



UNIVERSITY OF VIRGINIA  
SCHOOL OF ENGINEERING AND APPLIED SCIENCE  
CHARLOTTESVILLE, 22901

DEPARTMENT OF NUCLEAR ENGINEERING AND ENGINEERING PHYSICS  
REACTOR FACILITY

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TELEPHONE: 804-924-7136

November 3, 1983

Director, Office of Inspection and  
Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Subject: Response to Notice of Violation and Proposed Imposition of  
Civil Penalty EA 83-90  
Reference: Inspection Report No. 5G-062-02

Dear Sir:

Attached is the University of Virginia Reactor (License No. R-66)  
Facility's response to the Notice of Violation and Proposed Imposition  
of Civil Penalty (EA 83-90) as required by that notice. Also attached is  
a check (Check No. 105680) for \$1000.00 to pay the imposed civil penalty.

Although we have decided not protest the civil penalty, we would  
like to note that we do not agree with all of the violations stated in  
the Notice (EA 83-90) and to emphasize our belief that, in this particular  
situation, the imposition of a civil penalty was excessive and not  
required to obtain management's attention and action. We would like to  
suggest that the NRC review the policy of imposing civil penalties on  
University licensees, to determine if such penalties serve the purpose  
of enhancing reactor safety.

Sincerely,

Sworn to and subscribed before me this 3rd  
day of November, 19 83  
Witnessed by Delores E. Van Notary Public  
My Commission Expires October 14, 1985

T. G. Williamson  
T. G. Williamson, Chairman  
Dept. of Nuclear Engineering  
and Engineering Physics

J. S. Brenizer  
J. S. Brenizer, Director  
Nuclear Reactor Facility

cc: J. P. O'Reilly, Regional Administrator ✓  
NRC, Region II  
Reactor Safety Committee

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Response to Notice of Violation and Proposed Imposition  
of Civil Penalty

Docket No. 50-062  
License No. R-66  
EA 83-90

I. Response to particular violations

A. Technical Specification 3.1(1) requires that reactor not be operated above 1kw unless the minimum shutdown margin is greater than 0.4% delta k/k.

Contrary to the above, the reactor was operated at a power greater than 1kw during the period May 25-30, 1983 without the required shutdown margin.

Response:

- 1) We admit that the reactor was operated at a power greater than 1kw during the period May 25-30, 1983 without the required shutdown margin.
- 2) The violation occurred because the reactivity worth of a fuel element had not been measured properly after its insertion into the core, control rod worths were not required to be measured at specific intervals and a core configuration change was not quantitatively defined.
- 3) New procedures have been implemented which require proper measurement of the shutdown margin when changes are made in the core. The revised procedures specifically define a core configuration change.
- 4) The revised procedures have been implemented and have been incorporated in the training and requalification program. All senior operators were actively involved in the development of the new procedures. New reactor operator trainees this summer were trained specifically on the importance of reactivity control.
- 5) Full compliance was achieved by implementation of procedures concerning reactivity measurements (Section 5 SOP) and incorporation of procedural changes into the operator requalification program. These changes were implemented by July 5, 1983.

B. Technical Specification 4.1(2) requires that shim rod reactivity worths be measured whenever the rods are installed in a new core configuration. SOP 5.7 requires rod worth measurements be performed following core configuration changes.

Contrary to the above, a new core configuration existed resulting from core alterations made on May 20, but the required shim rod reactivity worth measurements were not made.

Response:

- 1) We admit that shim rod reactivity worth measurements were not made

after core alterations on May 20.

2) The reasons rod reactivity worth measurements were not made was because, in our interpretation of the procedures in effect at that time, the core alterations on May 20 did not constitute a new core configuration.

3) We recognize the deficiency in the previous procedures which did not require that shim rod reactivity worth measurements be made at defined intervals. A core configuration change is now specifically and quantitatively defined in the procedures and rod calibrations are performed when the core configuration is changed. In addition, the procedures now specify a time period for control rod recalibration based on the number of MW-days of operation.

