SAFEGUARDS & SECURITY STRATEGY

Safeguards & Security requirements are derived from the quantity and attractiveness of the material, as shown in Figures1 and 2.

	Attractiveness Level	Pu/U-233 Category (kg)				Contained U-235/Separated Np-237/Separated Am-241 and -243 Category (kg)				All E Materials Category IV
		I	II	III	IV[1]	I	II	III	IV[1]	
WEAPONS Assembled weapons and test devices	A	All	N/A	N/A	N/A	All	N/A	N/A	N/A	N/A
PURE PRODUCTS Pits, major components, button ingots, recastable metal, directly convertible materials	B	≥2	≥0.4<2	≥0.2<0.4	<0.2	≥5	≥1<5	≥0.4<1	<0.4	N/A
HIGH-GRADE MATERIALS Carbides, oxides, nitrates, solutions (≥25 g/L) etc.; fuel elements and assemblies; alloys and mixtures; UF_4 or UF_6 (≥ 50% enriched)	C	≥6	≥2<6	≥0.4<2	<0.4	≥20	≥6<20	≥2<6	<2	N/A
LOW-GRADE MATERIALS Solutions (1 to 25 g/L), process residues requiring extensive reprocessing; moderately irradiated material; Pu-238 (except waste); UF_4 or UF_6 (≥ 20% < 50% enriched)	D	N/A	≥16	≥3<16	<3	N/A	≥50	≥8<50	<8	N/A
ALL OTHER MATERIALS Highly irradiated forms, solutions (<1 g/L), uranium containing <20% U-235 or <10% U-233[2] (any form, any quantity)	E	N/A	N/A	N/A	Reportable Quantities	N/A	N/A	N/A	Reportable Quantities	Reportable Quantities

[1]The lower limit for Category IV is equal to reportable quantities in this Manual.
[2]The total quantity of U-233 = [Contained U-233 + Contained U-235]. The category is determined by using the Pu/U-233 side of this table.

Figure 1 Nuclear Material Safeguards Categories

Description/Form	Maximum SNM concentration* (wt%) for MC&A and physical protection termination	Maximum SNM concentration (wt%) for only physical protection equivalent to Category IV
SNM solutions and oxides: nitrate, caustic or chloride solutions, contaminated/impure oxides, metal fines and turnings, glove box sweepings	0.1	N/A
SNM amenable to dissolution and subsequent separation: pyrochemical salts, chloride melt, hydroxide cake, floor sweepings, alumina, condensates reduction residues, sand, slag, and crucible, magnesium oxide crucibles spent fuel and spent fuel residues	0.1	0.2
SNM in organic matrixes or requiring mechanical separation disassembly and subsequent multiple recovery operations: HEPA filters, organic solutions, oils and sludges, graphite or carbon scrap, surface contaminated plastics, metal components, combustible rubber	0.2	1.0
SNM bound in matrix of solid, sintered, or agglomerated refractory materials: SNM embedded in glass or plastic, high-fired incinerator ash, spent resins, salt sludges, raffinates, and sulfides	0.5	2.0
SNM microencapsulated in refractory compounds or in solid-dilution: vitrified, bituminized, cemented, or polymer-encapsulated materials, SNM alloyed with refractory elements (tungsten, platinum, chromium, stainless steel); ceramic/glass salvage	1.0	5.0

•SNM weight percent is based on element weight for Plutonium and isotope weight for U-235 and U-233. Source: DOE-STD-1194-2011

Figure 2 Additional Attractiveness Level E Criteria for SNM

1.1 Receipt and Storage

Each cask of both AVR and THTR fuel holds pebbles that contain Special Nuclear Material (SNM) bound in a matrix of sintered refractory material. The SNM concentration is less than 0.5 wt% for all casks; hence, each cask is Attractiveness Level E. Therefore, all 455 casks *in toto* will constitute a Category IV quantity of SNM and will be protected as such in the L-Area Property Protection Area (PPA) as per DOE Order 473.3, *Protection Program Operations*,

Storage requirements Category IV Quantities of SNM:

Storage. Category IV quantities of SNM must be stored in a locked area within at least a PPA, and procedures must be documented in an approved site security plan (SSP).

Intrusion Detection System for Category IV quantities of SNM.

PROTECTING SPECIAL NUCLEAR MATERIAL. Intrusion detection and assessment systems and/***or visual observations by protective force (PF) personnel*** *must be used to protect SNM and classified matter to ensure breaches of security barriers or boundaries are detected and alarms annunciate.*

Lock and Keys
Level III. Buildings, gates in fences, cargo containers, and storage areas protecting Category IV SNM, and government property whose loss would adversely impact security and/or site/facility operations require Level III security locks and keys.

Storage in L-Area Property Protection Area (PPA)
The security strategy for the storage of CASTOR casks in the L-Area PPA:

- The casks will be stored on a crusher run pad in the L-Area PPA.
- The pad will include fencing, Level III locks, and lighting.
- Protective force patrols will be conducted on a routine basis.

1.2 Processing

The Safeguards & Security objective for fuel processing is to maintain the SNM at Attractiveness Level D. This can be accomplished by:

- Ensuring solution concentrations are < 25 g/l SNM
- Ensuring solids are < 10 weight % SNM (achieved in most cases by not separating thorium from uranium)
- Down blending HEU to Attractiveness Level E with NU or DU
- Avoiding the production of SNM in metal form
- Avoiding the production of HEU oxide

The separated kernels recovered from the carbon digestion are Attractiveness Level D, and cannot roll up to a Category I quantity. If an L Area option is selected, the process equipment will be located inside the 105-L Building, which is inside a Protected Area. For an H Canyon option, an assessment will be required to ensure the adequacy of kernel storage within the process cell area.

All waste streams will be Attractiveness Level E prior to discharge from the process facility for final treatment.