UNIVERSITY OF FLORIDA

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May 27, 1994

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Sir:

Re: Facility License R-56
Docket No. 50-83

In compliance with our Technical Specifications reporting requirements, enclosed is one copy of the 1991-1992 University of Florida Training Reactor Annual Progress Report.

This document is intended to comply with the requirements of Section 6.6.1 of the UFTR Technical Specifications.

Please advise if further information is needed.

Sincerely,

William G. Vernetson

William G. Vernetson
Director of Nuclear Facilities

WGV/dms
Enclosure

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Contract #DE-AC07-ER04014
Report #ORO-4014-21
(Contract #DE-FG07-83ER75103)

ANNUAL PROGRESS REPORT OF THE UNIVERSITY OF FLORIDA TRAINING REACTOR

September 1, 1990 - August 31, 1991

Submitted By

Dr. William G. Vernetson
Director of Nuclear Facilities

NUCLEAR FACILITIES DIVISION

DEPARTMENT OF NUCLEAR ENGINEERING SCIENCES
College of Engineering
University of Florida
Gainesville

Contract #DE-AC07-ER04014
Report #ORO-4014-22
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I. INTRODUCTION

A. Overall Utilization

The University of Florida Training Reactor's overall utilization for the past reporting year (September, 1991 through August, 1992) continued to be at historically high levels of quality usage, limited only by unavailability of the reactor or necessary personnel. The diversity of users and usages was characteristic of the 1986-1987 reporting year when the 91.5% availability factor was the highest in recent history and probably in the 29-year history of the facility. Availability this year remained at relatively high levels at 72.9%. However, unlike in previous years, this availability accounts for lost availability for administrative reasons as well as for repair and maintenance related reasons. Otherwise availability for this year would be over 79.0%.

Despite the lack of any single really large outage during this year, the total time spent on maintenance activities is significant, especially for two core area thermocouple electrical connection repairs in September, 1991 and again in July/August, 1992 accounting for nearly a full month of forced outage time, though partial implementation of a modification involving installation of terminal strips and quick disconnects should begin to facilitate future repairs of this nature while minimizing dose commitment. There was also significant time spent on corrective and preventive maintenance on the nuclear instrumentation circuits, on the secondary cooling system to replace the deep well pump and associated check valve, on the stack radiation monitor and on the area radiation monitoring system, with most problems not recurring to demonstrate effectiveness of corrective action for most failures.

The University of Florida Training Reactor (UFTR) continues to experience a high rate of utilization in a broad spectrum of areas with total utilization continuing near the highest levels recorded in the early 1970's when available. Indeed, most usage indicators are characteristic of the 1987-1988 year when availability was 79.3% with quality usage occurring whenever system and operator availability permits. This broad based utilization has been supported by a variety of usages including research and educational utilization by users within the University of Florida as well as by other researchers and educators around the State of Florida through the support of the Department of Energy (DOE) Reactor Sharing Program and several externally supported usages. Several science projects were also accommodated. Significant effort has also been devoted to facility enhancement where a key ingredient accounting for this usage has been the licensing of two new part-time senior reactor operators (SROs) early in the year after the Reactor Manager/SRO left early in the previous year and another SRO was unavailable to perform licensed duties after April, 1991. Personnel associated with the UFTR are listed in Section II; facility operations for all usages are delineated in Section III indicating the diversity of usage.

The yearly total energy generation of 21.9 Megawatt-hours for the 1991-1992 reporting year represents a significant 25% increase over the previous reporting year. Nevertheless, despite this relatively high energy generation, this value ranks only seventh in energy generation in the last ten years; however, it ranks 13 out of 23 in the operational history of the UFTR licensed at 100 kW during which time energy generation has averaged under 23 Megawatt-hours per year. The increase in energy generation this year was primarily due to the increased availability of licensed operators, increased reactor availability and a number of large research projects requiring lengthy irradiations.

The run time, time when the reactor is running at any power level, has also increased nearly 19.9% from the previous year. This increase in run time is primarily attributed to increased reactor availability and to increased availability of licensed operators. On a further positive note, this increase is also indicative of the large amounts of time used to run classes and other educational activities, especially for institutions using the facility under the Reactor Sharing Program either for classes or training, where reactor operation is only part of the educational or training activity. The extended low power usage for education, as well as for operator training, plasma kinetics research and neutron transmission and radiography services radiography contributes significantly to total reactor operation time but in a limited way to total energy generation during the year.

