

NRC INSPECTION MANUAL

INSPECTION PROCEDURE 72500

INITIAL FUEL LOADING PROCEDURE

PROGRAM APPLICABILITY:

72500-01 INSPECTION OBJECTIVES

Ascertain whether the procedure to be used for initial fuel loading is consistent with FSAR commitments, regulatory requirements, regulatory guidance and applicable codes and standards.

72500-02 INSPECTION REQUIREMENTS

Initial Fuel Loading Procedure Review (BWR & PWR)

02.01 Verify that specific commitments contained in the FSAR, DL Safety Evaluation Report, Docketed Letters from the licensee, and Technical Specifications have been included.

02.02 Verify authorized management approval.

02.03 Verify review by appropriate committee.

02.04 Review the procedure format.

02.05 Verify that FSAR deficiencies related to fuel loading previously identified are resolved.

02.06 Verify that prerequisites and initial conditions include:

- a. Appropriate signs and warnings posted as per 10 CFR 20.
- b. Radiation work permits if required.
- c. Appropriate clean areas.
- d. Composition, responsibilities and duties of the fuel handling crew.
- e. Communication between control room and reactor building.
- f. Fuel inspection performed within the specified time prior to fuel loading.

g. Valve lineup lists.

- h. Pump operability and lock-outs.
- i. Containment integrity.
- j. The status of the reactor vessel, vessel internals, control rods, and control rod drives.
- k. Vessel water level.
- l. Reactor coolant system temperature and water quality limitations.
- m. Emergency boron addition system (PWR) or Standby Liquid Control System (BWR) required to be operable and the status of all other systems required for fuel loading.
- n. The operability of fuel handling cranes, equipment and tools -- recent operability demonstrated.
- o. Reactor building purge system tested and operability recently verified.
- p. Status of protective systems including verification procedural steps.
- q. Calibration of in-core and ex-core flux monitors.
- r. Response check of in-core and ex-core flux monitors.
- s. Number of in-core and ex-core flux monitors.
- t. Neutron source locations.
- u. Audible count monitor or high count annunciator required for the control room.
- v. Radiation monitors for the initiation of purge isolation and control room isolation are identified and verified to be operable (PWR).
- w. Radiation monitors, nuclear instrumentation, manual initiation and other devices to actuate evacuation alarms tested prior to fuel loading.

02.07 Review the Limitations and Precautions section to assure that it specifies:

- a. Minimum crew requirements as numbers of SRO, RO and the involvement of each in the fuel loading operation.
- b. Limitation on the number of people in the reactor building, control room, and limitations of access to the fuel loading operations area.
- c. The shift time limits for operators.
- d. Personnel entrance procedures for the reactor building.

- e. Independent verifications for the fuel assembly serial number and core position.
- f. Special Inspection Procedures for fuel that is suspected of being damaged.
- g. Maintenance of a reciprocal multiplication plot.
- h. Procedural limitations for reactivity addition.
- i. Limits for deviations between predicted data and measured data.
- j. Approvals required for changes in sequence of fuel assembly loading, detector location or source locations.
- k. Limitations on fuel loading in the event of communications failure.
- l. Acceptance criteria for the positioning of fuel elements.
- m. Restrictions on fuel movements prior to obtaining stable counts.
- n. The minimum requirements for flux monitors including audible monitors or annunciators, and minimum count rate for initial loading of fuel.
- o. Requirements for suspension of operation until cause is determined if an unexpected increase or decrease in count rate occurs.
- p. Administrative methods for resolving differences of opinion among personnel involved in fuel loading.
- q. Minimum requirements for maintaining coolant circulation in the core (PWR).
- r. Steps and conditions for emergency poison injection with either the boron addition (PWR) or Standby Liquid Control (BWR) system.
- s. Limitations on water levels in fuel pool and reactor vessel.
- t. Minimum numbers of radiation monitors. Minimum numbers of monitors by location shall be indicated and action steps required to be taken if any become inoperative.

02.08 Verify that the procedure includes step-by-step instructions for manipulating fuel and for recording the operations.

02.09 Fuel loading increments should be included.

02.10 The counting period for low count rates and minimum allowable signal to noise ratios must be identified and compared with regulatory limits.

02.11 Verify that the procedure requires a visual check of each assembly in each core position.

02.12 Verify that the procedure requires documentation that each prerequisite has been met, that each limitation and precaution has been observed, and the person verifying these items is identified.

02.13 Confirm that the procedures require that all data is recorded and that the recorder is identified.

72500-03 INSPECTION GUIDANCE

Initial Fuel Loading Procedure Review (BWR & PWR)

03.01 The FSAR, Technical Specifications and other regulatory documents (ACRS letter, RL Safety Evaluation Report, docketed letters from licensee) should be reviewed by the inspector to identify commitments related to initial fuel loading.

03.02 Assure that licensee procedures have the proper approval signatures as required by technical specifications. The FSAR specifies the management level responsible for plant safety. Normally this is the plant superintendent and he should review and approve each procedure. This procedure should be provided to the inspector 90 days before the scheduled fuel loading date. (Ref: FSAR, proposed technical specifications, Reg. Guide 1-68-Appendix B)

03.03 A review committee will be required to review each procedure. A representative of that committee must sign the procedure. The FSAR specifies the committee title and organizational membership for the review of procedures. The inspector should verify by a review of the committee minutes that a meaningful review has been performed by this committee.

03.04 The procedure format and content should contain a title, purpose, references, prerequisites, precautions, limitations, and actions and step-by-step procedural detail with adequate space for identifying that the actions are completed. Signoff should include each action or signoff for each block of actions completed by a single individual in a narrow time frame.

