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PETITION RULE

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May 24, 1963

Secretary
U. S. Atomic Energy Commission
Washington 25, D. C.

COMMENTS ON PROPOSED CHANGES IN 10CFR
PARTS 70 AND 71

Dear Sir:

After studying the proposed changes published in the Federal Register on March 5, 1963, we have a number of comments which we hope will receive careful consideration.

Our principal objection is that the requirements, particularly those in Part 70, are much too specific. Surely the purpose of the regulation, namely "to protect health and minimize danger to life or property" can be met by briefer and more general criteria. For example, Sections 70.34 and 70.35 could be replaced by the statement: "An alarm system must be provided that is capable of detecting a nuclear incident, and employees must be instructed in emergency procedures to be followed for rapid evacuation of the area if the alarm is sounded". Similarly Sections 70.41 - 70.47 and 70.51 - 70.57 could be replaced by the statement: "When consideration has been given to all factors that might credibly increase the reactivity in a given situation, the configuration of fissionable material having the maximum reactivity shall be subcritical. In making this assessment, calculations should be referred to experimental data wherever possible, and adequate margins must be allowed in the calculations for uncertainty both in the data and in the methods used." There is no objection to having 10CFR Part 70 spell out the factors that must be considered in this assessment. Reference to the American Standard for "Operations With Fissionable Materials Outside Reactors", which is

expected to be adopted soon, would be appropriate. If it is considered necessary, the margin of subcriticality could be specified, and we would have no objection provided it were small enough. We would suggest that when all contingencies have been considered and allowance has been made for uncertainties in data and calculations, the maximum k_{eff} should not exceed 0.99. Definitions of k_{eff} differ, but for a critical situation all definitions give k_{eff} of unity. If a definition is considered necessary, we suggest the definition of criticality factor given as Equation 7.2 on p. 170 of the Physical Theory of Neutron Chain Reactors by Weinberg and Wigner.

If, in spite of our recommendation to the contrary, the regulations are to contain highly specific criteria, we object to the particular criteria in the proposed revisions on two grounds. In the first place, they are not nearly extensive enough to cover adequately all the various special situations that might arise without requiring safety factors that in many common cases would be excessively large. Although Section 70.14 provides for "specific exemptions" and Sections 70.47 and 70.56 permit "special unit limits" and "special array limits", one might question the case with which specific exemption would be obtained or with which special limits would be approved. In the second place, we object to taking the criteria in Sections 70.42 - 70.46 and in 70.51 - 70.55 directly from the Nuclear Safety Guide, TID-7016, Revision 1. This document, as its name implies, was intended to be simply a guide. It has served and continues to serve this purpose admirably, but its authors never intended that it appear as a part of a regulation. It is a handy reference both for the novice, and for the nuclear safety expert in cases where there is no particular economic or other incentive to push for the maximum in mass or dimensions, that would be permitted by full consideration of all factors in a given situation. Plans exist for a second revision of TID-7016 and there will undoubtedly be future revisions in years to come. New experimental data, such as are currently being obtained by Hanford in its extensive experimental program with plutonium systems, and reliable calculated extrapolations of data will be incorporated.

In examining an applicant's claim that when consideration has been given to all contingencies a given situation will indeed remain subcritical, the Division of Licensing and Regulation is certainly within its rights to refer to TID-7016, Revision 1, or to other guides, handbooks, or compilation of data that it wishes to employ, but it does not seem proper to single out the present version of TID-7016 (or any other guide) for official sanction to the extent of including it in the proposed regulation. One cannot, of course, argue with the facts of life as revealed by carefully performed critical experiments, but one can argue with the somewhat arbitrary safety factors in TID-7016 and with the largely empirical methods employed in extrapolating data. In particular the double batch safety factor in TID-7016 should not be made mandatory since the possibility of double batching clearly depends on the particular situation. The arbitrary classification of reflectors as "minimal", "nominal", and "thick" may be useful for illustrative purposes, but

it also should not be made mandatory.

Specific Comments by Section

70.4 (r) We object to classifying reflectors as "minimal", "nominal", and "thick". Consideration should be given to actual reflector thicknesses and materials.

70.4 (w) In many cases "Unit" as defined in this way may not have a clear meaning.

70.25 This is a good section and represents most of what is really needed.

70.33 (c) In areas where advantage is taken of 70.25 b-2-IV and water is excluded, water would not be used for extinguishing a fire.

70.34 (a) (1) We do not believe that this is a realistic setting for a criticality alarm. This would give us, for example, a large number of false alarms in most of the areas where we are handling critical materials. In an incident causing 10^{18} fissions, a setting of 10 R per hour would be quite adequate.