Additional significant time and resource commitments were made for efforts related to conversion of the UFTR from high enriched uranium (HEU) to low enriched uranium (LEU). A total of 1200 SPERT fuel pins were transferred for shipment to Oak Ridge National Laboratory (ORNL) on May 17, 1990; subsequently, the "storage only" license was revised and the fuel moved to a new location in the Nuclear Research Field Building involving considerable upgrade of the new facility as well as commitments of time for assuring decontamination and security requirements were met. This year weekly facility checks and continued efforts to request permission to ship the fuel to a secure Department of Energy facility along with a two day visit by a DOE fuel engineer to look at the physical layout of the UFTR facility plus review of fuel drawings involved over 70 hours of experiment time not counting the time spent in carrying out thermal hydraulic analyses to support the conversion effort.

Although there were no extended outages this year, periodic failures and repairs related to surveillances and the need for modifications continued to cause lost availability with two failures of the core temperature monitoring system accounting for the most outage times. Repairs on the nuclear instrumentation system including power supply replacement, repairs on the control blade position indicating circuits, replacement of the secondary deep well pump motor and check valve, and various other repairs especially on the stack and area radiation monitoring system also accounted for a large portion of all unavailability. These and other failures also caused lost facility usage and hence negatively affected energy generation and run time. The radiation monitoring system is the one system evaluated as most in need of replacement for which funding is being sought from the Department of Energy via the University Reactor Instrumentation Program for the next reporting year. As indicated above, the total run time for the facility was increased about 19.9% from the previous year indicating considerable increases in facility usage at all levels from research to class utilization both from within and external to the University of Florida. With the licensing of two SROs early in the year with one appointed to serve as Reactor Manager at year's end, the availability of operating personnel this year was greatly increased and should be even better next year. Overall, the indication is toward considerable low power usage and continued high utilization of the reactor subject to availability of the reactor and licensed operators.

Analysis of facility utilization shows that the diverse usage and relatively high energy generation continuing from the previous year are attributable to continuing supportive conditions as in the last year. As noted for the last eight years, the refurbishment of the Neutron Activation Analysis Laboratory has impacted favorably on all areas of utilization from research projects using neutron activation analysis (NAA) to training and educational uses for students at all levels. With successful implementation of an improved remote sample-handling "rabbit" facility, efforts to advertise availability and encourage usage of the UFTR (especially for research) have proceeded in a favorable light, though always less quickly than hoped. Implementation of the standard rabbit capsule size with larger carrying capacity has further supported use of the facility. The additional implementation of two state-of-the-art PC-based spectrum analysis systems with complete ORTEC software packages for spectrum analysis and data reduction has been a key factor supporting reactor utilization during the last six reporting years for education and training uses as well as research projects, several of which constitute large ongoing but promising seed projects to support proposals. Indeed, the 1987-1988 reporting year was the first full year for availability of the PC-based ORTEC analyzers with standardized rabbit system capsule size. The NAA Laboratory had also been outfitted with its own independent sample and standards drying facility during the 1987-1988 reporting year and in the 1988-1989 year saw the first full implementation of this support facility along with a new 4.5 digit electronic balance to provide two complete lab sample preparation facilities. In addition to continuing efforts to provide proper switching and computer control software for the automatic sample changer first installed in the 1989-1990 year, the previous year saw implementation of the new ORTEC OMNIGAM software and spectrum analysis package to speed up as well as simplify spectrum analysis. During the 1991-1992 reporting year, additional computer storage capacity and a new monitor were added along with a new spectroscopy system and multichannel buffer. In addition, an integral shield was added for one detector and a desiccator station was added for storage of standards and processed samples, as every effort is being made to supply accurate and reliable trace element analysis for a wide range of projects from high school students working on science fair projects to doctoral students using trace element analysis for their research.

The result of these various improvements has been an easier, more reliable and faster turnaround of samples submitted to be irradiated for neutron activation analysis with a resultant increase in interest by potential users. The implementation of these facilities has given UFTR management the capability to promote it among University of Florida users and among researchers at other universities and colleges around the State of Florida. As the availability of this high technology facility becomes better advertised through its users, its usage continues to increase, limited realistically by the unavailability of full-time personnel committed to the analytical laboratory facility. Staffing is clearly a key limiting factor in the total throughput as well as the rate of processing of samples for trace element analysis after irradiation in the UFTR.

