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issue papers

TRW

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Mr. L. J. Evans, Jr.
Program Development
Safeguards Division
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Evans:

Enclosed please find our expanded chart showing the applicability of the Interim and Companion Rules to the MOX fuel cycle and to RD&D activities. This chart raises important issues regarding the scope of the Interim Rule and the definition of Category III plutonium. These issues are discussed on the following page.

Sincerely,

David L. Bodde

DLB:ae
Enclosure

Interim Rule Coverage. Suppose less than 2Kg of SGP per day flows through a given portion of a plant, say the analytical lab. Although a "significant amount" of elemental plutonium may never be present at any one time, the total throughput over a year's operation would nevertheless be quite large. Should a time dimension be included in the Interim Rules to control this situation?

Definition of Category III Plutonium. The separation of Pu into categories was based on the ratio $\frac{Pu}{^{238}U}$. When this ratio is below .04, the material is considered Category III under the definitions used in the attached chart. This ratio was selected because the critical mass of such a material increases asymptotically at about 4% Pu. At issue is whether the definition of Category III material should be increased to, say, 5% Pu.

- Factors which favor such an increase.
  - An economic incentive apparently exists to increase MOX Pu concentrations to the 5% range. This is because the buildup of neutron-absorbers in reload cores makes higher reactivity in the fuel desirable. However, we are not aware of any analysis which quantifies this marginal benefit.
  - Even at 5%, the concentration of Pu is too low to make the material directly usable in a fission bomb.[1)]
- Factors weighing against such an increase.
  - At 4% or below, there is absolute assurance that a bomb would be unworkable.

1) M. Willrich and T.B. Taylor Nuclear Theft: Risks and Safeguards 1974, p. 15.

	MATERIAL \ STAGE OF MOX FUEL CYCLE	(1) MOX FUEL FABRICATION: RECEIVING & STORAGE	Pu BLENDING & STORAGE	MOX BLENDING	FUEL PELLET & ROD FABRICATION	F… S…
CATEGORY I	$P_u > 20\%$ or only fissile element	E + IR	E + IR			
	$\frac{^{235}U}{U} > 90\%$					
	^{233}U					
CATEGORY II	$20\% > P_u > 4\%$	E + C (?)	E + C (?)	E + C (?)	E + C (?)	E[illegible]
	$90\% > \frac{^{235}U}{U} > 10\%$ (?)					
CATEGORY III	$P_u < 4\%$			E	E	[illegible]
	[illegible] $\frac{\ldots}{U}$ … 10 (?)			E	E	[illegible]

[illegible] plant at Barnwell, S.C. and at the NFS plant at West [illegible]

[illegible] (DAT) & TRIGA [illegible]

APPLICABILITY OF

					TRANSPORTATION	(2) FUEL ASSEMBLY PLANT		
MOX BLENDING	FUEL PELLET & ROD FABRICATION	FUEL ROD STORAGE	GEN PROCESS TRASH&SCRAP STORAGE	ANALYTICAL LAB		RECEIVING & STORAGE	ASSEMBLY	S
			E + IR (?)	E + IR (?)				
+ C (?)	E + C (?)	E + C (?)	E + C (?)	E + C (?)	E + C (?)	E + C (?)	E + C (?)	E
E	E	E	E	E	E	E	E	
E	E	E	E	E	E	E	E	

... the NFS plant at West Valley, N.Y.

TO MOX FUEL CYCLE AND RDSD ACTIVITIES

LANT		TRANSPORTATION	(3) REACTOR			TRANSPORTATION	(4) REPROCESSING FACI	
Y	STORAGE		RECEIVING & STORAGE	USE	SPENT FUEL STORAGE		SPENT FUEL RECEIVING & STORAGE AREA	SEPARATIO
								E + IR (
?)	E + C (?)	E + C (?)	E + C (?)					
	E	E	E	E	E	E	E	E
		E		E	E	E	E	

:EPROCESSING FACILITY *					TRANSPORTATION	(5) CONVERSION *		
IT FUEL EIVING STORAGE REA	SEPARATIONS	Pu NITRATE STORAGE	GEN PROCESS TRASH &SCRAP STORAGE	ANALYTICAL LAB		Pu NITRATE TO OXIDE CONVERS.	Pu OXIDE STORAGE	GEN PR TRASH& STOR
	E + IR (?)	E + IR (?)	E + IR (?)	E + IR (?)	E + IR	E + IR	E + IR	E + I
			E + C (?)	E + C (?)				
E	E	E	E	E	E	E	E	
				E	E			

...SION *			TRANSPORTATION	(6) PLUTONIUM STORAGE		RD&D
...TE	Pu OXIDE STORAGE	GEN PROCESS TRASH&SCRAP STORAGE		INTERIM PuO_2 STORAGE	TRANSPORT	DEFINED AS IN IR & CFR 70.4 (j) INCLUDES LWBR, HTGR, LMFBR
	E + IR	E + IR (?)	E + IR	E + IR or C (?)	E + IR	E + C
						E + C
						E + C
						E + C (?)
						**E + C (?)
	E	E	E	E	E	E
			E			E