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July 10, 1979

Mr. George Lear, Chief
Operating Reactors Branch 3
Division of Reactor Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Docket No. 50-297

Dear Sir:

In accordance with 10CFR Parts 2 and 50, the attached proposed changes in the Technical Specifications to our Facility Operating License R-120 are submitted.

The proposed changes have been approved by our Radiation Protection Council in accordance with Section 6.2.2(d) of our Technical Specifications.

Sincerely,

Joab L. Thomas
Chancellor

Attachments:
Proposed Changes and Supporting Analysis
to Technical Specifications

CC: Dr. T. S. Elleman, w/attachs.
Professor J. R. Bohannon, Jr., w/o attachs.
Dr. R. F. Saxe, w/attachs.
Mr. L. T. Caruthers, w/o attachs.
Dr. E. C. Theil, w/attachs.

Subscribed and sworn to before me
this 13 day of July, 1979.

Notary Public
My commission expires 1-5-80

PROPOSED CHANGES AND SUPPORTING ANALYSIS TO TECHNICAL SPECIFICATIONS

I. Section — Requested Change

3.3 d — Change to read:

| Measuring Channel | Minimum No. Operable |
|---|---|
| d. Pulse Energy or N-16 Channel | 1 (c) |

3.3 — Change footnote to read:

(c) Required only in the pulse mode. Requires either the Pulse Energy Channel or N-16 Channel for measurement of pulse energy.

3.4 e — Change to read:

| Measuring Channel | Minimum No. Operable | Function | Operating Mode in Which Req'd |
|---|---|---|---|
| e. Pulse Energy or N-16 Channel | 1 (d) | Provide total energy data on pulse (Manual Scram) | Pulse |

3.4 — Add footnote that reads:

(d) In pulse mode only, requires either the Pulse Energy Channel or N-16 Channel to provide information on pulse energy for manual scram.

3.4 — Change third paragraph of Bases to read:

The Pulse Energy Channel or the N-16 Channel provides information on pulse energy. In the very unlikely event that an abnormal situation should develop, the operator is provided this information following the pulse in order that he may return the reactor to its safest state, and take any other precautionary action deemed necessary.

Safety Analysis

The N-16 Channel integrator reliability has been demonstrated in our start-up program and subsequent routine pulsing. The N-16 Channel responds in the same manner as the Pulse Energy Channel, providing a direct measurement of pulse energy following the pulse. The requested changes for Sections 3.3 and 3.4 identify the N-16 Channel as an available channel for measuring pulse energy. The FUISTAR Final Safety Analysis Report approves the use of the N-16 Channel for Pulse energy measurement in Section 7.1.4.

Requested Change

Section

3.6a Change to read:

| Equipment/Condition | Function | Operating Mode in Which Required |
|---|---|---|
| a. All doors, except the Control Room and basement corridor entrance; self-closing; closed and locked. | To maintain reactor building negative differential pressure (f) | All |

3.6 Add Footnote (f) that reads:

(f) Doors may be held opened by authorized personnel for less than five minutes for personnel and equipment transport provided audible and visual indication is available for the reactor operator to verify door status.

Safety Analysis

Maintaining the reactor building differential pressure while operating is the responsibility of the reactor operator. The requested change will allow any reactor bay door to be opened for periods of time to permit transport of equipment and personnel. In the event a radioactive release should occur, the evacuation and confinement system would be placed in operation at the direction of the reactor operator and if any reactor bay door had been open for personnel or equipment transport, the door would self-close upon exit of personnel thereby maintaining required negative differential pressure in the confinement mode. Furthermore, audible and visual indication of door status will enable the operator to verify the doors are closed following the initiation of the evacuation and confinement systems.

Section Requested Change

4.1 a Change to read:

a. All fuel elements shall be visually inspected biennially but at intervals not to exceed twenty-six months.

Safety Analysis

It is North Carolina State's intention to adopt its Technical Specification to ANSI N378-1974, "Standard for the Development of Technical Specifications for Research Reactors"., and toward this end, a tolerance has been added to the surveillance intervals. This tolerance shall provide for continuity of surveillance test, maintenance, and reactor operation. Changes in Surveillance Sections 4.1.a, 4.2.b, 4.2.c, 4.3.d, 4.4 and 4.5.D, reflect the addition of a tolerance interval for the performance of the surveillance

requirement. Based upon results of proven satisfactory performance of the current PULSTAR Surveillance Program, adding a tolerance interval to the subject specifications will not compromise reactor safety. The tolerance intervals added are consistent with Section 4 of ANSI N378-1974, i.e., an annual surveillance item has a two-month tolerance.

| Section | Requested Change |
|---|---|
| 4.2 a | Change to read: |

a. The reactivity worth of the pulse rod and each control rod shall be determined annually but at intervals not to exceed fourteen months for the steady state core in current use. The reactivity worth of the pulse rod and each control rod for the pulsing core in current use shall be determined within six months prior to pulsing operations. The reactivity worth of all rods shall be determined for any new core or rod configuration prior to routine operation.

