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 section of the report 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 four changes to the reactor facility during the reporting period.

a. UPGRADE OF THE PERCENT POWER CHANNEL, PULSING CHANNEL AND THE FUEL ELEMENT TEMPERATURE TEST CIRCUIT

(1) Description

The U. S. Department of Energy University Research Reactor Instrumentation Grant program for 1993 provided the funds to perform an upgrade of certain electronics in the OSTR console. In particular, the existing percent power channel, the pulsing channel (nv circuit) and the fuel element (FE) temperature test circuits were upgraded.

Percent Power and Pulsing Channels

The percent power channel and the pulsing channel (nv circuit) were replaced by a power range monitor (PRM), which is a modern equivalent of the two channels it replaces. The new PRM equipment was manufactured by Gamma-Metrics.

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High Voltage Power Supply

The high voltage power supply for the uncompensated ion chamber (UIC) was replaced by a modern equivalent power supply in the new PRM.

Computer Data Acquisition System (CDAS)

The computer data acquisition system (CDAS) was modified to bypass the existing amplifier and use the 10 volt full scale output available from the power range monitor.

Fuel Element Temperature Test Circuit

The fuel element temperature test circuit was modified to eliminate the use of a D-cell battery and a voltage divider to provide a test input signal to the digital thermometer. In lieu of the existing circuit, a more reliable 6.8 VDC regulated voltage from the bulk temperature thermometer was used to provide a step ramp input for the fuel element temperature thermometer.

(2) Safety Evaluation

A safety evaluation of the upgrade of the console electronics consisted of a detailed review which determined that the changes did not constitute an unreviewed safety question or require changes in the OSTR Technical Specifications.

Percent Power and Pulsing Channels

The changes to the percent power and pulsing channels contribute to increased reliability and service life of the system by replacing old components with new ones. These changes enhance the ability of the systems to perform their intended safety functions and decrease the probability of equipment malfunction. Should failure occur in any component in the new PRM, the result is the prevention of reactor

operation or a scram if the reactor is already operating. In addition, the margin of safety is actually increased with the modification because under the old design, reactor power was not monitored for the time between when the reactor is switched from steady state operation to pulse operation and the reactivity insertion is made. In the new configuration, the percent power channel is active during this interval because it is no longer switched out of the circuit. Another advantage the new PRM brings is the ability to test the pulsing channel as a part of the normal startup checks. This is a further enhancement to the margin of safety. Thus, the changes to the percent power and pulsing channels do not constitute an unreviewed safety question.

High Voltage Power Supply

The change to the high voltage power supply for the percent power channel contributed to increased reliability and service life for the components of the system thus decreasing the probability of equipment failure. The new system enhances the safety function of the high voltage power supply system through the introduction of a limit on the loading of the high voltage monitor signal to 60% of the unloaded signal compared to the previous 0%. This ensures compliance with the Technical Specification requirement for a high voltage scram at 25% of the nominal operating voltage. The change gives an increased margin of safety and does not introduce an unreviewed safety question.

Computer Data Acquisition System (CDAS)

The computer data acquisition system serves no safety function. It simply monitors the indicated reactor power signal. The minor modification of bypassing the existing CDAS amplifier does not prohibit the control systems of the console from performing their intended safety functions. OSTROP 6 requires a safety evaluation of the procedural changes to

OSTROP 26, entitled " Procedures for the Use of External Monitoring and Recording Devices." Bypassing the amplifier required that changes be made to this procedure but the procedural changes did not cause an increase in the possibility for the CDAS to interfere with the control functions within the console. Hence, these changes do not introduce an unreviewed safety question.

Fuel Element Temperature Test Circuit

The change to the fuel element temperature test circuit made the test circuit less likely to fail and easier to operate. Even if the new circuit should fail, the fuel element temperature monitoring system will not be prohibited from monitoring the proper reactor fuel temperature and it will thus continue performing its safety function. The change did not introduce an unreviewed safety question.

b. REPLACEMENT OF THE SELECTOR SWITCH FOR THE FUEL ELEMENT TEMPERATURE SAFETY CHANNEL

(1) Description

The purpose of the fuel element temperature safety channel is to monitor the temperature of the fuel and if it exceeds 510°C then initiate a reactor scram. Should this ever occur, the Technical Specifications require that an evaluation be conducted to determine whether the fuel element temperature safety limit of 1150°C for FLIP fuel or 1000°C for standard TRIGA fuel was exceeded.