In addition to support from the College of Engineering through the Nuclear Engineering Sciences Department, the primary catalyst for maintaining facility usage continues to be the Department of Energy's Reactor Sharing Program. This reporting year was the ninth consecutive year in which the UFTR was supported as part of DOE's Reactor Sharing Program.

This program is designed to increase the availability of university reactor facilities such as the UFTR for non-reactor-owning educational (user) institutions ranging from high schools to colleges and universities. Basically, this grant provides funds against which reactor operating costs may be charged when the facilities are utilized by regionally affiliated user institutions for student instruction/training or for student or faculty research that is not supported by outside funding. In all, twenty-three different outside academic institutions ranging from high schools to universities around the State of Florida and across the country made use of this program to utilize the UFTR for research (primarily via neutron activation analysis to determine trace element composition), for reactor facility demonstrations, experiments and course work related to various aspects of operation. Further usages include training of students in various community college programs such as nuclear medicine technology and radiation protection technology and for research and training programs for high school students for which a number of senior level science fair projects are still in progress. Again this year, several of these projects received local and regional awards with a number of these outstanding students from previous years now attending upper division programs in the College of Engineering here at the University of Florida.

At years end, several unsupported research projects were still awaiting availability of the UFTR under the Reactor Sharing Program as UFTR usage attributable to this DOE-sponsored program continues to grow. Despite considerable cost-sharing by the University of Florida, all of the reactor sharing funds allocated by the Department of Energy for this reporting year were fully utilized. Indeed, the funds were all utilized by the ninth month. Fortunately, this program has been put back on track from previous government reductions so the Grant had been renewed at the 8% increased funding level for this reporting year (the first increase in three years) and for another 11% increase for the next reporting year so further expansion of this usage may be possible. In expectation of better future availability of funds, Reactor Sharing users have always been and will continue to be accommodated as much as possible during this next reporting year since the UFTR is the only such facility in the State of Florida and one of only four in the southeast.

Reactor use by University of Florida courses and laboratories continues at the substantial level established in the last several years. Course and department usages within the University range from the Environmental Engineering Sciences Department in its Health Physics courses to the Chemistry Department in a graduate level radiochemistry laboratory course. Of course, the biggest single user department remains the Nuclear Engineering Sciences Department which uses the reactor facility for both graduate and undergraduate laboratories, research projects and class demonstrations and exercises. An expanded usage in recent years is for senior level design projects of which there were a number again this year, each directed to provide some improvement in the physical facility, in the reactor experimental capabilities or in NAA Laboratory operations. The existence of an operating facility for such design projects is a unique educational opportunity for engineering students who get immediate feedback on the viability of their design work. This year also saw renewed activity in plasma kinetics research for benchmark calibration of fission and gamma sensitive detector chambers. Although unfunded, this usage is hoped to provide impetus for future support. This year also saw usage for beginning a large project on quantifying the uptake of mercury into laboratory rat brain and kidney tissue from bone implantation of amalgams. Other new research projects this year included analysis of oyster shells, stoichiometric analysis of SiC fibers for the Materials Science and Engineering Department, irradiations for nuclear quadrupole dosimetry measurements for the Nuclear Engineering Sciences Department and copper activation for the Pharmacy Department. Additional new experiments are planned for the upcoming year. External users for courses include Central Florida Community College for its radiation protection technology courses as well as Santa Fe and Hillsborough Community Colleges for their nuclear medicine technology courses plus physics courses at Florida Community College in Jacksonville and Santa Fe Community College. This year also saw usage by Jacksonville University for faculty and students in their Physics and Chemistry Departments.