Safety Analysis

The terms "standard reference core" and "pulse core" have been replaced by "steady state core in current use" and "pulsing core in current use" respectively, in order to adopt the surveillance requirement to the latest core configuration in operation. The rod worth measurements for the pulsing core within six months prior to pulsing insures that recent data will be available to precisely position the pulse rod, and, the surveillance of the steady state core will provide adequate information about changes in rod worths due to burnup.

| Section | Requested Change |
|---|---|
| 4.2 b | Change to read: |

b. Control rod drop and drive times and the pulse rod drive time shall be determined annually, but at intervals not to exceed fourteen months, and after a control rod mechanism is moved to a new position in the core or after maintenance or modification is performed on the control rod mechanism. Pulse rod turn around time shall be determined within six months prior to each pulsing operation.

Safety Analysis

The requirement for measuring pulse rod drop time has been removed since this measurement has no physical significance. Proper movement of the pulse rod is tested by pulse rod turn around time measurements. The addition of a tolerance on the surveillance interval is consistent with the safety analysis for Section 4.1 a.

| Section | Requested Change |
|---|---|
| 4.2 c | Change to read: |

c. The pulse and control rods shall be visually inspected biennially but at intervals not to exceed twenty-six months.

Safety Analysis

Consistent with safety analysis for Section 4.1 a.

| Section | Requested Change |
|---|---|
| 4.2 | Change Bases to read: |

The reactivity worths associated with the steady state core are measured to assure that the required shutdown margin is available, to provide a means of determining the reactivity worths of experiments inserted in the core and reactivity coefficients. The measurement of reactivity worths on an annual basis for the steady state core provides a correction for the slight variations expected due to burnup. This frequency of measurement has been found acceptable at similar research reactor facilities, particularly the prototype PULSTAR which has a similar slow change of rod worth with burnup. The measurement of control rods and pulse rod reactivity worths for the pulse core within six months prior to pulsing insures that adequate data is available to precisely position the pulse rod during pulsing operations. The visual inspection of the pulse and control rods and the measurement of the drive and drop times for the control rods and the drive time for the pulse rod are made to determine whether the rods are capable of performing properly in regard to the transient analysis in the FSAR. During these inspections, evidence of corrosion and wear, travel limit setpoints, and drop and drive times will be recorded and data analyzed for trends. Verification of proper operation after maintenance or modification of the control rod system will attest to proper reinstallation and reconnection.

Safety Analysis

Consistent with safety analyses for 4.2 a and 4.2 b.

| Section | Requested Change |
|---|---|
| 4.3 c | Change to read: |

c. A channel calibration of the Safety and Linear Power

Level measuring channels by the calo · cric method shall be made semi-annually but at intervals not to exceed seven months.

4.3 d — Change to read:

d. A channel calibration of the following channels shall be made semi-annually but at intervals not to exceed seven months:

1. Pool Water Temperature
2. Primary Coolant Flow and Flow Monitoring (Flapper)
3. Pool Water Level

Safety Analysis

Consistent with safety analysis for 4.1 a.

| Section | Requested Change |
|---|---|
| 4.3 e | Change to read: |

e. A calibration of the channel to be used for measuring pulse energy shall be made using a test pulse of less than 1.0% Δk/k reactivity insertion prior to any operation in the pulse mode with reactivity insertions above 1.0% Δk/k. During this test, the overpower trip bypass timers shall be verified to be operable.

Safety Analysis

The requested change for Section 4.3 e insures that the appropriate surveillance test shall be performed on the channel that is to be used for measuring pulse energy (either the Pulse Energy Channel or N-16 Channel). Analysis for use of N-16 Channel to measure pulse energy is consistent with safety analysis of Section 3.4

| Section | Requested Change |
|---|---|
| 4.4 | Change Specification to read: |

The area and stack monitoring systems shall be calibrated annually but at intervals not to exceed fourteen months. The setpoints shall be verified weekly.

Safety Analysis

Consistent with safety analysis for Section 4.1 a.



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| Section | Requested Change |
|---|---|
| 4.5 a | Change to read:<br><br>a. Prior to reactor operation, the confinement system and evacuation system shall have been verified to be operable within the previous seven-day period. |
| 4.5 b | Change to read:<br><br>b. Operation of the confinement system on auxiliary generator power will be checked every two weeks but at intervals not to exceed twenty-one days. |