A review of the current system revealed that a different switch design would allow the fuel element temperature safety channel to perform the above function under a wider range of possible conditions. With the new switch, if any channel other than one of those connected to an operating thermocouple (1, 2 or 3) is selected, then the rod withdrawal prohibit is

actuated thus preventing reactor operation. In the future should any one of the three thermocouples fail, a jumper in the new switch could be removed to ensure that the rod withdrawal prohibit is activated if that channel is selected. The new switch circuit also ensures a clear separation of the 115 VAC scram bus from the thermocouple circuit.

(2) Safety Evaluation

The new switch does not change the connection between the thermocouple and the scram system, so the fuel element temperature safety channel will continue to perform its intended function. The installation of the new switch improves the overall safety of the reactor by ensuring that the fuel temperature scram is operable whenever the reactor is not secured.

c. INSTALLATION OF A 10 MΩ RESISTOR IN THE PULSE MONITORING CIRCUIT OF THE POWER RANGE MONITOR

(1) Description

After installation of the new power range monitor system, the peak power display indicated a value of approximately 1.3% when the channel was in the low gain mode. When the mode switch was placed in the PULSE LOW position, the channel was put in the high gain mode and the display read zero. The source of this noise signal was the 115 VAC percent power and non-operation scram circuits.

Consultation with GAMMA-METRICS, the manufacturer of the power range monitor, revealed that the channel uses the dual bistable trip unit to switch the pulsing amplifier from a voltage follower (Gain = 1) in the PULSE HIGH mode to a non-inverting amplifier with a gain of four in the PULSE LOW mode. The result is an open line from the amplifier to the bistable on the backplane of the module. The open line acts as an antenna

picking up noise from the 115 VAC percent power and non-operation scram circuits.

GAMMA-METRICS agreed that a solution was to install a 10 MΩ resistor in the circuit to bleed off the noise pickup. The modification should have resulted in a 0.1% change in the pulse power and energy readings.

(2) Safety Evaluation

The installation of the 10 MΩ resistor did not effect the operability of the pulse monitoring channels except that a system measurement error which was introduced by the noise signal should have been eliminated. Since the channel served only a monitoring function, failure of the resistor would not result in an increased safety concern.

d. MODIFICATION OF THE PULSE MONITORING CIRCUIT OF THE POWER RANGE MONITOR

(1) Description

The installation of the 10MΩ resistor in the pulse monitoring circuit of the power range monitor, which was approved by the Reactor Operations Committee, failed to remove the approximately 1.3% baseline reading on the peak power display when the channel was in the low gain mode. Subsequent investigation revealed that the actual source of the erroneous reading was noise pickup from the 115 VAC percent power scram loop which is on one side of the dual bistable card and the energized reed relay of the dual bistable circuit on the other side of the card.

To correct the problem, an existing 3.32 KΩ resistor was moved to the amplifier side of the relay and the bistable logic was reversed so that the relay is energized in the PULSE LOW mode but is tied to common so that

noise is not developed. In PULSE HIGH mode, the relay is de-energized so the open line is not subjected to noise buildup.

To achieve the change in the bistable logic the following changes were made. The #2 bistable was changed to trip on a positive decreasing input. To ensure the X4 gain LED on the front panel is ON when the relay is energized, the circuit trace from R35 to CR3 was cut and a jumper installed from R35 to JP6 pin 3.

Before declaring the system operational again, checks of the power range monitor were performed to assure normal operation of all channels.

(2) Safety Evaluation

The modification did not effect the operability of the pulse monitoring channels except that a system measurement error introduced by the noise signal was eliminated. Since the channel serves only a monitoring function, possible failure of the redesigned circuit would not result in an increased safety concern.

2. 10 CFR 50.59 Changes to Reactor Procedures

There were four 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 REACTOR OPERATIONS COMMITTEE CHARTER

(1) Description

On an annual basis, a standing Reactor Operations Committee (ROC) subcommittee reviews the Committee's charter. The 1994 review indicated that several changes were needed to keep the charter current. These

changes only clarified activities already specified in the current charter. None of the changes involved major changes in ROC operating policies.

