

October 25, 1994

U. S. Nuclear Regulatory Commission  
ATTENTION: Document Control Desk  
Washington, D.C. 20555

Subject: Annual Report of Changes, Tests and Experiments Performed  
Under the Provisions of 10 CFR 50.59 for the Oregon State  
University TRIGA Reactor (OSTR), License No. R-106, Docket No.  
50-243.

The following report is submitted in accordance with the requirements of 10 CFR 50.59(b) and 10 CFR 50.4, and covers the OSTR's annual reporting period of July 1, 1993 through June 30, 1994. The information in this report is compiled annually and is submitted to the USNRC in this specific 10 CFR 50.59(b) report, as well as in a special section of the OSTR annual report, which was submitted on October 24, 1994.

During the specified reporting period there were no changes to the reactor facility and seven changes to reactor procedures conducted pursuant to 10 CFR 50.59. In addition, there was one change to a reactor experiment performed under the provisions of 10 CFR 50.59 during the current reporting period.

The individual changes being reported are listed below by category and by title, and are described in more detail in Attachment A. Regarding this attachment, you will note that it includes a brief description of each change followed by a summary of the safety evaluation conducted for the described change. As required, none of the changes performed under the provisions of 10 CFR 50.59 necessitated a change in the OSTR Technical Specifications or involved an unreviewed safety question as defined in 10 CFR 50.59(a)(2).

1. Changes to the Reactor Facility:

There were no changes to the reactor facility during the reporting period.

Telephone

503-737-2341

Fax

503-737-0480

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9411030221 941025  
PDR ADDCK 05000243  
R PDR

JEH

2. 10 CFR 50.59 Changes to Reactor Procedures

- a. Revisions to the Radiation Center and OSTR Emergency Response Plan
- b. Revisions to the Radiation Center and OSTR Emergency Response Plan
- c. Revision to OSTROP 11.0 - Fuel Element Handling Procedures
- d. Minor Revision to OSTROP 18.0
- e. Revision to OSTROP 26, Procedures for the Connection of External Monitoring and Recording Devices
- f. Revision to OSTROP 16, Annual Surveillance and Maintenance Procedures
- g. Revision to OSTROP 6, Administrative and Personnel Procedures

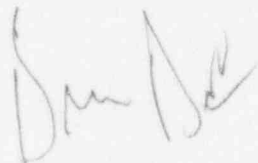
3. 10 CFR 50.59 Changes to Reactor Experiments

There was one change to a reactor experiment during this reporting period.

- a. Revision to Reactor Experiment B-12

We trust that you will find this year's report to be in good order. However, should you require more information or have questions regarding our report, please let me know.

Yours sincerely,



Brian Dodd  
Director, Radiation Center

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Enclosure

cc: Regional Administrator, Region IV, USNRC, Arlington, Texas  
Mr. Al Adams, OSTR Project Manager, USNRC, Washington, D.C.  
Mr. David Stewart-Smith, Oregon Department of Energy, Salem, Oregon  
S. E. Binney, Chairman, Reactor Operations Committee, OSTR  
J. F. Higginbotham, Reactor Administrator, OSTR  
D. S. Pratt, Senior Health Physicist, OSTR  
A. D. Hall, Reactor Supervisor, OSTR

## ATTACHMENT A

### Changes to the OSTR Facility, to Reactor Procedures, and to Reactor Experiments Performed Pursuant to 10 CFR 50.59

The information contained in this attachment provides a summary of the changes performed during the reporting period under the provisions of 10 CFR 50.59. For each item listed, we have included a brief description of the action taken and a summary of the applicable safety evaluation. Although it may not be specifically stated in each of the following safety evaluations, all actions taken under 10 CFR 50.59 were implemented only after it was established by the OSTR Reactor Operations Committee (ROC) that the proposed activity did not require a change in the facility's Technical Specifications and did not introduce or create an unreviewed safety question as defined in 10 CFR 50.59(a)(2).

1. 10 CFR 50.59 Changes to the Reactor Facility

There were no changes to the reactor facility during the reporting period.

2. 10 CFR 50.59 Changes to Reactor Procedures

There were seven changes to reactor procedures which were reviewed, approved, and performed under the provisions of 10 CFR 50.59 during the reporting period.

a. REVISIONS TO THE RADIATION CENTER AND OSTR EMERGENCY RESPONSE PLAN

(1) Description

As a result of the annual review of the Radiation Center and OSTR Emergency Response Plan, and also as a result of the annual emergency response drill, a number of changes were needed to the plan and its implementing procedures.

