August 26, 1981

Docket No. 50-333

RECEIVED SEP 03 1981 U.S. NUCLEAR REGULATORY COMMISSION

Mr. George T. Berry
President & Chief Operating Officer
Power Authority of the State of New York
10 Columbus Circle
New York, New York 10019

Dear Mr. Berry:

The Commission has issued the enclosed Amendment No. 59 to Facility Operating License No. DPR-59 for the James A. FitzPatrick Nuclear Power Plant. The amendment consists of changes to the Technical Specifications in response to your application dated December 6, 1979.

The amendment revises the Technical Specifications to allow spiral fuel unloading and reloading of the core which results in reducing the required number of control blade guides. In addition, Technical Specification modifications have been made to clarify source range monitor (SRM) requirements during such evolutions. The staff has reviewed your proposal and found it acceptable.

Copies of the Safety Evaluation and Notice of Issuance are also enclosed.

Sincerely,

Thomas A. Ippolito, Chief
Operating Reactors Branch #2
Division of Licensing

Enclosures:
1. Amendment No. 59 to DPR-59
2. Safety Evaluation
3. Notice

cc w/enclosure
See next page

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NRC FORM 318 (10/80) NRCM 0240 **OFFICIAL RECORD COPY** USGPO 1980—329-824

Mr. George T. Berry

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

POWER AUTHORITY OF THE STATE OF NEW YORK

DOCKET NO. 50-333

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 59
License No. DPR-59

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Power Authority of the State of New York (the licensee) dated December 6, 1979, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, Facility Operating License No. DPR-59 is amended by changes to the Technical Specifications as indicated in the attachment, and Paragraph 2.C(2) of Facility Operating License No. DPR-59 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 59 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

T. A. Ippolito

Thomas A. Ippolito, Chief
Operating Reactors Branch #2
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: August 26, 1981

ATTACHMENT TO LICENSE AMENDMENT NO. 59

FACILITY OPERATING LICENSE NO. DPR-59

DOCKET NO. 50-333

Revise Appendix A as follows:

Remove Pages	Insert Pages
227	227
230	230
	230a
231	231
232	232
234	234
235	235
	235a
	235b

3.10 LIMITING CONDITIONS FOR OPERATION

3.10 CORE ALTERNATIONS

Applicability:

Applies to fuel handling and core reactivity limitations.

Objective:

To assure that core reactivity is within the capability of the control rods and to prevent criticality during refueling.

Specification:

A. Refueling Interlocks

1. The Reactor Mode Switch shall be locked in the Refuel position during core alterations and the refueling interlocks shall be operable except as specified in Specifications 3.10.A.2, 3.10.D, and 3.10.E

2. Fuel shall not be loaded into the reactor core unless all control rods are fully inserted except in accordance with Specification 3.10.A.7.

3. The fuel grapple hoist load switch shall be set at $\leq$650 lbs.

4.10 SURVEILLANCE REQUIREMENTS

4.10 CORE ALTERATIONS

Applicability:

Applies to the periodic testing of those interlocks and instruments used during refueling and core alterations.

Objective:

To verify the operability of instrumentation and interlocks used in refueling and core alterations.

Specification:

A. Refueling Interlocks

1. Prior to any fuel handling, with the head off the reactor vessel, the refueling interlocks shall be functionally tested. They shall also be tested at weekly intervals thereafter until no longer required and following any repair work associated with the interlocks.

2. Whenever the reactor is in the refuel mode and rod block interlocks are being bypassed for core unloading, one licensed operator and a member of the reactor analyst department shall verify that the fuel from the cell has been removed before the corresponding control rod is withdrawn.

control rod after the fuel assemblies in the cell containing (controlled by) that control rod have been removed from the reactor core. All other refueling interlocks shall be operable.

7. In the "refuel" mode, there are interlocks which prevent the refueling bridge (if loaded) from moving toward the core unless all control rods are fully inserted. These interlocks may be bypassed during spiral loading except for those control cells which contain fuel or that control cell which is being loaded. Interlocks for all cells containing fuel, or for any cell about to be loaded, shall be operable.

