

March 9, 2001

Dr. Kuruvilla Verghese, Interim Director
Nuclear Reactor Program
Department of Nuclear Engineering
North Carolina State University
P. O. Box 7909
Raleigh, NC 27695-7909

SUBJECT: NRC INSPECTION REPORT NO. 50-297/2001-201 AND NOTICE OF VIOLATION

Dear Dr. Verghese:

This refers to the inspection conducted on February 26 - March 1, 2001, at your PULSTAR research reactor facility. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

Various aspects of your safety program were inspected including selective examinations of procedures and representative records, and interviews with personnel. As a result of the inspection, two apparent violations were identified. The violations are cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding the violations are described in detail in the enclosed report.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The NRC will use your response in accordance with its policies to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/NRC/ADAMS/index.html>.

Dr. K. Verghese

-2-

Should you have any questions concerning this inspection, please contact Craig Bassett at 404-562-4712.

Sincerely,

/RA/

Ledyard B. Marsh, Chief
Events Assessment, Generic Communications
and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-297
License No. R-120

Enclosures: 1. Notice of Violation
2. NRC Inspection Report No. 50-297/2001-201

cc w/encl: Please see next page

North Carolina State University

Docket No. 50-297

cc:

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Test, Research, and Training
Reactor Newsletter
University of Florida
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Gainesville, FL 32611

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Dr. K. Verghese

-2-

March 9, 2001

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/RA/

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cc w/encl: Please see next page

Distribution: w/enclosure

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| EHylton | PIsaac | LMarsh | DMatthews |
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ENCLOSURE 1

NOTICE OF VIOLATION

North Carolina State University
PULSTAR Reactor Facility

Docket No.: 50-297
License No.: R-120

During an NRC inspection conducted on February 26 - March 1, 2001, two apparent violations of NRC requirements were identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violations are listed below:

1. 10 CFR 50.54(q) states that, if a change is made (to the Emergency Plan) without approval, the licensee shall submit, as specified in 10 CFR 50.4, a report of each change within 30 days after the change is made.

Contrary to the above, the licensee submitted Revision 6 of the Emergency Plan to the NRC by a letter dated August 17, 2000. The licensee had placed the Plan into effect on June 1, 2000, because it had been concluded that the changes made in the revision did not decrease the effectiveness of the Plan and thus did not require the approval of the NRC.

This is a Severity Level IV violation (Supplement IV).

2. Technical Specification Section 6.2.3, dated April 30, 1997, requires that all new procedures and major revisions thereto having safety significance, including procedures implementing the Emergency Plan, be reviewed by the Radiation Safety Committee or the Reactor Safety and Advisory Committee as appropriate.

Contrary to the above, from April 30, 1997, through February 23, 2001, revisions were made to various emergency plan implementing procedures without the required review by either safety committee before implementation.

This is a Severity Level IV violation (Supplement IV).

Pursuant to the provisions of 10 CFR 2.201, the North Carolina State University is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the responsible inspector, U.S. Nuclear Regulatory Commission, Region II, 61 Forsyth St. S. W., Suite 23T85, Atlanta, GA 30303, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or Demand for Information may be issued as to why the license should not be modified, suspended, or

revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

Because your response will be placed in the NRC Public Document Room (PDR), to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be placed in the PDR without a redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.790(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

Dated at Rockville, Maryland, this 9th day of March, 2001.

U. S. NUCLEAR REGULATORY COMMISSION

Docket No: 50-297

License No: R-120

Report No: 50-297/2001-201

Licensee: North Carolina State University

Facility: PULSTAR Reactor

Location: Raleigh, North Carolina

Dates: February 26 - March 1, 2001

Inspector: Craig Bassett

Approved by: Ledyard B. Marsh, Chief
Events Assessment, Generic Communications
and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

This routine, announced inspection included onsite review of various aspects of the licensee's programs concerning the conduct of operations and emergency preparedness as they relate to the licensee's one megawatt (1MW) Class 2 research reactor. The licensee's programs were directed toward the protection of public health and safety and were generally in compliance with NRC requirements. However, two apparent violations of regulatory requirements were identified.

Conduct of Operations

- Staffing, reporting, and record keeping met requirements specified in Technical Specifications (TSs) Section 6.1.
- Review and oversight functions required by TSs Section 6.2 were acceptably completed by the Radiation Safety Committee (RSC) and the Reactor Safety and Audit Committee (RSAC).
- Design changes had been reviewed with respect to 10 CFR 50.59 and approved by the RSAC as required.
- The requalification/training program was up-to-date and acceptably maintained. Medical examinations were being completed as required.
- Facility procedures and document reviews satisfied TSs Section 6.3 requirements. Procedural compliance was acceptable.
- Reactor fuel movements were made and documented in accordance with procedure and the fuel was being inspected biennially as required by TSs Section 4.1.
- The program for surveillance and Limiting Conditions for Operation confirmations was being carried out in accordance with TSs requirements.
- The program for the control of experiments satisfied regulatory requirements and license commitments.