First, the closure of the Trojan Nuclear Power Plant necessitated the deletion of all references throughout the plan and procedures to Portland General Electric (PGE) and the potential use of the whole body radiation monitor at

Trojan. Second, a reorganization of the university's administrative structure required changes in the titles of certain positions, and a change in the organizational diagram. Third, the title given to the second person in the line of succession for the Emergency Director and the Public Information Officer needed to be changed from Senior Reactor Operator to Chairman of the Reactor Operations Committee because the Chairman decided not to renew his Senior Reactor Operator license.

Other revisions involved updates on the Area Radiation Monitors (ARMs), changes in the allowed emergency exposure limits, the addition of new decontamination facilities at the Good Samaritan Hospital, as well as corrections of typographical or minor grammatical errors.

(2) Safety Evaluation

The removal of PGE from the emergency response plan and implementing procedures was made because the Trojan facility was closed down and whole body counting is no longer available. Whole body monitoring services are available from several commercial companies. For this reason, the removal of the PGE assistance was not regarded as a reduction in the effectiveness of the plan.

The reorganization of the university's administrative structure was the subject of a request to change the OSTR Technical Specifications submitted to the USNRC on July 7, 1993. The emergency plan changes ensure conformity to the proposed changes in the Technical Specifications.

The change in the title of the person second in the line of succession for the Emergency Director and Public Information Officer does not have any negative safety implications, because while the title has changed, the person filling the position has not. The Senior Reactor Operator and the Chairman of the Reactor Operations Committee are one and the same. Furthermore,

anyone qualified to serve as Chairman of the Reactor Operations Committee is qualified to fill these positions in the Emergency Response Plan.

The changes to the ARMs have been addressed in the 10 CFR 50.59 Safety Analysis numbered 92-9 and, therefore, the conforming changes to the emergency plan need not be evaluated further here.

Revisions to EPA guidance on allowable emergency doses for various situations prompted the reduction of the lifesaving dose from 75 rem to 25 rem and the non-lifesaving dose from 25 rem to 10 rem. Clearly, these reductions follow federal guidance and result in a potential cancer risk decrease and an overall increase in safety.

Good Samaritan Hospital (GSH) has purchased a portable decontamination table and a portable shower. This provides more flexibility as to where injured, contaminated patients will be initially treated. The GSH Standard Operating Procedure relating to such emergencies has been revised and the changes to the OSTR Emergency Response Plan make allowance for use of these facilities. This change increases the effectiveness of the plan by providing flexibility to cope with a greater variety of situations.

Typographical and grammatical changes increase the plan effectiveness by making it more accurate and easy to read.

b. REVISIONS TO THE RADIATION CENTER AND OSTR EMERGENCY RESPONSE PLAN

(1) Description

A number of changes to the Emergency Response Plan were needed as a result of the revision of 10 CFR Part 20. The effective date for these revisions was January 1, 1994, when the OSU Radiation Center implemented the revised 10 CFR Part 20. During the review of the emergency plan, it was recognized that a number of other minor changes were also needed and,

therefore, these changes were made at the same time. All changes were made under the provisions of 10 CFR 50.54 (q) and do not reduce the emergency response effectiveness of the plan.

(2) Safety Evaluation

Deletion of the paragraph in **Section 3.1.4** relating to the Fire Department providing training for Radiation Center personnel reflects the fact that a formalization of this training in the emergency plan was no longer needed. Key Radiation Center personnel have been sufficiently trained so that they can provide instruction to other Center staff. The OSU Radiation Center maintains a close relationship with the Corvallis Fire Department with various informal training opportunities provided both by and for the Fire Department. Deletion of this paragraph does not reduce the effectiveness of Radiation Center staff response to fires.

Deletion of **Section 3.2.2 c)** was made to avoid confusion with respect to who authorizes emergency doses in excess of the occupational limits. In several other places in the plan it stated that the Emergency Director would authorize such doses with the concurrence of the Campus Radiation Safety Officer, if available. This is the correct wording, since there will always be a person fulfilling the duties of the Emergency Director, whereas the Campus RSO may not always be available.

Changes to **Sections 4.1, and 7.4.3, and Table 5.1** were made to delete reference to quarterly dose limits. With the revised Part 20 there are no quarterly limits. The new wording achieves the same result by using the phrase "any applicable occupational dose limit." This takes care of the total effective dose equivalent, shallow dose equivalent and eye dose equivalent limits, as well as allowing for other potential regulatory changes.

Changes to emergency action levels for Class I and Class II emergencies were made to make allowance for the fact that the revised Part 20 does not

deal with MPCs, but does use the concept of effective dose equivalent. There are two action levels in the existing plan which have MPC criteria as well as whole body dose equivalent criteria. It was redundant to have both the airborne concentration and whole body dose criteria since the internal and external hazard can now be combined by setting a total effective dose equivalent (TEDE) emergency action level. Since the whole body weighting factor is unity, the appropriate TEDE action levels are the same numerically as the previous whole body dose values of 15 mrem and 75 mrem for Class I and Class II emergencies, respectively.

