3.8 REFUELING

Applicability

Applies to operating limitations during refueling operations.

Objective

To ensure that no incident could occur during refueling operations that would adversely affect public health and safety.

Specification

. During refueling operations, the following conditions shall be satisfied:

1. The equipment door and at least one door in each 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.
2. Radiation levels in the containment and spent fuel storage areas shall be monitored continuously.
3. The core subcritical neutron flux shall be continuously monitored by the 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. When core geometry is not being changed, at least one source range neutron flux monitor shall be in service.

4. At least one residual heat removal pump and heat exchanger shall be operable.

5. During reactor vessel head removal and while loading and unloading fuel from the reactor, T_{avg} shall be $\leq 140°F$ and the minimum boron concentration sufficient to maintain the reactor subcritical by at least 10% $\Delta k/k$. The required boron concentration shall be verified by chemical analysis daily.

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

7. The spent fuel cask shall not be moved over spent fuel. In addition, if the spent fuel pit contains spent fuel, the spent fuel cask shall not be moved over <u>any</u> region of the spent fuel pit unless spent fuel stored therein has been allowed to decay for at least forty-five days since the last time any of those spent elements were in other than a shutdown (i.e., subcritical) condition.

8. The containment vent and purge system, including the radiation monitors which initiate isolation, shall be tested and verified to be operable immediately prior to refueling operations.

9. No movement of fuel in the reactor shall be made until the reactor has been subcritical for at least ninety hours. In the event that more than one region of

fuel is to be discharged from the reactor those assemblies in excess of one region shall not be discharged before a continuous interval of 400 hours has elapsed after shutdown.

10. The minimum water level above the top of the core shall be at least 23 feet whenever movement of spent fuel is being made.

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

12. The fuel-handling building charcoal filtration system must be operating whenever spent fuel movement is being made. The fuel-handling building charcoal filtration system need not be operating whenever the spent fuel has had a continuous 35-day decay period.

13. 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.

B. If any of the specified limiting conditions for refueling is not met, refueling shall cease until the specified limits are met, and no operations which may increase the reactivity of the core shall be made.

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 a 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 (2 above) and neutron flux provides immediate indication of an unsafe condition. The residual heat pump is used to maintain a uniform boron concentration.

The shutdown margin indicated in Part 5 will keep the core subcritical, even if all control rods were withdrawn from the core. During refueling, the reactor refueling cavity is filled with approximately 350,000 gallons of water from the refueling water storage tank with a boron concentration of 2000 ppm. The minimum boron concentration of this water at 1615 ppm boron is sufficient to maintain the reactor subcritical by at least 10% $\Delta k/k$ in the cold shutdown 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. Part 6 allows 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 ninety hours decay time following plant shutdown and the 23 feet of water above the top of the core are consistent with the assumptions used in the dose calculation for the fuel-handling accident. The requirement for the fuel-handling 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 filtration system would not be required to be operating.

The waiting time of 400 hours required following plant shutdown before unloading the entire reactor core assures that the maximum pool water temperature will be within design objectives as stated in the FSAR.

During normal operation when the spent fuel cask is being placed in or removed from its position in the spent fuel pit, mechanical stops will be incorporated on the bridge rails which will make it impossible for the bridge of the crane to travel further north than a point directly over the spot reserved for the cask in the pit. The movement of the cask is further restricted to after 45 days following shutdown in order to minimize the consequences of a cask drop accident.

It will be possible to handle the spent fuel cask with the 40-ton hook and to move new fuel to the new fuel elevator with the 5-ton hook, but under normal conditions the spent fuel cask will not be carried directly over the spent fuel in the spent fuel storage area. Dead load test and visual inspection of the refueling building crane before handling spent fuel provide assurance that the crane is capable of proper operation.

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.

ATTACHMENT B

APPLICATION FOR AMENDMENT TO OPERATING LICENSE

Consolidated Edison Company of New York, Inc.

Indian Point Unit No. 2
Docket No. 50-247
Facility Operating License No. DPR-26

July, 1975

Safety Evaluations

Item 7: Add "In addition, if the spent fuel pit contains spent fuel, the spent fuel cask shall not be moved over any region of the spent fuel pit unless spent fuel stored therein has been allowed to decay for at least forty-five days since the last time any of those spent elements were in other than a shutdown (i.e., sub-critical) condition.

Safety Evaluation:

This restriction prevents occurrence of a cask drop accident during the first forty-five days after shutdown for refueling. An evaluation performed using the principal assumptions outlined in NRC Regulatory Guide 1.25 shows that, after forty-five days, even with damage to the maximum number of fuel assemblies that could be damaged by a cask dropped into the spent fuel pool, the exposure limits of 10CFR100 would not be exceeded.

Item 9: Add "In the event that more than one region of fuel is to be discharged from the reactor, those assemblies in excess of one region shall not be discharged before a continuous interval of 400 hours has elapsed after shutdown."

Safety Evaluation:

For the normal case of a single region discharge, the existing waiting time requirement of ninety hours assures that the pool water temperature is well below the design objective. For a full-core discharge, the added requirement of 400 hours total waiting time will limit the decay heat generation rate in the spent fuel pool so that the pool water temperature will not exceed the FSAR design objective. The decay heat calculation was performed in accordance with the NRC branch position paper (Auxiliary and Power Conversion Systems Branch Position, Section 9.2.5, Appendix A, Residual Decay Energy for Light-Water Reactors for Long-Term Cooling).

The proposed changes have been reviewed by the Station Nuclear Safety Committee and the Consolidated Edison Nuclear Safety Committee and both committees concur that these changes do not represent a significant hazards consideration and will not cause any change in the types or increase in the amounts of effluents.