4.1.3 TRIGA FUEL ELEMENTS

Applicability

This specification applies to the surveillance requirements for the TRIGA fuel elements.

Objective

The objective is to verify the continuing integrity of the fuel element cladding.

Specifications

All fuel elements and control rods with fuel followers shall be inspected visually for damage or deterioration and measured for length and bend before being placed in the core for the first time and at intervals not to exceed the sum of 3,500 dollars in pulse reactivity or two years, not to exceed 30 months*, whichever comes first. (* Note The interval shall become "two years not to exceed 36 months" from the effective date of the amendment until August 13, 1994 when the interval reverts to "two years not to exceed 30 months.")

Basis

The frequency of inspection and measurement schedule is based on the parameters most likely to affect the fuel cladding of a pulsing reactor operated at moderate pulsing levels and utilizing fuel elements whose characteristics are well known.

Reason for the Amendment

The reason for the amendment is to allow a one time extension of the fuel inspection interval to reduce the fuel handling by one half during the six month life of the amendment. The fuel element surveillance with the present interval would require unloading the core for inspection on or before February 13, 1994. A facility modification which requires unloading the core was originally planned to coincide with the biennial fuel inspection. A delay in the delivery of critical components has delayed this modification until May or June 1994. Realizing that the risk of fuel element rupture during fuel handling is greater than the risk of fuel rupture during normal operation the staff is seeking this amendment. With this amendment the fuel inspection can be delayed and performed during the modification thereby eliminating one fuel unload.

Analysis

The PSBR SAR is silent on the issue of fuel aging or analysis concerning surveillance frequency of the fuel elements. The Safety Evaluation Report

related to the renewal of the operating license for the Research Reactor at Pennsylvania State University, NUREG-1158, January 1986, does address fuel aging, during pulsing and normal operation, in section 14.5. The conclusion of that section is "...that there is reasonable assurance that fuel aging will not significantly increase the likelihood of fuel-cladding failure or the calculated consequences of an accidental release in the event of the loss of cladding integrity."

Both the PSBR SAR and the SER analyze an accident which is a rupture of a fuel element cladding in air. The former calls this a Maximum Hypothetical Accident, MHA, and the latter calls it a Fuel Handling Accident. The SER considers it a Fuel Handling Accident because the most likely scenario leading to a fuel element cladding rupture in air is that it occurs during fuel handling.

PSBR has performed less than 330 dollars in pulse reactivity since the last inspection of the fuel in this loading. This is less than 10% of the limit in the specification.

Conclusion

Considering the analyses in the SAR and SER the PSBR staff concludes that a 20% increase in the interval between fuel element surveillance in order to eliminate a fuel unloading is not only reasonable but prudent. The staff is not asking for a permanent change because the 30 month interval is not considered unreasonable in normal circumstances.

4.1.3 TRIGA Fuel Elements

Applicability

This specification applies to the surveillance requirements for the TRIGA fuel elements.

Objective

The objective is to verify the continuing integrity of the fuel element cladding.

Specification

All fuel elements and control rods with fuel followers shall be inspected visually for damage or deterioration and measured for length and bend before being placed in the core for the first time and at intervals not to exceed the sum of 3,500 dollars in pulse reactivity or two years, not to exceed 30 months,* whichever comes first. (*Note: The time interval for this specification shall be "two years not to exceed 36 months" from the effective date of Amendment No. 31 until August 13, 1994 when this time interval will revert back to "two years not to exceed 30 months.")

Basis

The frequency of inspection and measurement schedule is based on the parameters most likely to affect the fuel cladding of a pulsing reactor operated at moderate pulsing levels and utilizing fuel elements whose characteristics are well known.

4.2 Reactor Control and Safety System

4.2.1 Reactivity Worth

Applicability

This specification applies to the reactivity worth of the control rods.

Objective

The objective is to assure that the control rods are capable of maintaining the reactor subcritical.

Specification

The reactivity worth of each control rod and the shutdown margin for the core loading in use shall be determined annually, not to exceed 15 months, or following core or control rod changes equal to or greater than 0.1% $\Delta k/k$ (~$1.00).

Basis

The reactivity worth of the control rod is measured to assure that the required shutdown margin is available and to provide an accurate means for determining the core excess reactivity, maximum reactivity,