Safety Analysis

The proposed change provides for a more realistic test of the confinement initiation and evacuation system on the auxiliary generator. The present specification of testing the confinement initiation system on the auxiliary generator requires a lineup of circuit breakers to perform this surveillance that would normally not be present during operations. This is due to the fact that upon loss of commercial power to the Control Room Distribution Panel, the confinement initiation relay de-energizes so that upon return of commercial power or auxiliary generator power, the reactor building is automatically placed in the confinement mode. Therefore, the requested changes to Section 4.5 a and 4.5 b remove the requirement to test the confinement initiation system on the auxiliary generator. The evacuation system, including logic relays and evacuation horns, is powered from the Control Room Distribution Panel. There is no vital bus from the generator to the evacuation/confinement initiation system; therefore, if the confinement system will initiate on commercial power, then it will also initiate on auxiliary power. Therefore, the test demonstrating that the Control Room Distribution Panel can be powered from the auxiliary generator coupled with the weekly test of the evacuation/confinement initiation system on console power via commercial power will automatically insure operation of the evacuation/confinement initiation system on auxiliary generator. The requested changes provide for the most time efficient testing of the confinement and evacuation system without compromising reactor safety.

| Section | Requested Change |
|---|---|
| 4.5 c | Change to read:<br><br>c. A visual inspection of the door seals and closures, dampers and gaskets of the confinement and ventilation systems shall be performed semi-annually at intervals not to exceed seven months to verify they are operable. |

Safety Analysis

The continual scheduling of this surveillance requirement has been found to be more convenient on a semi-annual basis. Since the requested change reduces the surveillance intervals, reactor safety is not compromised.

| Section | Requested Change |
|---|---|
| 4.5 d | Change to read: |

d. The Control Room differential pressure gauges shall be calibrated annually but at intervals not to exceed fourteen months.

Safety Analysis

Consistent with safety analysis for 4.1 a.

| Section | Requested Change |
|---|---|
| 4.5 e | Change to read: |

e. The filter trains shall be tested to verify that they are operable triennially but at intervals not to exceed thirty-nine months and prior to reactor operation following confinement filter replacement.

Safety Analysis

The reliability of the confinement filters has been demonstrated through extensive filter testing since the PULSTAR Startup Program. Filter train testing, in accordance with NRC Regulatory Guide 1.52, has been performed three times since the initial installation and testing of the confinement filter beds with no indication of degradation of the filter train, i.e., particulate and iodine removal efficiencies and bypass leakage have essentially remained unchanged. The surveillance test results below for Confinement Fan #1, the predominantly operated confinement filter train, demonstrates the reliability of the charcoal bed:

| Date | Iodine Removal Efficiency | DOP Removal Efficiency | Freon Bypass Leakage |
|---|---|---|---|
| 15 July 1974 | 99.93% | 99.99% | < 0.1% |
| 13 July 1976 | 99.99% ± 0.01% | 99.99% | < 0.1% |
| 13 July 1978 | 99.99% ± 0.01% | 99.99% | < 0.1% |

Reference: PULSTAR Surveillance File No. PS-5-03-3

Improvements in filter testing techniques have led to more precise and reliable test data so that confidence in the filter train is maintained without compromising reactor safety.

| Section | Requested Change |
|---|---|
| 4.5 f | Change to read: |

f. The 600 cfm air flow rate in the confinement stack exhaust duct shall be verified annually but at intervals not to exceed fourteen months.

Safety Analysis

The requested change represents a reduction in the surveillance interval and thus is more conservative with respect to reactor safety.

| Section | Requested Change |
|---|---|
| 6.7.5 a | Change to read:<br><br>a. A brief narrative summary of (1) operating experience, including a cross-section of experiments performed, (2) changes in performance characteristics related to reactor safety that occurring during the reporting period, and (3) results of surveillance tests and inspections. |

Safety Analysis

The requested change clarifies the necessary reporting requirements by removing the duplication between Section 6.7.5 a and 6.7.5 e. In particular, changes in facility design and changes in operating procedures were previously included in both sections. Reporting requirements for experiments have also been clarified, i.e., a cross section of experiments performed is reported for Section 6.7.5 a and the safety evaluation and description of new experiments and tests are reported in Section 6.7.5 e.

| Section | Requested Change |
|---|---|
| 6.7.5 f | Remove the subdivision letter g. to read:<br><br>Gaseous Waste (summarized on a monthly basis) |

Safety Analysis

The requested change is a grammatical correction and does not change the intent of the specification. Gaseous waste fall under the general category of radioactive effluents detailed in 6.7.f f.

| Section | Requested Change |
|---|---|
| 6.7.5 g | Change to read:<br><br>g. A summary of radiation exposures received by facility personnel and visitors, including pertinent details of significant exposures. |
| 6.7.5 h | Change to read:<br><br>h. A summary of the results of radiation and contamination surveys performed within the facility. |
| 6.7.5 | Add subdivision (i) that reads:<br><br>i. A description of any environmental surveys performed outside the facility. |

Safety Analysis

The requested changes to 6.7.5 g, 6.7.5 h, and the addition of 6.7.5 i clarify reporting requirements for surveys and exposures. The requested change to 6.7.5 g replaces the words "dates and time" with "pertinent details". This change will provide for an increase in reporting requirements from just dates and time to more significant details such as when, where and how the exposure occurred. The latter details are more important in terms of reporting a significant exposure rather than just when it occurred.