with the dose limits for normal exposure conditions.

Table S1 is titled Maximum dose constraints…, and yet the final constraint is described as the minimum value of any constraint. The value of this constraint should be 0.1 mSv, and it should be described as the constraint at which further action to reduce the dose is not likely to be justified.

Paragraph (S8) The dose limit for the public from all sources is 1 mSv (Publ. 60). The dose constraint for a single source is also 1 mSv. Publ. 60 implies that the limit applies to the average dose to a critical group, although it uses the term constraint instead of limit.
The term "class of exposure" needs to be defined.

Paragraph (S18) The Commission should be very cautious about this approach to protection of non-human species. It could result in the restriction of serious radiological protection by focusing limited resources on unimportant issues and lead to unintended consequences by limiting the irradiation of species for biological and pest control.

Quantities Used in Radiological Protection

Paragraph (40) The reference to Section 3.6 should be to Section 3.5.2.

Paragraph (44) It would be advisable to state here that the quantity *absorbed dose* is referred to elsewhere as *dose*, e.g. Paragraph (60).

Paragraph (47) Does the Commission have radiobiological experiments which give results between low LET (<10 keV per micron) and ~100 keV per micron? The basis document for this "judgement" needs to be provided.

Paragraph (54) The statements in this paragraph are excellent and very necessary. Perhaps this should be placed at the very front of the report.

Paragraph (72 &73) It is good that the Commission returns to recommending an analytical function to determine the weighting factors for neutrons. However, there is no scientific basis given for forcing the factor to 20 at 1 MeV. In addition,

there is no logic for forcing the weighting factor to 5 for high energies. For neutrons above a few hundred MeV energy deposition is primarily from protons set in motion by the neutron interactions. Protons are given a factor of 2 and neutrons at these energies should also carry a weight of 2, not 5. This is important for exposures at high energy accelerator facilities and for space flight.

Paragraph (90) The statements in Paragraph (85) indicate that the data in Publication 74 remain valid. However, in this paragraph we seem to be led to expect a revision of Publication 74.

Paragraph (91) The decision not to publish current ALI values is a mistake. Radiation safety professionals with a minimum of training recognize the limitations of ALI's with regard to compliance with dose limits. ALI values can be normalized to a convenient dose value, such as 10 mSv. The availability of ALI's permits the determination of basic parameters when creating or reevaluating internal dosimetry programs.

Biological Aspects of Radiological Protection

Section 4.2 is an excellent discussion of cancer induction and hereditary effects.

The General System of Protection

Paragraph (130) The implication of the third sentence is that individuals are generally exposed to many sources, ("only a small number…can be identified…"). This is simply not true. Even exposure to "several" sources (first sentence) outside a work situation is very unlikely for most people.

Paragraph (133) Applying a **dose constraint** at some level below the recommended dose limit and relating this to the most exposed individuals is unnecessarily restrictive. The limit should be applied to the most exposed. The **constraint** is more logically and reasonably applied to the mean exposure of a group of individuals. No individual is likely to be maximally exposed from more than one source.

Paragraph (136) The last sentence is unnecessary and improper. There is no valid reason for the Commission to express to regulatory agencies that they are expected to implement **dose constraints** below the maximum recommended.

Paragraph (150) The first sentence is excellent. The rest of the paragraph represents the hopes and dreams of the Commission but goes far beyond providing "guidance" If the recommendations are judged to be helpful, they will be adopted.

Paragraphs (154/155) These two paragraphs are confusing, unhelpful and unnecessary. Paragraph (149) says all that needs to be said.

The Commission's Required Levels of Protection for Individuals

Title "Required" is not the appropriate word. It should be "Recommended".

The Commission's recommendations relative to dose constraints are not clear. This lack of clarity is compounded by the statement in paragraph (163) "The Commission expects that the resulting values normally will be lower than the maximum value recommended by the Commission, but probably not by as much as a factor of ten." Essentially, the Commission has provided recommendations on maximum values of constraints, not clearly defined their origin or rationale, and then recommend that governments develop their own constraints at levels lower than those recommended by the Commission.

Paragraph (156) There is no clear basis for the statement in the third sentence concerning a reduction in dose to the public.

Paragraph 157) The ICRP has articulated no scientific basis for relating the levels of "maximum constraints" (limits) to the levels of annual effective dose from natural sources (excluding radon)? The establishment of new recommendations for dose limits and constraints should have a clearly articulated basis in science.

Paragraph (158) The "range" of annual doses from natural background certainly goes higher than 2.4 mSv. UNSCEAR 2000 characterizes 0.8 to 2.4 mSv as the typical range.

Paragraph (161) and Paragraph (164) – last bullet
The need for action should be low for doses less than one tenth of the background dose. Action should be unnecessary for doses less than one hundredth of background dose.

Paragraph (165) A potential consequence of the use of the recommended constraints is a conflict with the Commission's dose limits for workers: 50 mSv in any given year provided that the individual's exposure does not exceed 100 mSv in a five year period. The primary concern is that the new concept of dose constraint will have an adverse effect on collective occupational exposure in the nuclear power industry in the United States. By limiting the ability to effectively manage individual exposures for certain specialty workers, collective exposure could increase unnecessarily.

