3.8 REFUELING, FUEL STORAGE AND OPERATIONS WITH THE REACTOR VESSEL HEAD BOLTS LESS THAN FULLY TENSIONED

Specification

A. The following conditions shall be satisfied when fuel is in the reactor vessel and the reactor vessel head bolts are less than fully tensioned:

1. Prior to initial movement of the reactor vessel head, the containment purge supply, exhaust and pressure relief isolation valves, including the radiation monitors which initiate isolation, shall be tested and verified to be operable or the inoperable isolation valves locked closed in accordance with Specification 3.8.B.8.

2. The core subcritical neutron flux shall be continuously monitored by two source range monitors, each with continuous visual indication in the control room and one with audible indication in the containment available whenever core geometry is being changed (excluding the movement of neutron source bearing assemblies). When core geometry is not being changed, at least one source range neutron flux monitor shall be in service. With both of the required monitors inoperable or not operating, boron concentration of the reactor coolant system shall be determined at least once per 12 hours.

3. At least one residual heat removal (RHR) pump and heat exchanger shall be operable and in operation when water level is greater than or equal to 23 feet (EL 92'0") above the top of the reactor vessel flange.

4. When water level is less than 23 feet above the top of the reactor vessel flange, both RHR pumps and RHR heat exchangers shall be operable with at least one of each in operation.

5. If the requirements of Specification 3.8.A.3 or 3.8.A.4 cannot be satisfied, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required RHR pump(s) and heat exchanger(s) to operable status.

6. The requirements for RHR pump and heat exchanger operability/operation in Specifications 3.8.A.3 and 3.8.A.4 may be suspended during maintenance, modification, testing, inspection, repair or the performance of core component movement in the vicinity of the reactor pressure vessel hot legs. During operation under the provisions of this specification, an alternate means of decay heat removal shall be available when the required number of RHR pump(s) and heat exchanger(s) are not operable. With no RHR pump(s) and heat exchanger(s) operating, the RCS temperature and the source range detectors shall be monitored hourly.

7. The reactor Tavg shall be less than or equal to 140°F.

8. Specification 3.6.A.1 shall be adhered to for reactor subcriticality and containment integrity.

B. With fuel in the reactor vessel and when:

i) the reactor vessel head is being moved, or
ii) the upper internals are being moved, or
iii) loading and unloading fuel from the reactor, or
iv) heavy loads greater than 2300 lbs (except for installed crane systems) are being moved over the reactor with the reactor vessel head removed,

the following specifications (1) through (12) shall be satisfied:

1. Specification 3.8.A above shall be met.

2. The minimum boron concentration shall be sufficient to maintain the reactor subcritical by at least 10% Δ k/k. The required boron concentration shall be verified by chemical analysis daily.

3. Direct communication between the control room and the refueling cavity manipulator crane shall be available whenever changes in core geometry are taking place.

4. No movement of fuel in the reactor shall be made until the reactor has been subcritical for at least 131 hours.

5. A dead-load test shall be successfully performed on the spent fuel pit bridge refueling crane before fuel movement begins. The load assumed by the refueling crane for this event must be equal to or greater than the maximum load to be assumed by the refueling crane during the refueling operation. A thorough visual inspection of the refueling crane shall be made after the dead load test and prior to fuel handling.

6. The fuel storage building charcoal filtration system must be operating whenever spent fuel movement is taking place within the spent fuel storage areas unless the spent fuel has had a continuous 35-day decay period.

7. Radiation levels in the spent fuel storage area shall be monitored continuously whenever spent fuel movement is taking place in that area.

8. The equipment door, or a closure plate that restricts direct air flow from the containment, and at least one personnel door in the equipment door or closure plate and in the personnel air lock shall be properly closed. In addition, at least one isolation valve shall be operable or locked closed in each line penetrating the containment and which provides a direct path from containment atmosphere to the outside.

9. Radiation levels in the containment shall be monitored continuously.

10. A licensed senior reactor operator shall be at the site and designated in charge of the operation whenever changes in core geometry are taking place.