03.05 Deficiencies may be noted between the FSAR and the current Regulatory Documents (i.e., Reg. Guides, and Rules and Reg.). These deficiencies will be verified to have been previously resolved by RL or must be forwarded to Headquarters for resolution.

03.06 Prerequisite and initial conditions should be consistent with applicable provisions of Reg. Guide 1.68.

- a. Assure that the signs and warnings required by 10 CFR 20.203 have been posted and that personnel have been trained as required by 10 CFR 20.206.

- b. The licensee administrative procedures will require radiation work permits. This procedure should require use of that administrative procedure.
- c. Licensee administrative procedures should specify that appropriate "clean areas" be established prior to fuel loading. Personnel access will be limited by specific procedures. A special personnel access list will limit access to the refueling area.
- d. The proposed technical specifications will specify a minimum crew. They should require that the procedure include a description of the duties of the personnel assigned to the core loading crew. The authority and the responsibility of each crew member should be clearly defined (usually by reference to another procedure or to the FSAR). Procedural details should include the requirements of licensed SRO and licensed RO duties. (Reg. Guide 1.68, Appendix C, Paragraph B.2.1 (RG 1.68 C-B11)).
- e. Verbal communications systems must be in service during all fuel loading operations. (RG 1.68 C-B1k)
- f. Fuel and control rod inspections should be recent enough that all of the identified problems and known deficiencies with either fuel or control rods have been resolved prior to fuel loading. (RG 1.68 C-B1b).
- i. Sufficient procedural details should be included to assure that the containment is specified and established as required by the technical specifications. (RG 1.68, C-B1e).
- m. Sufficient procedural details must be contained within this procedure to assure that the emergency boron addition system is operable and in readiness. The procedure must also contain criteria for use of this system. (RG 1.68 C-B1i and B3c.).
- t. The initial location of the neutron sources must be specified. The precautions for handling neutron sources should be included in the procedure.

03.07 Limitations and Precautions

- a. Minimum crew requirements are included in technical specifications. Normally the technical specifications require that a SRO be in charge of refueling with no other concurrent operational duties for the balance of plant during the loading of fuel assemblies into the reactor core. A licensed operator must be operating the fuel handling crane during fuel loading or the SRO in charge of fuel loading must be present in the loading area if the operator is qualified but unlicensed. A second licensed SRO must be in the plant directing control room activities and the balance of plant activity. The control console must at all times have a licensed operator (a licensed RO, the above listed SRO, or a qualified unlicensed operator at the controls but with the SRO in the control

room). (RG 1.68 C-B21, and proposed technical specifications).

- b. The procedure limitations should be stated to limit the numbers of spectators or other worker activities during the fuel loading operation. A personnel limited access list should be provided for the refueling floor.
- c. Normally shift personnel should not work more than 16 hours in a row or more than 72 hours in a seven day period.
- d. Personnel entrance procedures may be detailed in the procedure under review or be required by reference to a previously provided administrative procedure.
- h. Step-by-step fuel loading increments should be included within the procedure. However, prior to each subsequent fuel loading increment an extrapolation and a conservative interpretation of the 1/M evaluation must be made by the SRO prior to initiating loading of the next loading increment. (RG 1.68 C-B2f.)
- i. Procedures should contain an expected subcritical multiplication behavior for each fuel loading increment. The procedure must contain limits and instructions to operating personnel for an unpredicted high count rate or an unpredicted low count rate. (RG 1.68 C-B2g and B2n).
- j. Procedures shall contain specific instructions for changing the procedure and for resuming loading operations after any procedural limit has been reached or invoked. (RG 1.68 C-B2n and B3f).
- k. The procedure should require that fuel loading cease with the occurrence of unexpected circumstances such as unexpected subcritical multiplication behavior, loss of communications between the control room and fuel loading station, inoperable source range detector and inoperability of the emergency boration system. (RG 1.68 C-B3a).
- l. Proper seating and orientation of fuel and components should be specified in the procedure. Procedural limitations should also specify core and instrumentation conditions at the time fuel movements are made.
- r. The conditions for emergency boron injection should be stated in the procedure. (RG 1.68 C-B1i and B3c.).

03.08 Fuel transfers, source relocation, detector relocation and data taking should all be detailed in a step-by-step procedure. Procedural details should include normal plant procedures and control measures such as jumper logs. Each procedure should be specified where applicable. The procedure should require necessary nonstandard arrangements be restored to their normal status after the test is completed. (RG 1.68 C-A8 and B).

03.09 Loading sequence for each fuel loading increment shall be specified. The core should be constituted so that the reactivity

worth of each added individual fuel assembly becomes less as the core is assembled. Functional testing of associated control rods shall be specified for the installation of each fuel cell. Shutdown margin check frequency should be defined and procedurally required (BWR).

03.10 Procedural guidance should be included; to assure that good statistical data is obtained even for low count rates, to provide methods for normalizing count rate after detector relocation, and to provide guidance for interpretation of the inverse multiplication plot. (RG 1.68 C-B2e and B2f).

03.11 Procedural details should require dual verification (once may be in refuel areas and once may be at the fuel examination area) of the assembly serial number, maintaining a display indicating the status of the core, completion of the appropriate fuel handling records, and verification of the proper seating and orientation of each fuel assembly in the core. (RG 1.68 C-B2b and B2c).

03.12 Test results shall be documented and evaluated to assure that test requirements have been satisfied. (10 CFR 50, Appendix B, Criterion XI).

03.13 Test records shall, as a minimum, identify the inspector or data taker, type of observation, the results, the acceptability, and the action taken in connection with any deficiencies noted. Records shall be identifiable and retrievable.

END