B. Core Monitoring

During core alterations two SRM's shall be operable, one in the core quadrant where fuel or control rods are being moved and one in an adjacent quadrant. For an SRM to be considered operable, the following conditions shall be satisfied:

1. The SRM shall be inserted to the normal operating level. (Use of special movable,, dunking type detectors during initial fuel loading and major core alterations in place of normal detectors is permissable as long as the detector is connected into the normal SRM circuit.)

B. Core Monitoring

Prior to making alterations to the core the SRM's shall be functionally tested and checked for neutron response. Thereafter, the SRM's will be checked daily for response, except as specified in Specification 3.10.B.3 and 4.

2. The SRM shall have a minimum of 3 counts/sec with all rods fully inserted in the core except as noted in 3 and 4 below.

3. Prior to spiral unloading, the SRM's shall have an initial count rate of $\geq$3 CPS. During spiral unloading, the count rate of the SRM's may drop below 3 CPS.

4. During spiral reload, SRM operability will be verified by using a portable external source every 12 hours until enough fuel is loaded to maintain 3 CPS. Alternatively, two fuel assemblies will be loaded in different cells containing control blades around each SRM to obtain the required 3 CPS. Until these two assemblies have been loaded in a given quadrant, it is not necessary for the SRM in that quadrant to indicate the minimum count rate of 3 CPS. The loading of fuel near the SRM's does not violate the intent of the spiral reloading pattern.

C. Spent Fuel Storage Pool Water Level

Whenever irradiated fuel is stored in the spent fuel storage pool, the pool water level shall be maintained at a minimum level of 33 ft.

D. Control Rod and Control Rod Drive Maintenance

1. A maximum of two non-adjacent control rods separated by more than two control rods in any direction, may be withdrawn from the core for the purpose of performing control rod core/or control rod drive maintenance providing the following conditions are satisfied, except as specified in 3.10.D.2 below and 3.10.A.7 above.

   a. The Reactor Mode Switch shall be locked in the Refuel position. The refueling interlock which prevents more than one control rod from being withdrawn may be bypassed for one of the control rods for which maintenance is being performed. All other refueling interlocks shall be operable.

   b. Specification 3.3.A.1 shall be met or the control rod directional control valves for a

C. Spent Fuel Storage Pool Water Level

Whenever irradiated fuel is stored in the spent fuel storage pool, the pool level shall be recorded daily.

D. Control Rod Drive and Control Rod Drive Maintenance

1. This surveillance requirement is the same as driven in 4.10.A

minimum of eight control rods surrounding each drive out of service for maintenance will be disarmed electrically and sufficient margin to prevent criticality demonstrated, except as specified in 3.10.A.7.

2. More than two control rods may be withdrawn from the reactor core provided:

a. The Reactor Mode Switch shall be locked in the Refuel position. The refueling interlock which prevents more than one control rod from being withdrawn may be bypassed on a withdrawn control rod after the fuel assemblies in the cell containing (controlled by) that control rod have been removed from the reactor core. All other refueling interlocks shall be operable.

2. Sufficient control rods shall be withdrawn prior to performing this maintenance to demonstrate that with a margin of 0.25 percent Δk that the core can be made subcritical at any time during the maintenance with the highest worth operable control rod fully withdrawn and all other operable rods fully inserted. Alternately, if a minimum of eight control rods surrounding each control rod out of service or maintenance are to be fully inserted and have their directional control valves electrically disarmed the 0.25 percent Δk margin will be met with highest worth control rod remaining in service during the maintenance period fully withdrawn.

A. Refueling Interlocks

During refueling operations, the reactivity potential of the core is being altered. It is necessary to require certain interlocks and restrict certain refueling procedures such that there is assurance that inadvertent criticality does not occur.

To minimize the possibility of loading fuel into a cell containing no control rod it is required that all control rods surrounded by fuel assemblies are fully inserted when fuel is being loaded in the reactor core. This requirement assures that during refueling the refueling interlocks, as designed, will prevent inadvertent critically. The core reactivity limitation of Specification 3.3 limits the core alterations to assure that the resulting core loading can be controlled with the reactivity control systems and interlocks at any time during shutdown or the following operating cycle.