The changes to the ROC charter included several very minor editorial clarifications which were of no significance from a safety standpoint. All of the changes are listed in the safety evaluation. Additions are shown in italics, deletions are lined through.

(2) Safety Evaluation

The last sentence of Section II.5 of page 2 was changed to read: "Any such actions taken by an ROC subcommittee will be reviewed by the full ROC at the next regular*ly scheduled* meeting."

Section III.1.d, page 3 was changed to read: "An audit of operating procedures (OSTROPs). *The ROC reviews each OSTROP annually on a rotating basis, i.e., a certain fraction of the OSTROPs are reviewed each quarter."*

The second item d of Section III.1, page 3 was changed to read: "Radiation surveys (including routine surveys such as daily, weekly and monthly; special surveys; *radioactive material* receipt surveys; and environmental monitoring surveys)."

Section III.1.f of page 3 was changed to read: "The Radiation Center Health Physics Procedure *(RCHPPs)*. The ROC reviews the RCHPPs annually on a rotating basis, i.e., a certain fraction of the RCHPPs are reviewed each quarter. However, during the interim period, the Senior Health Physicist has the authority to review and revise RCHPPs as necessary without ROC approval."

Section III.1, page 3 was changed to allow for unique identification of specific sentences or paragraphs within this section. Hence the second group of letters from a through d were changed to f through I and the third group of letters from a through g were changed to j through p.

In Section III.2.a of page 4, the word "regularly" was inserted between next and scheduled.

Based on the nature and scope of the changes described above, it is evident that the changes were editorial. In cases where the changes added or deleted statements, the changes arose from the need to ensure that the current version of the charter is consistent with and responsive to the requirements of the OSTR license and technical specifications, and reflects the operating policies of the ROC. None of these changes have a negative safety impact and they should be beneficial to safety since they eliminate confusion or misunderstandings.

b. 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 a number of changes were made to the plan. The implementation of the new radiation protection regulations (10 CFR 20) necessitated the revision of the references to this document and the completion of the APEX facility added the need to address the new emergency conditions this facility imposes on the Radiation Center.

(2) Safety Evaluation

The implementation of the new 10 CFR 20 changed the paragraph numbers which identify the requirements for reporting of emergencies. These changes in no way decreased the effectiveness of the plan.

The completion of the APEX facility added another area at the Radiation Center which could require response in the event of an emergency. The changes made to the plan in recognition of this possibility did not decrease the effectiveness of the plan.

The other changes reflected the changing nature of the use in some areas of the Radiation Center, to accommodate changes in staff and to correct grammatical errors. All of these changes increased the plan's effectiveness by making it more accurate and easier to read. Special note is made that with the promotion of the reactor operator to the position of Reactor Supervisor, the OSU Campus Radiation Safety Officer replaced the reactor operator position in the line of succession to the Senior Health Physicist (page 3-8, section 3.3.2). Since the RSO is knowledgeable in radiation protection issues, participates in all appropriate Radiation Center training programs and is a very familiar with the facility, this change did not decrease the effectiveness of the plan.

The technical specifications require that a continuous air monitor which monitors for particulate radioactivity be operable in the reactor facility during operation. The particular instrument used to satisfy this requirement has the capability to monitor for both gaseous and particulate radioactivity. However, the backup instrument does not have gaseous monitoring capability. Thus the statement in the plan which is specific to the primary instrument was changed to require only particulate monitoring capability.

Due to the added redundancy in monitoring capability, this change increased the effectiveness of the plan.

The changes described above were reviewed and approved by the Reactor Operations Committee (ROC) prior to being implemented. ROC approval included a review of this evaluation and the Committee's conclusion that the changes did not require a change in the OSTR Technical Specifications and did not constitute an unreviewed safety question as defined in 10 CFR 50.59(a)(2). This evaluation also included a review of applicable radiation protection aspects and was found to be consistent with the Radiation Center's commitment to ALARA.

c. MINOR CHANGES TO OSTROP 18.0, PROCEDURES FOR THE APPROVAL AND USE OF REACTOR EXPERIMENTS

(1) Description

During a review of OSTROP 18.0, Procedures for the Approval and Use of Reactor Experiments, a number of minor items were identified as needing either updating or revising. The items are listed below.

In Section 18.1.e, page 18.1, the first line was changed to read "To become an approved Program Director, individuals must apply to the Radiation Safety Committee." The second sentence referring to obtaining the blank forms was deleted.

