



# North Carolina State University

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19 February 1996

U.S. Nuclear Regulatory Commission  
Region II

Attn: Mr. Craig Bassett  
Senior Inspector, Fuels Facility Branch  
Division of Nuclear Materials Safety

101 Marietta Street, N.W.  
Suite 2900  
Atlanta, GA 30323-0199

Subject: 1995 PULSTAR Research Reactor Emergency Drill Critique

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

Dear Mr. Bassett:

The PULSTAR reactor facility performed an announced emergency drill on 21 December 1995 between 0800 and 1100 hours. Off-site support organizations participated at this drill. Overall, the drill was considered successful in that it provided a comprehensive test of the PULSTAR Emergency Plan and Procedures.

A critique was held immediately following the drill. A summary of the critique comments is attached for your information. If you have any questions or comments, please call me at (919) 515-4602 or Gerald Wicks, CHP at (919) 515-4601.

Sincerely,

Pedro B. Perez  
Associate Director,  
Nuclear Reactor Program

cc: C. Mayo, Ph.D., NCSU, Chairman, RSAC  
G. Wicks, CHP, NCSU

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## 1995 PULSTAR DRILL CRITIQUE

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An announced drill was held on 21 Dec 95. Only the time and date were announced in advance. Knowledge of the drill scenario was limited to G. Wicks, C. Mayo, and D. Rainer of NCSU.

Participating organizations included:

Nuclear Reactor Program  
NCSU Environmental Health & Safety  
NCSU Public Safety  
Wake County Major Response and Logistics Division  
State of NC Division of Radiation Protection  
Raleigh Fire Department

Drill controllers included:

C. Mayo, Ph.D., NCSU, Director of Nuclear Reactor Program and Chair of Reactor Safety and Audit Committee  
S. Pressley, NCSU, Nuclear Engineering (student)  
S. Vojta, NCSU, Nuclear Engineering (student)  
C. Illan, NCSU, Nuclear Engineering (student)

Drill observers included:

D. Rainer, NCSU, Director of Environmental Health & Safety  
J. James, State of NC, Division of Radiation Protection  
D. Bass, Wake County Major Response and Logistics  
N. Cheek, Wake County Major Response and Logistics  
J. Knopp, Ph.D., NCSU, Chair of Radiation Protection Committee

Drill Events:

The written scenario was followed for events related to the PULSTAR reactor. However, an unrelated hazardous materials event which was included in the written scenario was cancelled during the PULSTAR drill by NCSU personnel (D. Rainer and G. Wicks). The PULSTAR drill response included a hazardous materials response by NCSU and the City of Raleigh Fire Department.

Drill actions and simulations included: (see the attached Drill Log)

- Assessment and corrective actions
- Classification and Notification
- Evacuation and Re-entry
- Termination and Recovery

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### DRILL LOG:

NOTE: Most drill actions were performed or simulated. Availability of equipment and supplies were checked before simulating actions.

- 8:22 Reactor at 950 kW.
- 8:30 Shaking and vibration of BEL occurs.  
Reactor operator commenced shutdown by gang insert of control rods.
- 8:35 Occupants in reactor bay leave and call Control Room.  
Personnel are safe and not contaminated and report experiencing building vibrations.
- 8:40 Reactor shutdown verified and reactor key off.  
NRP personnel arrive in Control Room.
- 8:45 Primary pool level decreasing.  
Primary pump was shut off.  
NCSU Public Safety was called and shaking and vibrations in other areas on campus were reported. NRP staff determines that emergency action levels have been met and begin call out of the PEO. NCSU Public Safety and Radiation Protection were informed of the need for emergency response.
- 8:55 Primary valves P-1 and P-5 were closed using remote, manual controllers.  
NRP staff searches for leak location in reactor bay.
- 9:00 Leaks found in pipe trenches at valves P-17 and P-18.
- 9:05 Radiation Protection Officer arrives at Control Room. NRP activates PEO, declares "Unusual Event" and begins off-site notifications.
- 9:10 BEL evacuated by pulling of fire alarm.
- 9:15 NCSU Public Safety arrives and sets up ICS.  
Raleigh Fire Dept. and Wake County arrive outside of BEL.
- 9:20 BEL is re-entered by PEO team. Radiation monitor data was obtained by remote readout from room 2123 (outside Control Room).
- 9:30 Radiation survey indicates no airborne or contaminated areas inside of reactor bay.  
High radiation alarm at Over-the-Pool occurs. Emergency classified as "Alert". Off-site notifications are made.
- 9:45 Control Room and reactor bay entries were made. Fire hose was positioned over pool wall and pool fill begins. However, fill rate and leak rate were the same so no change in pool level was observed. Request for second fire hose was made by PEO.