A further change in the same emergency action levels involved replacing the words "at the site boundary" with "in the unrestricted area." Under most conditions involving a release of airborne radioactive material, the largest dose will not occur at the site boundary, but at some point further away. This is due to the closeness of the site boundary to the point of release. The revised action level statement is therefore more conservative than the old one.

Most references to in-vivo whole body counting at the Trojan nuclear power plant were deleted during a previously approved change to the emergency plan. However, one reference which was overlooked was deleted. The previous evaluation applies.

The changes from "MPC" to "DAC" in **Sections 7.1.2, 7.2.2, and 7.3.2** were appropriate because they occur in the context of stating that a certain value is a small fraction of the MPC (DAC). Clearly, changing from MPC to DAC does not change such statements at all.

The addition of the license or docket number on the information reported (**Sections 7.2.1 and 7.3.1**) makes it easier for the USNRC to find the relevant file when they are notified. This may help them provide a quicker response, and therefore, may have a positive implication on safety.



Deleting "Region V" from the phrase "Region V Regional Administrator" in **Section 10.3** does not have any safety implications, and it prepared the way for planned changes in the USNRC regional structure.

The representative emergency equipment inventories were updated.

c. REVISION TO OSTROP 11.0 - FUEL ELEMENT HANDLING PROCEDURES

(1) Description

OSTROP 11 was changed in order to add a new category of fuel handling which may be authorized by the Reactor Supervisor.

The pattern of use for the various reactor irradiation facilities has been changing. As part of this change, there has been a significantly greater demand for the sample-holding dummy fuel element (SHDFE) and the cadmium-lined, in-core, irradiation tube (CLICIT). Because each of these is placed in the B1 grid position when in use, the fuel element in this location has seen a great deal of handling in the last year or two. In fact, it was moved over 60 times in 1993. While this element did not show any observable signs of wear or damage, it seemed to be a good idea to distribute the wear and tear associated with being in grid position B1 among the other fuel elements. Since the requirement for fairly frequent movement of the B1 element is likely to continue for the foreseeable future, the Reactor Supervisor needed the flexibility to exchange the element in the B1 grid position with an element in another position without requiring ROC approval each time.

Therefore, item f. was added to OSTROP 11.A.1. as follows:

"f. The exchanging of the fuel element in core grid position B1 with an element elsewhere in the reactor core. If the difference in core excess as measured just before and just after exchanging the two elements is greater than 8 cents then the control rods will be recalibrated."



(2) Safety Evaluation

Occasional replacement of the fuel element in core grid position B1 with another element from the core reduces the amount of handling that any one element will have to undergo. This in turn reduces the wear and tear on fuel element cladding and helps to ensure long term cladding integrity. Therefore, this procedural change enhances safety.

The maximum reactivity change resulting from the exchange of any two fuel elements in the reactor core depends on the difference in the individual element's worth due to burnup differentials. Since the reactivity change with burnup is small and varies slowly with time, it is estimated that replacing the B1 element with any other element in the core will give a maximum reactivity change of only a few cents. Measuring the core excess before and after the fuel element exchange provides an assessment of this reactivity change.

The requirement to recalibrate the control rods if the difference in the core excess is significant ensures that Technical Specification 4.3.1.a is met. The value of 8 cents was chosen as being significant because the repeatability of any one control rod worth measurement is one or two cents and there are four control rods. Therefore, it is possible to have up to about an 8 cent difference in measured core excess with no physical core changes.

d. MINOR REVISION TO OSTROP 18.0

(1) Description

OSTROP 18.0 in section B.18.4.b. provides a list of personnel who must be present in the reactor facility at the start up of a new experiment. The purpose of the revision was to clarify the meaning of the words "in the reactor facility." Therefore, the sentence in this section was changed to read:

"b. At the start of a new experiment, the following personnel must be present in the reactor control room or near the experiment."

(2) Safety Evaluation

The change clarified the intent of the previous wording by making it more precise. This in turn reduced the potential for misunderstanding and thereby increased safety. The intent of the sentence which was revised is to ensure that a person responsible for the new experiment, and knowledgeable about it, is readily available to the reactor operations staff and the health physics staff should there be a need for a decision about the new experiment. The revised wording provides this assurance.

e. REVISION TO OSTROP 26, PROCEDURES FOR THE CONNECTION OF EXTERNAL MONITORING AND RECORDING DEVICES

(1) Description

The purchase of a new analog to digital converter board for the Computer-based Data Acquisition System (CDAS) and its associated software necessitated changes to the text of OSTROP 26. These changes were minor in nature and involved running a commercial software package called "daqware" on the computer rather than the program "V" required previously. In addition, there were minor editorial changes in OSTROP 26, and a new appendix was added which provides details on running daqware. The new software is much more user-friendly and useful for class applications. There were no changes in the manner in which the computer, converter board and console are attached, and no changes in how the computer receives data from the console.