Addition of large amounts of reactivity to the core is prevented by operating procedures, which are in turn backed up by refueling interlocks and circuitry which sense the condition of the refueling equipment and control rods. Depending on the sensed condition, interlocks are activated which prevent movement of the refueling equipment withdrawal of control rods (rod block).

Circuitry is provided which senses the following conditions:

1. All rods inserted.

2. Refueling platform positioned near or over the core.

3. Refueling platform hoists are fuel-loaded (fuel grapple, frame mounted hoist, monorail mounted hoist).

4. Fuel grapple not full up.

5. Service platform hoist fuel-loaded.

6. One rod withdrawn.

When the Mode Switch is in the Refuel position, interlocks prevent the refueling platform from being moved over the core if a control rod is withdrawn and fuel is on a hoist. Likewise, if the refueling platform is over the core with fuel on a hoist, control rod motion is blocked by the interlocks. When the Mode

Switch is in the Refuel position only one control rod can be withdrawn except as noted in Specifications 3.10.A, D and E. The refueling interlocks, in combination with core nuclear design and refueling procedures limit the probability of an inadvertent criticality. The nuclear characteristics of the core assure that the reactor is subcritical even when the highest worth control rod is fully withdrawn. The combination of refueling interlocks for control rods and the refueling platform provide redundant methods of preventing inadvertent criticality even after procedural violations. The interlocks on hoists provide yet another method of avoiding inadvertent criticality.

For a new core the dropping of a fuel assembly into the vacant fuel location adjacent to a withdrawn control rod does nto result in an excursion or a critical configuration, thus adequate margin is provided.

A spiral unloading pattern is one in which the fuel in the outer-most cells (four fuel bundles surrounding a control blade) is removed first. Unloading continues by removing the remaining outermost fuel by cell so that the center cell will be removed last. Spiral loading is the reverse of unloading. Spiral loading and unloading preclude the formation of flux traps (moderator-filled cavities surrounded on all sides by fuel). It is not necessary to accomplish a full core offload or onload in order to utilize the spiral movement procedure as long as the partial unloading/reloading plan complies with the description given above.

The Spiral unloading procedure is a special case of the method described in Specification 3.10.A.6. The spiral loading procedure is justified by the same logic used in the Bases for Specification 3.10.D. There it is noted that any control cell which contains 4 fuel bundles and a fully inserted control blade is more reactive than the same control cell after the fuel bundles and control blade have been withdrawn. Thus, during spiral loading or unloading, the shutdown margin of the partially loaded core can not possibly be less than the shutdown margin of the complete core which is required to comply with Specification 3.3.

B. Core Monitoring

The SRM's are provided to monitor the core during periods of plant shutdown and to guide the operator during refueling operations and plant startup. Requiring two operable SRM's in or adjacent to a core quadrant where fuel or control rods are being moved assures adequate monitoring of that quadrant during such alterations. The requirement of 3 counts/sec provides assurance that neutron flux is being monitored and insures that startup is conducted only if the source range flux level is above the minimum assumed in the control rod drop accident.

Under the special condition of spiral core unloading, it is expected that the SRM count rate will drop below 3 CPS before all of the fuel is unloaded. Since there will be no reactivity additions, a lower number of counts will not present a hazard. When all of the fuel has been removed to the spent fuel storage pool, the SRM's will no longer be required. Requiring the SRM's to be operable prior to fuel removal assures that the SRM's are operable and can be relied on even when the count rate drops below 3 CPS.

During spiral loading of the core, SRM operability will be verified by using a portable external source every 12 hours until enough fuel has been loaded to maintain at least 3 CPS. Alternative two fuel assemblies will be loaded in different cells containing control blades around each SRM to obtain the required 3 CPS. Unitl these two assemblies have been loaded, the adjacent SRM is not required to indicate the minimum count rate of 3 CPS.

C. Spent Fuel Storage Pool Water Level

To assure that there is adequate water to shield and cool the irradiated fuel assemblies stored in the pool, a minimum pool water level is established. The minimum water level of 33 ft is established because it would be significant change from the normal level (37 ft-9in.), well above a level to assure adequate cooling (just above active fuel).