Emergency Preparedness

- One apparent violation of 10 CFR 50.54(q) was noted for failure to submit changes to the Emergency Plan to the NRC within 30 days of the effective date of the Plan.
- One apparent violation was identified for failure to have revisions to the Emergency Procedures reviewed by the RSC or the RSAC as required.
- The emergency response facilities and equipment were being maintained as required. First responders were knowledgeable of proper actions to take in case of an emergency.

- The licensee maintained current Letters of Agreement with offsite agencies that showed that support would be available in case of an emergency.
- Annual drills were held as required, critiques were used to identify strengths and weaknesses, and corrective actions were taken to resolve problems identified.
- Documentation of emergency preparedness training for staff and off-site personnel indicated that training was being conducted as required.

Report Details

Summary of Plant Status

The licensee's one megawatt (1MW) PULSTAR research reactor continues to be operated in support of undergraduate instruction and laboratory experiments, reactor operator training, and various types of research. During the inspection, the reactor was started-up, operated, and shutdown, as required, to support experiments and research.

1. Organization, Operations, and Maintenance Activities (Inspection Procedure [IP] 69001)

a. Inspection Scope

To verify staffing, reporting, and record keeping requirements specified in Technical Specifications (TSs) Section 6.1 were being met, the inspector reviewed:

- organization and staffing for the facility
- administrative controls
- reactor operations logs
- annual reports

b. Observations and Findings

The licensee's operational organization had not changed since the last inspection. However, it was noted that the persons occupying the positions of Director and Associate Director had left those positions. A member of the Nuclear Engineering faculty was filling the position of Director and the Reactor Health Physicist was also filling the position of Associate Director. The licensee was in the process of trying to fill those positions at the time of the inspection. There were three individuals qualified as Senior Reactor Operators (SROs) at the facility and three qualified Reactor Operators (ROs). This organization was consistent with that specified in the TSs.

Through discussions with licensee representatives, the inspector determined that management responsibilities at the facility had not changed since the previous NRC inspection in this area which occurred in February 1999 (Inspection Report No. 50-297/99-201). The inspector determined that the Associate Director, Nuclear Reactor Program (NRP), retained direct control and overall responsibility for management of the facility as specified in the TSs. The Associate Director reported to the Chancellor of the university through the Director, NRP; the Head of the Department of Nuclear Engineering; and the Dean of the College of Engineering.

The Reactor Operations Manager maintained a schedule for reactor operations and tracked the completion of maintenance and surveillance activities. The inspector also noted that a complete schedule for all surveillance items was maintained on a board in the hallway leading to the reactor control room. This board and input from the Chief Reactor Operator and the Chief of Reactor Maintenance, kept everyone aware of upcoming activities and helped ensure good administrative control over operational and maintenance aspects of the facility.

A review of the reactor console logs showed that they were being maintained as required and problems, if any, were being documented. Corrective actions were taken as warranted. The annual reports summarized the required information and were issued at the frequency specified in the TSs.

c. Conclusions

Staffing, reporting, and record keeping met the requirements specified in TSs Section 6.1.

2. Review, Audit, and Design Change Functions (IP 69001)

a. Inspection Scope

In order to verify that the licensee had established and conducted reviews and audits as required and to determine whether modifications to the facility were consistent with 10 CFR 50.59 and TSs Section 6.2, the inspector reviewed:

- Radiation Safety Committee meeting minutes
- Reactor Safety and Audit Committee meeting minutes
- NRP Procedures
- audits and reviews
- design changes reviewed under 10 CFR 50.59

b. Observations and Findings

Section 6.2 of the TSs required that the Radiation Safety Committee (RSC) consist of at least seven voting members and meet at least six times per year to review safety aspects of facility operation. The Reactor Safety and Audit Committee (RSAC) was required to be composed of at least five persons and to meet at least four times per year with intervals between the meetings not to exceed six months.

The inspector reviewed the RPC and RSAC meeting minutes from September 1998 to the present. These meeting minutes showed that each committee was composed of at least the minimum number of members required and the committees met as required by the TSs with a quorum being present. The inspector noted that the RPC and the RSAC had reviewed/considered the types of topics outlined for their review by the TSs.