An annual dose constraint of 20 mSv could also negatively impact health care providers especially in areas that use fluoroscopy extensively such as Heart Catheterization and interventional radiology.

The ICRP defends the constraint concept and separates it from a dose limit by stating that the constraint is only for exposure to a single source while dose limits are from all sources. This fails to adequately address occupationally exposed population(s) receiving their annual occupational doses from what would reasonably be considered a single source.

Paragraph (169) The last sentence is not a good statement to have here. There may be valid reasons for these workers to have a dose constraint that is applied in excess of the public constraint (limit).

Paragraph (171) This is another example of the confusion between "protection of the individual" and the application of the constraints to the "most exposed individuals".

Paragraph (172) In this paragraph it appears that the average dose to a defined group of individuals is to be compared with the dose constraint, not the dose to the most exposed individual(s). The concept is unclear.

The Optimisation of Protection

Paragraph (203) The concepts discussed in the section on optimization such as development of a 'dose matrix' and the key elements of this 'dose matrix' may have value; however, it is difficult to comment on the specifics since the technical foundation document has not been published.

Exclusion of Sources from the Scope of the Recommendations

Paragraph (205) As stated in Publication 60, the term "exclusion" was reserved for radiations that are not amenable to control. Here it seems to include those considered to be "exempt", meaning that the resulting dose implications for these levels would be too small to be of concern. It would be much better to separate the two terms (exclusion and exemption) to avoid confusion.

Paragraph (210) and Table 10 The recommended exclusion levels in terms of specific radioactive concentration in Table 10 are both redundant and meaningless. The recommendation in Table 7 specifies a minimum value for any constraint of 0.01 mSv per year. Using this dose constraint the exclusion activity levels for radioactive materials can be determined. Further, the recommended exclusion levels may add confusion to communication with stakeholders, as the public may be led to believe that the suggested values are the actual cleanup values. It is not clear if the Commission intends that the 0.01 mSv be used to derive the exemption levels.

Additional confusion may arise because the dose constraint for cleanup of a contaminated site is about 0.2 to 0.3 mSv per year (0.25 mSv in the US). This corresponds to a concentration level of about 0.4 Bq per g for ^{137}Cs. A facility

with contaminated soil remediated to this level would be eligible for license termination but would have the presence of radioactivity above the exclusion activity level. This situation is exaggerated for artificial α-emitters. The creation of this regulatory limbo could present significant problems for decommissioning projects. The basis for such low values for exclusion are not explained by the ICRP in the draft recommendations nor is the relevance of these exclusion levels to the clearance levels proposed for international trade, unrestricted release of materials, etc.

No technical basis for the concentration-based exclusion levels is given. This makes it difficult to understand the significant differences between concentrations of naturally occurring radioactive materials and artificially produced radionuclides. On face value, the impression is given that the artificial radionuclides are one or two orders of magnitude more hazardous than NORM. Recognizing that the dose coefficients for the various radionuclides are not the same, it would be better to describe the basis for the exclusion levels, i.e., are they based on dose or risk considerations?

Medical Exposure

Paragraph (213) the second sentence should read, "…justification and optimization of the medical procedures." Patient exposure can be optimized as is discussed in Section 9.3.

In the 5th sentence, the reference should be to Section 6.2, not Chapter 6.4.

Paragraph (216) In the 4th sentence the statement should indicate that the judgment is whether the radiological procedure will be more effective than another procedure to improve diagnosis or treatment.

The Protection of the Environment

Paragraph (249) It is unclear how the "derived consideration levels" for Reference Animals and Plants will be applied to protect the environment. The Commission should consider whether there is any evidence to show that, at current human protection levels, there is a possibility that some part of the environment would likely to be harmed. This might be a better way of looking at this matter before a specific approach is recommended. In short, the proposed approach is premature.

Environmental impacts related to radiological protection concerns do not directly result from radiation. Rather, they are indirectly caused by related activities resulting from the need to protect humans from radiation exposure, such as the cleanup of contaminated lands. Such activities have resulted in considerable disturbance of the environment and destruction of the ecosystem. The Commission should give serious consideration to these types of activities when discussing protection of the environment and the impact of its recommendations.

Annex A

Paragraph (A24) This paragraph does not acknowledge that scientific data supporting a DDREF of 2 are many orders of magnitude greater in dose rate than that for background, at least for low-LET radiation. Accordingly, there must be a substantial uncertainty associated with the DDREF when extrapolated to dose rates on the order of natural background.

Paragraph (A41) and Table A2 Although the establishment of tissue weighting factors is very uncertain, the values should follow more logically from the values given in Table A1. This would lead to

0.12, 0.05 (thyroid), 0.03, 0.01 and 0.18 for the remainder,

if one accepts the artificial increase of the factor for the thyroid to 0.05. The assignment of 0.01 to salivary glands, brain and kidney is not logically supported because each remainder tissue would have a weighting factor >0.01 (0.18/14). The fact of the matter is that the weighting factors given in Table A2 cannot be rationalized from the data presented in Table A1.