D. Control Rod and Control Rod Drive Maintenance

During certain periods, it is desirable to perform maintenance on two control rods and/or control rod drives at the same time. This specification provides assurances that inadvertent criticality does not occur during such maintenance.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO.59 TO FACILITY OPERATING LICENSE NO. DPR - 59
POWER AUTHORITY OF THE STATE OF NEW YORK
DOCKET NO. 50-333

1. Introduction

By letter dated December 6, 1979[1] the Power Authority of the State of New York (PASNY) requested an amendment to the Technical Specifications for the James A. FitzPatrick Nuclear Power Plant (JAF). The proposed Technical Specification changes provide for spiral unloading/reloading of the core, permits spiral reloading without the requirement that all control rod blades be fully inserted, and redefines Source Range Monitor (SRM) operability during the spiral unloading/reloading operations.

2. Discussion

A spiral unloading pattern is one in which the fuel in the outer-most cells (four fuel bundles surrounding a control blade) is removed first. Unloading continues by removing the remaining outermost fuel by cell so that the center cell will be removed last. Spiral loading is the reverse of unloading. Spiral loading and unloading preclude the formation of flux traps (moderator-filled cavities surrounded on all sides by fuel). It is not necessary to accomplish a full core offload or onload in order to utilize the spiral movement procedure as long as the partial unloading/reloading plan complies with the description given above.

BWR Technical Specifications normally require that all but one control blade be inserted into the core during core alterations. This is no problem during normal refueling and control blade drive maintenance since only one core cell (defined as a control blade plus the four adjacent fuel assemblies) is worked on at any given time. However, a removal of the entire core would require all the fuel to be removed before any control blade was removed. This is not possible unless the plant has a full complement of control blade guides. These guides are needed to provide lateral support to control blades in defueled cells. The JAF facility does not have this many guides.

During the spiral unloading procedure described above the cells are removed sequentially in a spiral sequence with the cells closest to the center of the core removed last. During unloading of a fuel cell the control rod is removed or withdrawn. For the reasons justified herein it is not necessary to replace or insert the control rod for the given fuel assembly prior to removing the next fuel cell in the spiral sequence. Therefore, during the spiral unloading sequence more than one control rod may be absent at any point in time since control rods are not required in defueled cells. The loading sequence is the reverse of the unloading sequence with fuel loaded and control rods inserted in the center of the core first, and core perimeter cells loaded and control rods inserted last.

The effect of the amendment would also allow the count rate in the Source Range Monitor (SRM) channels to drop below 3 counts per second (cps) when the entire reactor core is being removed or replaced. During any core alteration, and especially during core loading, it is necessary to monitor flux levels. In this manner, even in the highly unlikely event of multiple operator errors, there is reasonable assurance that any approach to criticality would be detected in time to halt operations. Thus the minimum count rate requirement (3 cps) in the present Technical Specifications accomplishes three safety functions: (1) it assures the presence of some neutrons in the core, (2) it provides assurance that the analog portion of the SRM channels is operable, and (3) it provides assurance that the SRM detectors are close enough to the array of fuel assemblies to monitor core flux levels.

Unloading and reloading of the entire core leads to some difficulty with this minimum count rate requirement. When only a small number of assemblies are present within the core, the SRM count rate will drop below the minimum due to the small number of neutrons being produced. Likewise, with the decreasing geometry of the fuel array and the fixed position of the SRM detectors, the neutron attenuation by the increased distance and moderation will also affect the measurable count rate.

Past practice has been to connect temporary "dunking" chambers to the SRM channels in place of the normal detectors, and to locate these detectors near the fuel. Besides being operationally inconvenient, dunking chambers suffer from signal variations due to movement. Moreover, the use of dunking chambers increases the risk of loose objects being dropped into the vessel.

Our evaluation of the proposed change in the Technical Specifications approving count rates below 3 cps during the spiral unloading/reloading procedures is provided in Section 3.2.

3.0 Evaluation

3.1 Subcriticality in Spiral Unloading/Reloading

The spiral unloading/reloading procedure described in Section 2 allows only cells on the edge of the fuel array to be unloaded or reloaded. Thus the intermediate fuel arrays resulting from such a program will preclude the formation of flux traps. In such a case, the neutron multiplication factor of the intermediate fuel arrays must be less than or equal to that of a fully loaded core. It is also noted that any control cell which contains 4 fuel bundles and a fully inserted control blade is more reactive than the same control cell after the fuel bundles and control blade have been withdrawn. Thus, during spiral loading or unloading, the shutdown margin of the partially loaded core can not possibly be less than the shutdown margin of the complete core which is assured by other Specifications.