It was noted that both committees completed audits of the reactor program but the RSAC had the responsibility of conducting a biennial audit of the requalification program and the Emergency Plan and Emergency Procedures. An annual audit was required of the other aspects of the reactor facility operations to verify compliance with TSs and license requirements. The inspector noted that, since the last NRC inspection, audits had been completed in those areas outlined in the TSs. The inspector noted that the audits and the resulting findings were detailed and that the licensee's responses and corrective actions were acceptable.

Through review of applicable records and interviews with licensee personnel, the inspector determined that all design changes that had been initiated and/or completed at the facility, since the last NRC operations inspection, had undergone the prescribed review and approval process. Initially licensee staff completed the established forms outlining the changes. The proposed changes were subsequently reviewed by a person not having direct responsibility for the equipment or projects affected. Then the changes were presented to the RSAC and the RSC for review and approval in accordance with procedure. The inspector noted that the proper functioning of the equipment or item that had been changed was verified by tests or verifications as needed before the item was placed in service. The appropriate changes were also documented in procedures and/or were pending to be updated in the affected portion of the Safety Analysis Report (SAR), TSs, and/or drawing. None of the changes was determined to constitute an unreviewed safety question.

c. Conclusions

Audits were being conducted by the RPC and the RSAC according to the requirements specified in the TSs. Design changes had been reviewed with respect to 10 CFR 50.59 and approved by the RPC as required.

3. Operator Licenses, Requalification, and Medical Activities (IP 69001)

a. Inspection Scope

To determine that operator requalification activities and training were conducted as required and that medical requirements were met, the inspector reviewed:

- active license status
- logs and records of reactivity manipulations
- training records
- medical examination records

b. Observations and Findings

As noted earlier in this report, the licensee currently has three qualified SROs and three ROs at the facility. All licenses were current and the earliest that any is scheduled to expire is in November of the year 2003.

The Requalification Program was maintained up to date. Records showed that operator training was consistent with the Requalification Program requirements. A review of the applicable records showed that training had been conducted in the areas outlined in the licensee's requalification and training program. It was noted that lectures had been given as stipulated and that training reviews and examinations had been documented. Records of quarterly reactivity manipulations, other operations activities, and RO and SRO activities were being maintained. Records of the annual oral and demonstrated reactor proficiency and written examination results were also on file. All the operators had successfully completed the various tasks outlined and were current in their training

and requalification programs. The inspector also verified that the operators were receiving the required medical examinations.

c. Conclusions

The requalification/training program was up-to-date and acceptably maintained. Medical examinations were being completed as required.

4. Procedures (IP 69001)

a. Inspection Scope

To determine whether facility procedures met the requirements outlined in TSs Section 6.3, the inspector reviewed:

- selected sections of the PULSTAR Operations Manual
- selected Health Physics and Special Procedures (SPs)
- procedural reviews and updates

b. Observations and Findings

The procedures reviewed were acceptable for the facility and the current staffing level. The procedures specified the responsibilities of the various members of the staff and provided them instructions for performing their duties. The procedures were being reviewed annually as required and updated as needed. The operations that were observed during this inspection were completed in accordance with the applicable procedures.

c. Conclusions

Facility procedures and document reviews satisfied TSs Section 6.3 requirements. Procedural compliance was acceptable.

5. Fuel Movement (IP 69001)

a. Inspection Scope

In order to verify adherence to fuel handling and inspection requirements, the inspector reviewed:

- Fuel Handling Checklists
- PULSTAR Surveillance (PS) procedures
- applicable logs and PS records

b. Observations and Findings

The licensee was maintaining the required records of fuel movements that were completed. The reactor fuel was being inspected upon initial receipt and biennially as required by TSs. The procedures used and the controls established were acceptable. Fuel movements, inspection, and log keeping followed facility procedures and specially developed checklists.

c. Conclusions

Reactor fuel movements were made and documented in accordance with procedure and the fuel was being inspected biennially as required by TS 4.1.

6. Surveillance (IP 69001)

a. Inspection Scope

To determine that surveillance and Limiting Conditions for Operation (LCO) verifications were being completed as required by TSs Section 4, the inspector reviewed:

- selected PS procedures
- selected PS data and records
- Limiting Conditions for Operation
- associated logs and reports

b. Observations and Findings

The inspector noted that selected daily, monthly, quarterly, semiannual, annual, and biennial checks, tests, and/or calibrations for TS-required surveillance and LCO verifications were completed as stipulated. The verifications reviewed were completed on schedule and in accordance with licensee procedures. All the recorded results were within the TS and procedurally prescribed parameters. The records and logs were noted to be complete and were being maintained as required.

c. Conclusions

The program for surveillance and LCO confirmations was being carried out in accordance with TS requirements.