With many continuing usages already scheduled along with the state-of-the-art analysis instrumentation and support equipment in the NAA Laboratory, plus renewal of the Reactor Sharing Program support at an increased level, facility utilization and energy generation for the upcoming year should show growth in quantity as well as diversity. The latter augmentation is particularly possible because the UFTR utilization under the DOE Reactor Sharing Program has spread publicity on the availability of the UFTR so that a number of investigators on the University of Florida campus and elsewhere around the state continue to indicate interest in using the reactor facility and its experimental systems. Several other state-wide users are in the process of preparing proposals hopefully to provide funded usage of the UFTR within the next year. The large usages for groups at Florida State University and another at the University of Wisconsin at Eau Clair/Southeast Missouri State University, are primarily to demonstrate capabilities to support proposals seeking external support as an outgrowth of the DOE Reactor Sharing Program support. Therefore, expectations of continued growth in quantity as well as diversity of reactor facility usage dependent on a continued upgrading of facility capabilities and staff expertise are quite realistic. One previous concern about the lack of growth in Reactor Sharing support is partially reduced by the Program increase for the next year; in addition, the DOE University Reactor Instrumentation Program has been instrumental in providing support for much needed instrumentation such as the console two-pen recorder, the new air particulate detector and a backup reactor safety channel in previous years. During the 1991-1992 year it supported acquisition of a high speed chart recorder to facilitate certain UFTR console surveillances and thereby reduce personnel time commitments as well as a portable neutron survey meter essential to support neutron transmission and radiography as well as other experiments. The acquisition of an electronic maintenance tool kit was the key item of support this year as it has facilitated much of the other maintenance in the facility. The electronic maintenance tool kit along with the NAA Laboratory items such as the integral shield have greatly facilitated facility response to potential users by improving reactor availability and laboratory results. The Instrumentation Grant has also been renewed for the next year.

B. Facility Improvements

For facility enhancement, the neutron radiography facility was available during the last three years. Attempts at further optimization have not been successful during the reporting year. A major effort was devoted to installing a semi-permanent shield structure and a movable table for positioning objects and the film cassette for applications of neutron radiography in the 1988-1989 reporting year. As a result these improvements have not only reduced the radiation levels associated with radiography but have also reduced the time and effort required to implement the radiography facility as one of the UFTR experimental capabilities. The neutron radiography facility continues to provide a strong base for growth and diversification of usage during this year and should continue to do so during the upcoming year as the facility is further optimized to attract more users, not only for demonstrations and evaluations of radiography system parameters for laboratory and other exercises but also for research and service usage. One external company has already utilized the facility for over 150 hours of usage on a number of occasions and has been pleased with the results, especially with radiography performed using a graded thickness boraflex standard to demonstrate and document the sensitivity of the facility. One other possible university user is interested in using neutron radiography for research on layered materials.

Plans have also been formulated for installation of a prompt gamma analysis facility at the UFTR to complement the NAA Lab capabilities. This is a multiyear enhancement project; work in progress since last year includes characterization studies on a suitable beam port to complement a preliminary design of the facility performed as a summer research project by a high school student several years ago. During the upcoming year funds will again be solicited to support equipment purchases for this facility with installation and initial implementation possible by late in the next reporting year provided the necessary funding

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Another area of enhancement receiving considerable attention last year was a series of measurements to characterize all experimental facility irradiation parameters from neutron flux and spectrum characteristics and gamma dose levels and spectrum characteristics to ratios of neutron and gamma field dose parameters. As indicated above, some of this work has supported the preliminary efforts for design of a prompt gamma analysis facility. It had been hoped that a masters' level student would be able to bring this program to fruition during this year, though data to date has been sufficient to support continued plasma kinetics research for the space power reactor program at the University of Florida and for research on radiation effects on dielectric materials for a researcher at Florida State University. Further work is needed to support interests expressed by several users in performing radiation damage studies on electronic components, including one group at the University of Florida. This work is also needed to support the planned UFTR HEU-to-LEU fuel conversion.

Other significant facility enhancements during the year are the result of the DOE Instrumentation Grant to include the high speed chart recorder to support performance of various surveillances, the portable neutron sensitive survey meter to support experiments especially radiography and an electronic maintenance tool kit package which has proven invaluable in assuring the timely repair of electrical and electronic systems. Of course its use in repairs of the reactor safety system and performance of the Annual Nuclear Instrumentation Calibration Check (A-2 Surveillance) as well as the partial implementation of the terminal strip and quick disconnect system for the core thermocouple system have already paid for its cost.

Another enhancement has been in the NAA Laboratory facility for the installation of an automatic sample changer, developed as part of a senior project. At the end of the 1989-1990 reporting year, the device was completed but would only change a single sample. During the last two years, the timing circuit and computer software system have been in the process of being modified and redesigned to provide a fully automated sample changer to allow counting multiple samples without technician attention. This improvement promises to improve laboratory throughput and assure the laboratory remains competitive with other facilities but is not yet ready for implementation at year's end. As part of the same effort to maintain competitiveness, the next generation software package for the PC-based analyzers as well as additional computer MCB modules were obtained and implemented during the 1990-1991 year to improve the speed with which analysis is performed.