3.2 Neutron Flux Monitoring

3.2.1 Flux Attenuation

The four SRM detectors are located, one per quadrant, roughly half a core radius from the center. Although these are incore detectors and thus very sensitive when the reactor is fully loaded, they lose some of their effectiveness when the reactor is partially defueled and the detectors are located some distance from the array of remaining fuel.

GE's spent fuel pool studies have shown(2) that 16 or more fuel assemblies (i.e., four or more control cells) must be loaded together before criticality is possible. In spiral loading sequences in the JAF core, an array containing four or more control cells will be at most two control cells (i.e., about two feet) away from an SRM detector. We have previously examined the sensitivity loss in such a case(3) and found it to be at most one decade of sensitivity (i.e., about one fifth of the SRM's logarithmic scale). As in Reference 3, we find this to be acceptable.

3.2.2 Minimum Flux in the Core

We find the proposed amendment to be acceptable from the point of view of minimum flux provided the spiral reload includes fuel which has previously accumulated exposure in the reactor. We do not find the amendment to be applicable to the loading of a new core containing only fresh fuel. Such a loading must use lumped neutron sources and dunking chambers to meet the normal 3 cps minimum count rate.

3.2.3 SRM Operability

Specification 4.10.B requires a functional check of the SRM channels, including a check of neutron response, prior to making any alteration to the core and daily thereafter. This would be sufficient for core unloading and reloading, except that the more extensive fuel handling operations involved imply a greater possibility of SRM failure. During spiral unloading and reloading, Proposed Specification 3.10.B.4 would increase this frequency to every 12 hours or, as an alternative, allow some exposed fuel to be loaded adjacent to the SRM detectors to provide a minimum 3 cps count rate continuously. We agree that this increased testing is sufficient.

4.0 Summary

We have examined the proposed amendment and found it acceptable provided it is understood that spiral reload will include a significant quantity of exposed fuel.

5.0 Environmental Considerations

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact, and pursuant to 10 CFR Section 51.5(d)(4) that an environmental impact statement, or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of the amendment.

6.0 Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: August 26, 1981

References

1. Letter, P. J. Early (PASNY) to T. A. Ippolito (NRC), dated December 6, 1979.

2. General Electric Standard Safety Analysis Report, 251-GESSAR, Section 4.3.2.7, pg. 4.3-27.

3. "Safety Evaluation by the Office of Nuclear Reactor Regulation Supporting Amendment No. 27 to Facility Operating License No. DPR-63," Docket No. 50-220, enclosed with letter, T. A. Ippolito (NRC) to D. P. Dise (Niagara Mohawk Power Corporation), dated March 2, 1979.

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NO. 50-333

POWER AUTHORITY OF THE STATE OF NEW YORK

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY

OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 59 to Facility Operating License No. DPR-59, issued to the Power Authority of the State of New York, which revised the Technical Specifications for operation of the James A. FitzPatrick Nuclear Plant (the facility) located in Oswego County, New York. The amendment is effective as of the date of issuance.

The amendment revises the Technical Specifications to allow spiral fuel unloading and reloading of the core which results in reducing the required number of control blade guides, and clarify source range monitor requirements during such evolutions.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of the amendment was not required since the amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of the amendment will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of the amendment.

For further details with respect to this action, see (1) the application for amendment dated December 6, 1979, (2) Amendment No. 59 to License No. DPR-59 for the James A. Fitzpatrick Nuclear Power Plant, and (3) the Commission's Public Document Room, 1717 H Street, N.W., Washington, D.C., and at the Penfield Library, State University College at Oswego, Oswego, New York 13126. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Licensing.

Dated at Bethesda, Maryland, this 26th day of August 1981.

FOR THE NUCLEAR REGULATORY COMMISSION

Thomas A. Ippolito, Chief
Operating Reactors Branch #2
Division of Licensing