7. Experiments (IP 69001)

a. Inspection Scope

In order to verify that experiments were being conducted within approved guidelines, the inspector reviewed:

- PULSTAR Experiment Protocol Manual
- Request for Reactor Operation Run Sheets

- experiment review and approval by the RPC
- potential hazards identification
- control of irradiated items

b. Observations and Findings

The inspector noted that all the experimental procedures, formerly known as projects, had been reviewed, revised, standardized, and were renamed Protocols. All the experimental Protocols conducted at the facility were well-established, "tried" procedures that had been in place for several years. No new, "untried" experiments had been initiated, reviewed, or approved since the last inspection. The experiments that were conducted were completed under the cognizance of the Reactor Operations Manager and the Chief Reactor Operator as required. The results of the experiments were documented on the appropriate Request for Reactor Run Sheets. The inspector verified that the experiments that had been performed had received approval by the reactor operations staff and that the individuals requesting the reactor operations were authorized to do so. It was noted that engineering controls were used to limit exposure to radiation.

c. Conclusions

The licensee's program for the control of experiments satisfied regulatory requirements and licensee commitments.

8. Emergency Preparedness (IP 69001)

a. Changes to the Emergency Plan

(1) Inspection Scope

To determine compliance with the requirements of 10 CFR 50.54(q) and the licensee's Emergency Plan, the inspector reviewed:

- PULSTAR Emergency Plan and Procedures
- recent plan and procedure revisions and updates
- applicable letters and documents concerning the Emergency Plan

(2) Observations and Findings

10 CFR 50.54(q) states that, if a change is made (to the Emergency Plan) without approval, the licensee shall submit, as specified in 10 CFR 50.4, a report of each change within 30 days after the change is made.

The licensee submitted Revision Number 6 to their Emergency Plan (Plan) to the NRC by a letter dated August 17, 2000. However, the licensee had placed the revised Plan into effect on June 1, 2000, because it had been concluded that the changes made in the revision did not decrease the effectiveness of the Plan and thus did not require the approval of the NRC. Although the NRC reviewed the

changes and found they did not decrease the effectiveness of the Plan, the inspector confirmed that the revision had not been sent to the NRC within 30 days after the changes were made as required by the regulations.

The licensee was informed that failure to submit changes to their Plan to the NRC within 30 days of the effective date of the Plan was an apparent violation of 10 CFR 50.54(q) (VIO 50-297/2001-201-01).

(3) Conclusions

One apparent violation of 10 CFR 50.54(q) was noted for failure to submit changes to the Plan to the NRC within 30 days of the effective date.

b. Emergency Plan Implementing Procedures

(1) Inspection Scope

In order to verify the adequacy of the licensee's Emergency Procedures, the inspector reviewed:

- the Plan and Procedures
- RSC and RSAC meeting minutes
- recent revisions and updates of the procedures

(2) Observations and Findings

TSs Section 6.2.3, dated April 30, 1997, requires that all new procedures and major revisions thereto having safety significance, including procedures implementing the Plan, be reviewed by the RSC or the RSAC as appropriate.

The inspector reviewed the Emergency Procedures. It was noted that, from April 30, 1997, through February 23, 2001, one of the licensee's procedures, Emergency Procedure 8, "Revisions," Revision 3, dated October 15, 1995, specified that changes to the Emergency Procedures were to be coordinated by the Reactor Health Physicist and reviewed by the facility Associate Director. There was no requirement that stipulated a review was to be performed by the RSC or by the RSAC. Consequently, revisions were made to various Emergency Procedures without the required review by either safety committee before the procedures were implemented. Changes were made and implemented through revisions issued on December 15 and 17, 1997, on January 1, 1999, on June 1, 2000, and on January 12, 2001.

The licensee was informed that failure to have revisions to the Emergency Procedures reviewed by the RSC or the RSAC as required was an apparent violation of TS 6.2.3 (VIO 50-297/2001-201-02).

(3) Conclusions

One apparent violation was identified for failure to have revisions to the Emergency Procedures reviewed by the RSC or the RSAC as required.

c. Program Implementation

(1) Inspection Scope

To determine the adequacy of the licensee's implementation of the Emergency Preparedness Program, the inspector reviewed:

- emergency response facilities
- equipment and instrumentation staged for emergency response
- emergency response personnel training

(2) Observations and Findings

The inspector and a licensee representative conducted an inventory of the equipment and supplies that were required to be located in the Emergency Lockers in the Burlington Engineering Laboratory building. The facilities and equipment set aside for emergency response were being maintained as required in the Plan.