In Section 18.1.f, page 18.2, the first sentence was changed to finish with the wording "... must apply to the Radiation Safety Committee." The second sentence referring to obtaining blank forms was deleted. The last sentence was revised to read "The completed amendment request MUST be sent to the Senior Health Physicist ...". And the following sentence is

added to the end of the paragraph: "The Senior Health Physicist will retain copies of all amendment applications."

In Section 18.7.f, page 18.8a, a fourth category was added to the list of situations where a Radiation Safety Office approval number is not required. Hence change the wording of the NOTE to end with "... an approval number; 3) experimenters not part of OSU and not working under an OSU Radioisotope Use Authorization; and 4) reactor operation under experiment A1."

In Section 18.7.g, page 18.8a, the first sentence was changed to begin with the words "The licensed experimenter or in the absence of the licensed experimenter, the Radiation Center Senior Health Physicist, ..."

The page numbers of OSTROP 18.0 were revised to be sequential and this eliminated page 18.8a.

The irradiation request forms were replaced with copies of the current versions.

(2) Safety Evaluation

The deletion of the Radiation Safety Committee (RSC) Forms 102 and 105 do not diminish the ability of the Radiation Safety Office to collect the necessary information to perform an adequate safety analysis.

Experiment A1 by definition means that the reactor is simply being operated and that no samples are being irradiated in any reactor facility. Since there is no production of radioisotopes for the purpose of use or storage on the OSU Broadscope License, then there is no need to have an approval number for every operation under Experiment A1. Hence,

eliminating the need for an approval number under this condition has no safety implications.

The requirement that only the licensed experimenter can sign for an irradiation request is overly restrictive. Before signing for an absent experimenter, the Radiation Center Senior Health Physicist must ensure that each request is made with the full knowledge and understanding of the licensed experimenter and that the request is covered by the applicable OSU authorization. The Senior Health Physicist still has veto authority over all requests for irradiation services and hence the ability to perform an appropriate safety review is unaffected by the proposed change to the procedure.

d. MINOR CHANGES TO OSTROP 6.0, ADMINISTRATIVE AND PERSONNEL PROCEDURES AND OSTROP 12.0, CONTROL ROD MAINTENANCE, REMOVAL AND REPLACEMENT PROCEDURES

(1) Description

During a review of OSTROP 6.0, Administrative and Personnel Procedures and OSTROP 12.0, Control Rod Maintenance, Removal and Replacement Procedures a number of minor items were identified as needing either updating or revising. The items are listed below.

OSTROP 6.0

The following approval pages were updated to include the new members of the committee.

ROC 50.59 review, page IV.6.31
ROC ROCAS review, page IV.6.34
Information Bulletin, page IV.6.35

The approval paragraphs were changed to read as follows:

"**APPROVALS**

The changes described above were reviewed and approved by the Reactor Operations Committee (ROC) prior to being implemented. ROC approval included a review of this evaluation and the Committee's conclusion that the change does not require a change in the OSTR Technical Specifications and does not constitute an unreviewed safety question as defined in 10 CFR 50.59(a)(2). This evaluation also included a review of applicable radiation protection aspects and was found to be consistent with the Radiation Center's commitment to ALARA.

The following signatures indicate review and approval by the Reactor Operations Committee and review by licensed operators. If any ROC member does not completely concur with or understand the proposed change then that member should hold this form unsigned and notify the ROC Chairman. The matter will then be discussed at the next meeting of the Committee. If any individual ROC member is unable to sign the sheet due to absence or illness this will be so noted."

OSTROP 12.0

In the General Information section, the first sentence was changed to read "The control rods and their drives are described in Vol. #1 of the Training Manual."

(2) Safety Evaluation

There is no safety implication from the change in the membership of the committee. The change to the approval form ensures proper review of

safety issues and that all members of the committee are given a chance to review any proposed changes.

The rephrasing of the approval paragraph more clearly defines the authority of the ROC to make the change and emphasizes the Committee's commitment to the ALARA philosophy. There is no safety implication from this change.

The change to identify Volume #1 of the Training Manual more clearly identifies the document which describes the control rod drive system. There is no safety implication from this change.

3. 10 CFR 50.59 Changes to Reactor Experiments

There were no changes to reactor experiments during this reporting period.