(2) Safety Evaluation

Since the changes described above did not alter the manner in which the console and the computer were electrically connected, there were no negative safety implications associated with this procedural change.

f. REVISION TO OSTROP 16, ANNUAL SURVEILLANCE AND MAINTENANCE PROCEDURES

(1) Description

OSTROP 16.20 requires the inspection of selected fuel elements on an annual basis to determine if they are still within specifications. Because of its location in the B ring of the reactor grid, one of these elements turns out to be the instrumented fuel element. The reactor operations staff wanted to remove this element from the list of those requiring annual inspection because of the wear and tear on this element caused by its removal and insertion into the grid. To be more specific, the location of this element in grid position B4, means that the long connecting tube with the thermocouple leads in it has to be bent in order to remove and insert the element. It was feared that the required bending of the tube could ultimately damage the weld at the top of the instrumented fuel element, which would clearly be undesirable and would not be offset by the benefits gained by annually removing this element from the core.

(2) Safety Evaluation

The fuel elements which are designated for annual measurement are those in the B ring and those around the transient rod. The purpose of the annual measurements is to provide assurance that there are no undesirable physical changes occurring in these more highly irradiated elements. History has shown that the fuel elements which may show changes first are those around the transient rod. Removing the instrumented element from the list of ten elements does not significantly reduce the probability of finding the start of any such changes because checking the specifications of the other nine elements provides a sufficient level of inspection. If deemed appropriate in the future, the instrumented element can always be checked with no procedural changes since the Reactor Supervisor already has the authority to remove a single fuel element, measure it and replace it in the same position.

Further, because it now appears that the potential for damage to the instrumented element may be greater if it is repeatedly moved rather than being left in the B-ring, not measuring the instrumented element will increase reactor safety.

g. REVISION TO OSTROP 6, ADMINISTRATIVE AND PERSONNEL PROCEDURES

(1) Description

The purpose of this revision of OSTROP 6 was to clarify the wording relating to ROC review and approval of new reactor operators. The second sentence of 6.4.C.2.j was changed from:

"Initial review and approval of new personnel must be accomplished before the individual begins any supervisory or operational tasks."

to:

"Initial review and approval of new personnel must be accomplished before an individual's initial license application is submitted to the USNRC."

(2) Safety Evaluation

The intent of this section was to have the ROC review and approve new reactor operator personnel prior to their becoming NRC licensed reactor operators. It is clear that the most appropriate time to do this for new personnel is prior to the submission of their initial license application, since the Director of the Radiation Center signs the application statement saying that the person has been properly trained and is needed as a licensed operator. Since the proposed change does not alter the intent of the approval statement, but rather clarifies it, there are no adverse reactor safety implications associated with this change.

3. 10 CFR 50.59 Changes to Reactor Experiments

There was one change to a reactor experiment during this reporting period.

a. REVISION TO REACTOR EXPERIMENT B-12

(1) Description

Reactor experiment B-12 was revised to restore the requirement for a one page written experiment description and the approval of proposed B-12 experiments by the Reactor Supervisor, the Senior Health Physicist and the Chairman of the ROC.

When reactor experiment B-12 was last revised to make it conform to the new format for all other reactor experiments, two significant aspects of the old B-12 were inadvertently omitted. Therefore, item (12) to B-12 was added to restore the requirement for a one page written experiment description and specific approvals as follows:

"(12) For any new use of reactor experiment B-12, a one page written experiment description will accompany the irradiation request to enable the impact of the experiment to be evaluated. The experiment description will include an outline of the goals of the experiment, a brief description of the materials and apparatus to be used, where the experiment equipment will be placed, a calculation of any radioactivity to be formed, and an estimate of the reactivity effect of the experiment. The approval of the Reactor Supervisor, the Senior Health Physicist, and the Chairman of the Reactor Operations Committee must be obtained before performing any new experiment for the first time."

(2) Safety Evaluation

As stated in the experiment description, reactor experiment B-12 was designed to be general in nature with the purpose of accommodating exploratory programs. The experiment allows for a few trial runs to confirm

that the OSTR can be used to achieve a certain objective. There are a number of constraints, detailed in B-12, which provide limits on the types of experiments that can be performed. Anything beyond these constraints requires specific approval of the full ROC.

Providing the additional information required on the one-page written description, and having it evaluated by senior, knowledgeable staff minimizes the possibility of any unforeseen or unsafe event. Therefore, because the experiment change imposes additional review and approval requirements to B-12, safety is likely to be increased.