4) The revised procedures now define a core configuration change and require rod calibrations when such change occurs.

5) Full compliance was achieved by July 5, 1983 by implementation of procedures concerning reactivity measurements (Section 5 SOP) and incorporation of procedural changes into the operator training and requalification program.

C. Technical Specification 6.3 requires that written approved procedures shall be in effect and followed for start-up, operation, and shutdown of the reactor and for the handling of fuel and experiments.

Contrary to the above, the licensee did not have written approved procedures for determining reactor shutdown margin by accounting for changes in shutdown margin as a function of fuel manipulation, experiment manipulation, burnup, xenon concentration, or for calculating an estimated critical position.

Response:

1) We admit that we did not have written approved procedures specifically for determining reactor shutdown margin and for calculating estimated critical position. We deny that this is a violation of Technical Specification 6.3 because we had in place written approved procedures for start-up, operation, and shutdown of the reactor and for handling of the fuel and experiments. These procedures did require the determination of both the shutdown margin and the estimated critical position. We believe the difference is a matter of interpretation by the inspectors as to the detail which must be covered by procedures. We believe that a perceived inadequacy of the procedures to cover in detail each particular operation is a judgement that should be the subject of discussion between the inspectors and the facility staff and is a matter which should be resolved without escalation to the category of a violation.

2) We deny that we violated our technical specification.

3) In spite of the fact that we believe we did not violate Technical Specification 6.3, the startup, operation, and shutdown procedures have been revised to include suggestions made by the inspectors. Specifically, the procedures now specify the method of determining and documenting the shutdown margin determination.

4) The revised procedures have been implemented and have been incorporated in the training and requalification program.

5) Revised procedures concerning startup, operation and shutdown of the reactor were incorporated by July 5, 1983.

## II. Response to other items covered in the notice of violation.

A. We protest the statement "Further mitigation based upon corrective actions to prevent recurrence is not warranted because your long term actions were not aggressively pursued". The principal corrective actions to prevent recurrence was the revision of those section of the Standard Operating Procedures (SOP) relating to reactivity control, specifically section 5. This section was rewritten, reviewed by the safety committee, and in place by July 5, 1983. We also agreed to review and revise the entire SOP. During the enforcement conference held at our facility on July 14, 1983, we agreed to have this completed by the end of 1983. We believe that completion by that date constitutes an aggressive schedule in light of the magnitude of the job and the limits of staff time. We also note that the schedule agreed to by the NRC (Report No. 50-062/83-03) includes a completion date of revision of the SOP of December 31, 1983. The only difference between agreed upon schedule and the one we suggested at the enforcement conference is the details of completion dates for individual sections. We do not agree that this detailed schedule constitutes an act of aggressiveness which was lacking in our proposed schedule.

We also stated at the enforcement conference that we would rewrite the Safety Analysis Report (SAR) by July 1984. After discussion with the NRC staff it was agreed that a complete rewrite and resubmission of the SAR was not necessary. We did agree to the creation of an SAR like document with information in SAR Chapter 9 updated to include existing curved plate fuel analysis by October 31, 1983. We believe this to be an aggressive schedule.

B. We agree that the violation can be classified as Severity III by Section 4 "changes in reactor parameters which cause unanticipated reductions in margins of safety". We do not agree that our situation warrants a civil penalty. The basis for our contention is that at no time was the public health and safety compromised by this incident. At no time was there any possibility of the reactor being supercritical as we were always able to insert all rods to shutdown the reactor. Our procedures, which were in place at the time, require that the operator note that the rods and their followers be fully



inserted upon shutdown. At no time during the duration of the violation was the reactor shutdown without assurance that all rods were inserted. Further, we know of no evidence of solid blade type control rods, such as are in the UVAR, sticking in a research reactor core which has been in operation. Because the reactor was under control at all times and there was no realistic opportunity for an inadvertent supercriticality we believe that the imposition of a civil penalty magnifies the violation beyond its true significance.