Through drill critique reviews and interviews with licensee personnel, emergency responders were determined to be knowledgeable of the proper actions to take in case of an emergency.

(3) Conclusions

The emergency response facilities and equipment were being maintained as required. First responders were knowledgeable of proper actions to take in case of an emergency.

d. Offsite Support

(1) Inspection Scope

To verify the adequacy of the offsite support that would be provided to the licensee in case of an emergency, the inspector reviewed:

- the Plan and Implementing Procedures
- Letters of Agreement
- communications capabilities

(2) Observations and Findings

Updated Letters of Agreement were on file indicating that various state and local agencies were available to respond to the facility in case of an emergency. An

agreement also had been established with Rex Healthcare (Hospital) in case a contaminated, injured person required medical treatment.

Communications capabilities with these and other agencies were acceptable and had been tested on a periodic basis.

(3) Conclusions

The licensee maintained current Letters of Agreement with offsite agencies that indicated that support would be available in case of an emergency.

e. Emergency Preparedness Exercises and Drills

(1) Inspection Scope

To determine that the licensee was conducting drills as specified in the Plan, the inspector reviewed:

- recent drill scenarios
- critiques of drill performance
- other associated documentation of recent drills

(2) Observations and Findings

The inspector noted that drills had been conducted annually as required by the Plan. Critiques were held following the drills to discuss the positive and negative aspects of the exercise, to develop recommendations of ways to improve personnel performance, and to suggest possible solutions to problems identified. Corrective actions were taken to resolve problems noted when deemed appropriate by the licensee.

(3) Conclusions

Annual drills were held as required, critiques were used to identify strengths and weaknesses, and corrective actions were taken to resolve problems identified.

f. Emergency Preparedness Training

(1) Inspection Scope

In order to verify the adequacy of the licensee's emergency training, the inspector reviewed:

- the Plan and Procedures
- training requirements specified for staff and off-site personnel
- training records

(2) Observations and Findings

Emergency Preparedness and Response training was being completed and documented as required for licensee and off-site personnel. Training is given annually and letters are sent to the various off-site agencies informing them of the training and the times the classes are offered. Through a review of the training outlines provided for the various classes, the inspector determined that the training was acceptable.

(3) Conclusions

Emergency preparedness training was being conducted and documented for staff and off-site personnel.

9. Exit Interview

The inspection scope and results were summarized on March 1, 2001, with licensee representatives. The inspector discussed the findings for each area reviewed. The licensee acknowledged the findings and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

S. Bilyj, Reactor Operations Manager
L. Broussard, Chief Reactor Operator
K. Kincaid, Chief of Reactor Maintenance
P. Turinsky, Nuclear Engineering Department Head
K. Verghese, Interim Director, Nuclear Reactor Program
G. Wicks, Reactor Health Physicist and Acting Associate Director, Nuclear Reactor Program

Other Personnel

R. Benson, Chair, Reactor Safety and Advisory Committee
D. Howell, Acting Radiation Safety Officer, North Carolina State University (NCSU)
J. Riviere, Chair, Radiation Safety Committee, NCSU

INSPECTION PROCEDURE USED

IP 69001 Class II Non-Power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

| | | |
|--------------------|-----|---|
| 50-297/2001-201-01 | VIO | Failure to submit changes of the Emergency Plan to the NRC within 30 days of the effective date as required by 10 CFR 50.54(q). |
| 50-297/2001-201-02 | VIO | Failure to have revisions to the Emergency Procedures reviewed by the RSC or the RSAC as required by TS 6.2.3. |

Closed

None

LIST OF ACRONYMS USED

| | |
|------|--------------------------------------|
| CFR | Code of Federal Regulations |
| IP | Inspection Procedure |
| LCO | Limiting Conditions for Operation |
| MW | Megawatt |
| NCSU | North Carolina State University |
| NPR | Non-Power Reactor |
| NRP | Nuclear Reactor Program |
| NRC | Nuclear Regulatory Commission |
| Plan | Emergency Plan |
| PS | PULSTAR Surveillance (Procedure) |
| RO | Reactor operator |
| RSAC | Reactor Safety and Audit Committee |
| RSC | Radiation Safety Committee |
| SAR | Safety Analysis Report |
| SP | Special Procedure |
| SRO | Senior reactor operator |
| TS | Technical Specifications |
| TRTR | Test, Research, and Training Reactor |
| VIO | Violation |