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24/2/05

Submission to the International Commission on Radiation Protection's 2005 Recommendations

Our submission concerns the recommendation on Exclusion of Radiation Sources (S 12), in which the Commission has concluded that the activity concentration values in Table 2 provide a definition of what is to be considered radioactive for practical radiological protection purposes. It now recommends the figures in Table S2 as the basis of exclusion from the scope of its recommendations.

The ICRP has spent much of the last century in defining the scientific basis for radiation dose and its biologic effects. It publishes dose coefficients for radiation damage for natural and artificial radioisotope so that its expertise can be applied to naturally occurring radioactivity in soil, coal and coal ash.

By multiplying the ICRP dose coefficients and the known concentrations of natural alpha-emitters in materials, a measure of their relative radio toxicity can be obtained.

When the regulation says ***that the exclusion activity concentration for Artificial alpha-emitters is 0.01Bq/g [10 Bq/kg], and 0.1 for artificial beta –emitters***, most people would not have any idea of what meant in terms of radioactivity and radiation dose, and be able to relate it to their daily life.

We decided to compare the radiotoxicity of artificial alpha-emitters with the radiotoxicity of natural alpha-emitters in soil, coal ash and coal. The Table has been compiled from a number of sources and **International Commission on Radiation Protection [ICRP] and its Dose Coefficients** for a number of natural and "artificial" radioisotopes..

Radionuclide Concentrations in Soil, Coal and Coal Ash

Radionuclide	Dose #	Radionuclide Concentration, Bq/kg				
	nSv/Bq	Soil(4)	Soil(5)	Coal(3)	CoalAsh(3)	CoalAsh(4)
Pb 210	680		75	28	98	188
Th 232	220	30	37	29	99	237
U 238	44	35	24	25	89	79
U 235	46				[2]	2
U 234	49		26	[30]	[86]	86
Th 230	210		100	43	92	34
Ra 226	280	35	30	21	79	57
Po 210	240		8-200	21	59	117
Pu 239	250	10*				
Pu 238	230	10*				
Am 241	200	10*				

ICRP Dose Coefficients for ingestion.

* ICRP recommended exclusion level.

Note, the literature reports very wide variations in the concentrations of radionuclides in soil, the values given are averages. Po 210 has been estimated as 60 Bq/kg from 2 references which quote 40-110 (6)and 30-50 Bq/kg (7).

The average for soil is 106 muSv, 48.5 for Australian coal, 154 for its ash and 243 for UK coal ash. Under UK legislation there are no radiological controls on the operation of coal-fired power stations, or on how waste is discharged to the atmosphere. In 1998 UK power stations burned 45.4 million tonnes of coal producing, 7.3 million tonnes of radioactive coal ash of which 30,000 tonnes went up the chimney into the atmosphere together with an undefined quantity of radon gas. 370,000 tonnes were sold. The ash is considerably more radiotoxic than soil exceeding the ICRP's proposed exception level for ***artificial*** radionuclides .

We are concerned with the approach the ICRP uses to formulate the suggested limits for radiation exposure in the low range, i.e. of the order of natural background. The biological effects in this range are understandably difficult to estimate because the effects (if any) would be small and the experimental samples would need to be large. However, it is precisely in this range that some industries may be required to expend significant resources to meet the suggested limits. What is missing here is some Commission endorsed estimates of the uncertainties of their recommended dose limits so that such actions can be justified on a cost-benefit basis. In addition, in conjunction with quantifying such uncertainties, the Commission should make some specific recommendations for the research needed to further refine them.

. (S5) of the consultation Draft of the ICRP says**, " These constraints represent the level of dose where the action to avert exposures and reduce doses is virtually certain to be justified".**

What is the ICRP's justification for its recommendation on ***artificial*** radionuclides?

J Brough, President,
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Footnote

The New Scientist had advance notice of the publication of the ICRP document and said, " Most countries follow ICRP recommendations. Those that adopt the new limits will have to treat much larger amounts of contaminated soil, concrete and other materials as radioactive waste. This could increase the cost of disposing of low-level waste from British nuclear sites, say, from 5 billion to at least 9 billion pounds".

1 Radiological Impact on the UK Population of Industries which use or produce Materials containing enhanced Levels of naturally occurring Radionuclides. Part 1: Coal-fired Electricity Generation, Smith, KR; Crockett, GM; Oatway, WB; Harvey, MP; Penfold, JSS; and Mobbs, SF. National Radiological Protection Board, NRPB-R327, 2001.

2 Dose coefficients for ingestion of radionuclides by adult members of the public, from Guidelines for Drinking Water, Table 9.2, based on IAEA and ICRP from 1996.

3 The Analysis of Coals and Fly Ash for Trace Elements and Radioactivity. By JJ Fardy, GD McOrist and Y J Farrar; CSIRO. Presented at the Australian Coal Science Conference, 1984.

4 UNSCEAR 200Report, Vol 1, Annex B, Table 5. Natural radionuclide content in soil.

5 Environmental Chemistry of the Elements, H. J. M. Bowen, Academic press, 1979.

6 www.epa.state.oh.us/pic/nr/1998/august/nzs8mo1c.html

7 Distribution of Po 210 in the superficial soil layer in Moscow. Kerenkov, P. et al. 1 Gig Sanit. 2000 May-June: (3) 15-7. www.ncbi.nim.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=10900787&dopt=abstract.