Enhancements in the NAA Laboratory facility during this reporting year include the new spectroscopy system and the external multichannel buffer to speed data processing. Finally, the implementation of a low background integral lead shield has greatly improved sample counting efficiency as well as reduced counting time and improved element sensitivity. All of these improvements should increase laboratory throughput while enabling facility staff to spend more time addressing experiment design as well as student and faculty training. These improvements will further enhance the reputation of the facility and our effectiveness in serving users of the facility, not only for University of Florida students and researchers but also students and faculty from other educational institutions as part of the Reactor Sharing Program.

C. Staffing Considerations

After the loss of the full time SRO/Reactor Manager and the Acting Reactor Manager for all but consulting purposes in the 1990-1991 year, two new part-time student SROs were licensed early in this reporting year. As a result, staffing conditions during this past year have generally been supportive of the considerable broad-based increases in facility usage for education and training of students as well as research by faculty at the University of Florida and other schools. Nevertheless, all staff personnel have been part-time employees, which always necessitates detailed planning for some usages of the facility. At the end of the reporting year one of the new SROs was appointed as a part-time Acting Reactor Manager and a new student part-time SRO-trainee was hired to further alleviate personnel problems. With all the part-time personnel available combined with careful planning of activities, impact on facility operations by availability of licensed operators was minimized during this reporting year with the resulting high usage numbers quoted elsewhere in this report, especially in Section III.

Although such part-time employees provide a good experience base for operations, the lack of other full-time licensed staff members during the reporting year has occasionally necessitated limitations in the growth of some usage programs. It is expected that these limitations will be considerably less restrictive during the upcoming reporting year with the availability of both new SROs for the full reporting year and one designated as a part-time Acting Reactor Manager. It is also expected that the new trainee hired at year's end will be licensed during the upcoming year. Finally, although unsuccessful to date, the expectation is that we will be able to hire a new full-time Reactor Manager in the upcoming year.

D. Administrative Commitment of Resources

The level of administrative work dedicated to regulatory activities is expected to be at a similar or increased level during this next reporting year. Although the facility received one Nuclear Regulatory Commission (NRC) inspection during the reporting year in February, 1992 in the areas of Reactor Operations and Radiation Safety, it was cited for no violations. The inspection in February, 1992 was one of the better inspections in that several areas such as management involvement in facility operations, low contamination levels and low personnel radiation doses were called out as noteworthy with no program weaknesses noted. The inspection report (see Appendix A) did note two non-cited violations, one of which was for failure to follow the procedure for checking control blade interlocks prior to startup when the daily checkout is omitted. The other was for failure to adhere to surveillance requirements to check whether a loss of pump power on secondary deep well cooling would cause a trip. Both violations were licensee reported.

Activities in response to the NRC inspection as well as various efforts to maintain facility compliance and responsiveness occupied significant facility management and staff time during the reporting year. In particular, the time devoted for SRO license examinations for D. Simpkins and D. Cronin by NRC license examiner P. Isaac, in October, 1991, the subsequent response to the examination, the documented incorporation of subjects identified incorrectly as "generic program weaknesses" and the various checks, documentation and final report on the failure to perform the required surveillance of the limiting safety system setting on Loss of Secondary Coolant Pump Power (see report to NRC in Appendix B) involved much commitment of resources. Although this non-cited "violation" was considered primarily a matter of semantics, response to it along with documenting responses to the "generic weaknesses" involved a number of days of effort. In addition, the occurrences and reporting to NRC on the unscheduled trip on loss of secondary flow on city water in November, 1991 (see Appendix C for the report to NRC), the potential violation of technical specifications for a Safety Channel #2 circuit failure (see Appendix D for the report to NRC) and the second failure of a fuel box outlet thermocouple (see Appendix E for the report to NRC) all involved considerable commitments of time for review, corrective action and communications with NRC.

Development and submission of Physical Security Plan Revision 10 in September, 1991 (approved in October, 1991), Emergency Plan Revision 7 in December, 1991 (approved in June, 1992) and Safety Analysis Report (SAR) Revision 7 (submitted as information not requiring approval in June, 1992) along with subsequent incorporation in the master documents following approval each required considerable time commitments. Documentation for UFTR Emergency Plan Revision 7 is in Appendix F while documentation for UFTR Safety Analysis Report Revision 7 is in Appendix G.