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### DRILL LOG:

- 10:00 Control Room radiation monitor reaches high alarm. PEO evacuates Control Room and moves to NRP offices on second floor.
- 10:15 RHP surveys reactor bay. No airborne contamination or removable contamination was detected.
- 10:30 Control Room and reactor bay are re-entered.  
Repairs are made to P-17 and P-18 leaks.  
Second fire hose put in position and pool fill begins.  
Radiation surveys were performed.
- 10:45 Radiation levels decrease.  
Pool level was checked by observation using a mirror.
- 10:55 Pool fill complete and fire hoses were shut off.  
Radiation levels near normal.  
Recovery actions and organization were briefly discussed.  
Drill terminated and off-site notifications were made.

### Definitions:

NRP is Nuclear Reactor Program  
PEO is PULSTAR Emergency Organization  
ICS is Incident Command System  
BEL is Burlington Engineering Laboratory

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COMMENTS:

COMMENT	RESPONSE
ICS and PEO organizations operated well. Support organizations operated well.	None
Technical Advisor was needed at the second ICS command post.	This should be provided by the ICS. Members of the NCSU Radiation Protection Division are familiar with the facility. PEO staff are few and dedicated to the emergency response in the reactor building.
Emergency Plan needs building diagrams.	Building diagrams are available in the PULSTAR FSAR and will be placed in the BEL lock box.
Fire alarm was sounded prematurely. Building searches after fire alarm was sounded and after abnormal radiation levels were detected were not performed.	Fire alarm was sounded as directed by NCSU Public Safety for logistical reasons rather than for public safety. If necessary, building searches are to be coordinated by the ICS. In this drill, the Raleigh Fire Department and PEO were available to perform this search.
Telephone number for public inquiries is needed.	Public information is addressed by the ICS. Inquiries are to be directed as specified by the ICS Public Information Officer or NCSU News Services.
Scenario time-line may not have been realistic for the postulated event.	The general sequence of events was realistic, but on a compressed time-line to avoid delays.
Scenario needed visual aids and better data tables.	Comment noted. To be considered in development of future drills.
Some items in emergency lockers are old and should be checked and updated.	Emergency lockers are inventoried quarterly for content and functional status of materials. RHP will re-verify inventory status. Materials used in the drill were functional.
Emergency materials for pipe repairs and equipment for pool fill should be kept readily available for this type of credible event.	Most piping sections can be isolated to permit repairs. Other potential leaks are variable and materials required would depend on the leak. Most materials are available in the reactor bay or at other locations within the BEL. Staging of emergency pool fill equipment will be considered by the NRP.
Communications within the PEO and ICS need to be more consistent.	Individuals will be reminded of this in emergency plan training.
Common radio channel is needed for NCSU personnel.	NRP to determine feasibility of using a common radio frequency with Public Safety and EHSC.

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### CONCLUSIONS:

- Drill objectives were met.
  1. PEO and NCSU ICS were staffed within an hour.
  2. PEO assessment and corrective actions were timely and appropriate.
  3. PEO correctly classified the emergency initially and later on escalated the emergency classification as required by the PULSTAR Emergency Plan.
  4. PEO made off-site notifications within 30 minutes of emergency classification and termination.
  5. PEO obtained assistance from NCSU Public Safety, NCSU Environmental Health & Safety, Raleigh Fire Department, and Wake County, as needed, using the ICS.
  6. PEO terminated the emergency upon resolution of the postulated event. Recovery actions and the need for a recovery organization as required by the PULSTAR Emergency Plan and Emergency Procedures were discussed in general prior to termination.
  
- Although the drill deviated slightly from the written scenario, these deviations were not significant in that the drill provided a successful and comprehensive test of the PULSTAR Emergency Plan.

### COMMITMENTS:

1. RHP to re-verify emergency locker inventory status.
2. RHP to discuss proper communication in training.
3. RHP to consider use of more visual aids for future drills.
4. RHP to provide building diagrams for the BEL lock box to NCSU Public Safety.
5. Associate Director to consider staging of emergency pool fill equipment.
6. Associate Director to determine feasibility of using a common radio frequency with Public Safety and EHSC.