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U.S. ATOMIC ENERGY COMMISSION

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

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REGULATORY GUIDE 5.1

SERIAL NUMBERING OF FUEL ASSEMBLIES FOR LIGHT-WATER-COOLED NUCLEAR POWER REACTORS

A. INTRODUCTION

Part 70 of the Atomic Energy Commission's regulations requires that certain licensees establish and maintain written material control and accounting procedures which are sufficient to enable the licensee to account for the special nuclear material (SNM) in his possession. In the case of SNM contained in fuel assemblies, a system of control based on unique item identification of each fuel assembly is desirable to achieve an acceptable level of accountability control. This guide describes an acceptable numbering method for item identification of fuel assemblies for light-water-cooled nuclear power reactors.

B. DISCUSSION

Power reactor fuel is relatively inaccessible while at a reactor facility. The SNM itself is securely contained within the fuel cladding. Accurate quantitative measurements of the SNM content of the fuel assemblies are exceedingly difficult, and as yet not feasible except through use of techniques requiring disassembly into individual fuel rods. The SNM content of a fuel assembly is currently obtained by determining the SNM content in each discrete item (element or rod), and then verifying the presence of such items. The principal diversion threat for SNM at the reactor consists of theft of identifiable items. Accordingly, the AEC's material protection inspection practices for SNM contained in completed fuel assemblies on inventory at light-water reactor facilities are based on assuring that all individually identifiable fuel pieces received at the facility are still on hand or have been shipped to other licensed facilities.

A substantial level of assurance can be provided within this context if each fuel assembly is uniquely identified by a number inscribed in its structure. The unique numbering also offers an advantage at the time of reprocessing in that fuel assemblies can be readily identified according to origin and irradiation history, thus avoiding confusion in formation of dissolver batches.

The Fuel Assembly Identification Working Group of Subcommittee ANS-13, Fuel Assembly Criteria, has developed a standard (ANS 13.8) for fuel assembly identification. This standard was approved by the American National Standards Institute as N18.3-1972[1] on May 10, 1972.

Some fabricators purposely manufacture fuel assemblies that can be dismantled without any metal-cutting operation. This design feature allows relatively easy substitution of fuel rods, but complicates the verification of discrete power reactor fuel items.

C. REGULATORY POSITION

1. The provisions contained in ANSI N18.3-1972, "Fuel Assembly Identification," are generally acceptable and provide an adequate numbering basis for identification of individual fuel assemblies from the time of final fuel rod consolidation at the fabricator's facility until the assembly is dissolved as an entity.

2. In the special case of fuel assemblies from which a fuel rod or other SNM-containing component may be removed without the need of a metal-cutting operation, further identification and accounting measures in addition to those required in ANSI N18.3-1972 may be necessary. This determination will be made on an individual case basis.

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[1] Copies may be obtained from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.