One of the largest commitments of time was in response to NRC Project Manager Ted Michael's letter of November 13, 1991 listing a series of eleven questions resulting from review of the previously submitted but not updated UFTR Reactor Operator Requalification and Recertification Training Program. As a result the Program was completely reviewed and rewritten. Although the Program Plan did not appear to meet Part 55 requirements as originally submitted for renewal in the previous reporting year, it was always considered to do so. The rewritten Training Program fully documenting the Program as implemented was submitted in December, 1991 with NRC approval received via a letter from Project Manager Ted Michaels in February, 1992. The documentation for this rewritten Plan is contained in Appendix H.

Though no new Standard Operating Procedures (SOPs) were generated during the year, considerable administrative efforts were involved in making minor changes to seven procedures and in revising one procedure, UFTR SOP-D.5, "UFTR Reactor Waste Shipments: Preparation and Transfer." Revision 1 for SOP-D.5 was generated to assure any waste shipments would be in compliance with changes in NRC regulations since the original generation of the procedure in response to an NRC violation. To meet UFTR Technical Specifications, this revision of SOP-D.5 is contained in Appendix I.

Some additional time was also spent updating the estimated cost of decommissioning to meet the new requirements of 10 CFR 50.33 and 50.75 first promulgated in the 1990-1991 reporting year. As required, the updated cost was produced and documented in a memorandum dated August 25, 1992 to the UFTR Decommissioning Information File showing the estimated decommissioning cost has been increased to $2.18 million. These special responses to and communications with NRC were in addition to the usual information supplied periodically via telephone calls, the quarterly safeguards reports, the updated HEU to LEU Conversion Proposal submitted in March, 1992 to meet the requirements of 10 CFR 50.64(c)(2), as well as the response to an Oak Ridge National Laboratory request for completion of an NRC National Profile on Mixed Waste Questionnaire. In general, these various submittals and communications with NRC resulted in a commitment of more time in the 1991-1992 reporting year than in most previous years despite not having to respond to the major biennial inspection of facility operations.

Other regulatory agencies also affected the UFTR in the reporting year. Responses in September, 1991 to an American Nuclear Insurers (ANI) inspection of the previous year as well as responses to an inspection in May, 1992 involved considerable time. Though both inspections agreed the facility was operated and maintained acceptably, addressing a total of eleven recommendations for improvement including dismissing several recommendations occupied considerable time as did completion of an ANI records retention questionnaire in November, 1991 and an EPA Survey form for input on their review of standards controlling radionuclide air releases in October, 1991.

During the 1991-1992 reporting year, considerable effort was also spent in following up the decision made three years ago not to utilize the pin type SPERT fuel for conversion of the UFTR from HEU to LEU fuel. Considerable administrative effort was expended in attempting to arrange shipment of this unneeded fuel to a secure DOE facility like Oak Ridge National Laboratory without success as the Department of Energy apparently has no room for the SPERT fuel and even requested to be allowed to return the 1200 pins previously loaned to ORNL. This latter effort was not allowed as the current storage facility does not have sufficient room for accepting the 1200 pins back. Since it will be necessary to remove the remainder of the SPERT fuel to another facility eventually, the hope was that it could be accomplished in this year. Since it was not, the hope is now to do so early in the next reporting year before the QA Program expires in October, 1992.

In addition, with the previous completion of static neutronics calculations and production of a masters project, efforts during this reporting year were directed toward thermal hydraulics analysis as a 14-plate fuel bundle of standard silicide fuel plates was selected as the final design for the LEU core. The thermal hydraulic analysis was essentially completed during the year. However, completion of documentation of the analysis for the license submittal was delayed though the writeup was begun with the assistance of one graduate student who only worked on the project part-time for about two months. Another extension for the submittal of the safety analysis to NRC was noted in the proposal submitted in March, 1992 to NRC. One other area requiring considerable time was for

Described in Table III-7A is an explanation and date for all unscheduled trips for the reporting period. As explained in the table, there were three trips during the 1991-1992 reporting year as the first trips since the trips on September 7 and 15, 1989 and the trip on November 29, 1989 which was attributed to erratic operation of the bistable trip circuit for Safety 2 high voltage. The first trip was caused by poor measuring equipment combined with human error, while the last two trips were caused by building power fluctuations, again demonstrating the continued effectiveness of the corrective and preventive maintenance performed for the trips in 1989. The first trip occurred due to valving down the city water cooling flow for a temperature coefficient surveillance. Unfortunately, there is no flow meter on the line and only a check valve to control flow. The resultant fluctuations in flow were sufficient to cause the trip.