11. The minimum water level above the top of reactor pressure vessel flange shall be at least 23 feet (El. 92'0") whenever movement of spent fuel is taking place inside the containment.

12. If any of the conditions specified above cannot be met, suspend all operations under this specification (3.8.B.). Suspension of operations shall not preclude completion of movement of the above components to a safe conservative position.

C. The following conditions are applicable to the spent fuel pit any time it contains irradiated fuel:

1. The spent fuel cask shall not be moved over any region of the spent fuel pit until the cask handling system has been reviewed by the Nuclear Regulatory Commission and found to be acceptable. Furthermore, any load in excess of the nominal weight of a spent fuel storage rack and associated handling tool shall not be moved on or above El.-95' in the Fuel Storage Building. Additionally, loads in excess of the nominal weight of a fuel and control rod assembly and associated handling tool shall not be moved over spent fuel in the spent fuel pit. The weight of installed crane systems shall not be considered part of these loads.

Basis

The equipment and general procedures to be utilized during refueling are discussed in the FSAR. Detailed instructions, the above-specified precautions, and the design of the fuel-handling equipment incorporating built-in interlocks and safety features, provide assurance that no incident could occur during the refueling operations that would result in hazard to public health and safety.(1) Whenever changes are not being made in core geometry, one flux monitor is sufficient. This permits maintenance of the instrumentation. Continuous monitoring of radiation levels and neutron flux provides immediate indication of an unsafe condition. The residual heat removal pump is used to maintain a uniform boron concentration.

The shutdown margin requirements will keep the core subcritical, even if all control rods were withdrawn from the core. During refueling, the reactor refueling cavity is filled with borated water. The minimum boron concentration of this water will be sufficient to maintain the reactor subcritical by at least 10% $\Delta k/k$ in the cold shutdown condition with all rods inserted, and will also maintain the core subcritical even if no control rods were inserted into the reactor.(2) Periodic checks of refueling water boron concentration insure the proper shutdown margin. The specifications allow the control room operator to inform the manipulator operator of any impending unsafe condition detected from the main control board indicators during fuel movement.

In addition to the above safeguards, interlocks are utilized during refueling to ensure safe handling. An excess weight interlock is provided on the lifting hoist to prevent movement of more than one fuel assembly at a time. The spent fuel transfer mechanism can accommodate only one fuel assembly at a time.

The 131 hour decay time following plant shutdown and the 23 feet of water above the top of the reactor vessel flanges are consistent with the assumptions used in the dose calculations for fuel-handling accidents both inside and outside of the containment. The analysis of the fuel handling accident inside of the containment is based on an atmospheric dispersion factor (X/Q) of 5.1×10^{-4} sec/m^3 and takes no credit for removal of radioactive iodine by charcoal filters. The requirement for the fuel storage building charcoal filtration system to be operating when spent fuel movement is being made provides added assurance that the offsite doses will be within acceptable limits in the event of a fuel-handling accident. The additional month of spent fuel decay time will provide the same assurance that the offsite doses are within acceptable limits and therefore the charcoal filtrations system would not be required to be operating.

The requirement that at least one RHR pump and heat exchanger be in operation ensures that sufficient cooling capacity is available to maintain reactor coolant temperature below 140°F, and sufficient coolant circulation is maintained through the reactor core to minimize the effect of a boron dilution incident and prevent boron stratification.

The requirement to have two RHR pumps and heat exchangers operable when there is less than 23 feet of water above the vessel flange ensures that a single failure will not result in a complete loss of residual heat removal capability. With the head removed and at least 23 feet of water above the flange, a large heat sink is available for core cooling, thus allowing adequate time to initiate actions to cool the core in the event of a single failure.

The presence of a licensed senior reactor operator at the site and designated in charge provides qualified supervision of the refueling operation during changes in core geometry.

References

(1) FSAR-Section 9.5.2

(2) Fuel Densification-Indian Point Nuclear Generating Station Unit No. 2, dated January 1973, Table 3.3.