III. Response to Items Noted in Letter from J. P. O'Reilly to J. S. Brenizer  
October 6, 1983; Subject: Proposed Imposition of Civil Penalty EA 83-90.

A. "We request that you include in your response corrective measures that you may take relating to the planning process and the conduct of independent audits following completion of work related to nuclear safety."

Response:

The reactor safety committee is an independent group which is charged with conducting periodic audits and is involved in the planning process. We will request the reactor safety committee to consider further measures in this area. We also are examining our staff organization to determine if planning and management efficiency can be improved.

B. "We believe it would be constructive for you to consider the desirability of conducting a "lessons learned" program for senior operators involved with the planning of core and experimental configurations."

Response:

Since we have only six senior operators and all have been involved in the rewriting of procedures during the past several months, and all were involved in the evaluation of the violations, all are familiar with the "lessons learned" from this incident. We have already included a "lessons learned" session in the training program for new reactor operators and have held two requalification lectures with all reactor operators and senior reactor operators. We will consider "lessons learned" programs in the future.

IV. Response to Inspection Report No. 50-062/83-02

A. In the first paragraph of section 8, Corrective Action, the inspection report refers to minimum permissible critical rod position and predicted critical position and states that the licensee agreed to have a xenon worth curve developed and in use by August 11, 1983.

Response:

We do not believe that we agreed to have a xenon worth curve developed

and in use by August 11, 1983 and have no record of such agreement. Specifically, the revised procedures which were reviewed by the inspectors during the July 6-8, 1983 inspection, do not use the conception, or wording, of predicted (estimated) critical position. Without the requirement of a predicted critical position, a xenon worth curve is not required for startup. In the revised procedures two reactor startup conditions are included. If the reactor is to be started from a shutdown condition with a constant source count rate, the procedures now require determining minimum permissible critical rod positions by adding the minimum shutdown margin ( $0.4\% \Delta k/k$ ) to the total worth of the highest worth rod and determining from the current rod worth curves the rod positions needed to remove this amount of reactivity from the shutdown xenon-free core. Note that if the core is not xenon-free these positions become more conservative. The minimum critical rod position is used as a reference point to check for subcritical multiplication and instrument response, and to preclude operating at powers greater than 1 kw with a core which has an unacceptable shutdown margin. The second condition is to start up the reactor from a shutdown condition with a decreasing source count rate. In this case, the positions of the shim rods at the time the reactor was last shutdown are used as the reference point for determining the presence of subcritical multiplication. The condition of a decreasing source count rate after shutdown persists for only about 1 hour after extended 2 MW operation while the xenon reactivity worth does not peak until approximately 7.5 hours after shutdown from extended 2 MW operation.

We have generated a xenon worth curve to determine the time after shutdown to the xenon free core, by August 11, 1983, however it was generated by solving the xenon equations for our reactor and had not been verified experimentally. The curves were experimentally measured on 10-10-83. Work is currently underway to develop a computer program to generate xenon worth curves for each new core configuration.

We are particularly disturbed to see the phases predicted critical position and estimated critical position in the report because we spent considerable time discussing this with the inspectors during both the June 2-3 and the July 6-8 meetings and were under the impression that our use of the concept of a minimum permissible control rod position, rather than a predicted critical position, was agreed by all and that a xenon worth curve would not be required for startup.

B. On page 5 is included a schedule of corrective actions.

Response:

The schedule of revisions of the SOP, page 5, differs slightly from ours but we believe both meet the intent of having all revised procedures in place by December 31, 1983. Note, however, that the reactor safety committee is an independent body and thus, we have agreed only to have the reactor safety committee review the procedures by the proposed date. It is possible that the committee could request additional changes and rewriting before granting their final approval.