70.34 (a) (2) The response time of 3 seconds at a radiation level of 20 mr per hour seems a completely unnecessary restriction since the only advantage that the criticality alarm offers is for a very rapid response to an extremely high level field.

70.35 We object to this short interval for drills. Our present plan includes testing of the alarm on a quarterly basis for educational purposes and monitoring the system continuously for operability. Information meetings and instruction courses are held every six months but actual drills, which are in themselves rather hazardous, are carried out no more frequently than once every six months and we believe that annually would be sufficient. We have found that frequent testing of alarms encourages people to take such alarms less seriously than they should.

70.41 (e) See comment concerning 70.4 (r)

(h) (2) See comment concerning 70.4 (r)

70.42 It might be dangerous to consider suspensions or mixtures homogeneous. Consider, for example, a settling precipitate. The wording "...shall be subject to the limits prescribed by this section", is much stronger than that of 70.31 f, "...the Commission will be guided by the standards in sections 70.41 to 70.47 inclusive..." and shows even within the proposed regulation a trend away from considering the material in TID-7016 as a guide toward making it mandatory.

70.42 (a) The implication is that none of the limits on mass, cylinder diameter, and slab thickness may be exceeded, i.e., that the most restrictive limit must be employed.

The mass limits in Figure 1 are unacceptable since they contain a safety factor for double batching. Such a factor has no place in a technical standard since whether double batching can or cannot occur depends on equipment size and administrative controls, which may vary widely from one operation to another. The classification of reflectors in Figure 1-4 is objectionable. It should be made clear that Figures 3 and 4 refer to infinite cylinders and slabs.

70.42 (b) The same remarks apply as for (a). In addition, use of the exact isotopic composition of plutonium should be permitted in arriving at safe limits rather than either 0% or an arbitrary 3% Pu-240. Curves showing the effect of, say 3% Pu-240 and, say, three thicknesses of reflector have their place in a guide, but not in a regulation. Figure 13 has a curve for U-235 compounds or solutions. Why is not a similar curve presented for plutonium? Since plutonium solutions generally contain NO_3^- ions and free nitric acid, it is equally logical to present curves for plutonium solutions containing various concentrations of nitrate ion.

70.42 (c) Same remarks as for (a) and same remarks as for (b) with regard to Figure 13.

70.43 (c) (2) No allowance is made here for a legitimate increase in container size at low enrichment when moderation is restricted to regions removed from the range where the minimum sizes occur.

70.43	(d)	Allowance should also be made for a legitimate increase in slab thickness for slabs of restricted width and/or length.
70.43	(f)	Here again the curves referred to are a useful guide for indicating the effect of dilution, but in setting limits consideration should be given to the actual diluent involved.
70.44		The four curves drawn here for slightly enriched uranium apply to solid metal rods of the optimum size at the optimum ratio of water to uranium. No allowance is made for oxide rods, hollow rods, or restricted ratios of water to uranium. Again the objectionable double batch provision is incorporated in the mass limits.
70.46		These limits have the objectionable double batch allowance.
70.52		It is undesirable to single out any particular method for computing interaction. Surely a regulation is no place in which to present formulas for computing solid angles.
70.53	(b)	The table is not clear and again is too specific.
70.54	(b)	Although the 8-inch separation may be desirable in some cases, it should not be required in all cases. Individual units of sufficiently low reactivity can be stored safely at much closer spacing and still be safe if flooded with water.
71.41	(a)	Reference should not be made to the specific energy of 0.3 ev. The proper criterion is that an infinite array of packages should be subcritical and that mixtures of packages in any amount with extreme examples of other Class I packages should be subcritical.
71.41	(b)	These H/X ratios are much larger than would be required in proposed IAEA regulations.
71.42 and 71.43		The description of the British package is out of place here. It perhaps could be cited as an example of a Class I package. There are, however, many conceivable designs that would satisfy 71.41(a) and 71.42(a).

71.52(c) and 71.62(c)		The mass limits are unduly restrictive. Allowance for variations in enrichment, density, dilution, or shape should be permitted.
71.64	(e)	The specific solid angle criteria of 70.52 should not be singled out as the only criteria for limiting the number of packages per shipment.
71.65	(h)	There is no good reason for requiring a minimum separation between the special nuclear material and the outside of the outer container or even for always requiring inner and outer containers. The reason for 6 inches here and 4 inches in 71.62(c) is not clear.

Yours very truly,

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HKC:msg

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Washington 25, D. C.

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