Table III-7B contains no entries for scheduled trips. In this case, the lack of scheduled trips is primarily due to the lack of utility training programs where such trips are part of the training exercises. It is expected that some trips will be included in the Reactor Operations Laboratory course for the upcoming year as well as for some of the operations demonstrations for other advanced classes in nuclear engineering.

Several additional incidents (four reportable) other than the trips listed in Table III-7A described as unusual occurrences (and per UFTR Tech Specs sometimes potentially abnormal occurrences) occurred during this reporting year. Table III-8 contains a descriptive log of eight unusual occurrences with relatively brief descriptive evaluations of each. All of these occurrences were reported to NRC Region II in their periodic checks over the telephone, some on more than one occasion. Three of these occurrences, as the more significant entries, were promptly reportable or otherwise directed to be promptly reported to include Entries 4, 5 and 8.

Entry 1 addresses a Safety Channel 2 meter trip out of calibration which was checked and corrected prior to operation. Entry 2 addresses a stack monitor alarm soon after reaching full power at about 2000 cps versus the normal value of 4000 cps. Subsequently, after an unscheduled shutdown, the alarm indication was found to have drifted down to about 2100 which is conservative. After recalibration and several checks, the system was returned to normal operation.

Entry 3 addresses the failure of a connection on thermocouple point #2 (south center fuel box outlet line) with a resultant drifting of the temperature indication upscale to give an alarm. Following an unscheduled shutdown and core shielding unstacking, a failed thermocouple lead connection was repaired, the core shielding restacked and radiation surveys used to confirm proper replacement of shielding.

Entry 4 addresses a question raised by an NRC license examiner about whether a loss of pump power on the secondary deep well cooling system would cause a trip as required by technical specifications and whether this trip was subjected to the required periodic surveillance checks. Though the check on the daily checkout for loss of flow had been considered adequate by the licensee, it was decided to implement separate checks of the loss of secondary flow as well as the loss of pump power to meet the most restrictive interpretation of the tech spec requirements. This discovery event was promptly reported to NRC as a potential tech spec violation and the exact operation of the trip verified and the surveillance check added to the quarterly (Q-1 Surveillance) scram checks. The final report on this occurrence is in Appendix B.

Entry 5 addresses the Safety Channel 2 meter which was noted to flicker downscale (pegged) resulting in loss of trip capability for about twenty seconds with the meter recovering during the ensuing scheduled shutdown. An intermittent fault in the fine adjust potentiometer of the circuit was finally isolated though it was not the cause of the failure. A modification per 10 CFR 50.59 Evaluation and Determination No. 91-09 was also made to replace the fine and course gain potentiometers in this circuit with sealed units to limit environmental degradation. Cleaning of contacts was finally considered to have corrected the cause of the failure which was promptly reported to NRC. The final report to NRC on this event is in Appendix D.

Entry 6 addresses various trip indicators not being able to be reset during the weekly checkout. Here the cause of the problem was traced to a failed +15 V power supply. Under 10 CFR 50.59 Evaluation Number 91-10, an equivalent power supply was obtained and, following modification to accommodate the change in physical size and shape, the appropriate voltages were verified and the system restored to operability.

Entry 7 addresses failure of the temperature recorder after over two hours operation at full power. Following an unscheduled shutdown, the cause of the failure was found to be a set screw which had worked loose from the bar supporting the temperature recorder print wheel. After reassembly, the temperature traces were as expected but the printed numbers were noted to be reversed during the verification restart. After another unscheduled shutdown, the temperature print wheel was disassembled and the temperature points again realigned. Subsequent operation verified effectiveness of this corrective action.

Entry 8 addresses a recurrence of Entry 3 in that thermocouple point #2 was failed. However, this time the point for the south center fuel box failed downscale, with the operator failing to note the failure for the last 7-8 minutes of one run and the first hour of a second run. This failure was difficult to note because the downscale position of the printout is difficult to see and was not due to lack of operator attention. Though not considered to involve a violation of technical specifications, this occurrence was promptly reported with the concurrence of the Reactor Safety Review Subcommittee, primarily because of failure to note the problem for so long. Subsequently, permission was obtained from the Reactor Safety Review Subcommittee and the NRC to conduct two low power short irradiations. After uneventful completion of the runs, the core shielding was unstacked and the failure of the terminal connection to the thermocouple verified. After completion of the biennial fuel inspection (B-2 Surveillance), a modification under 10 CFR 50.59 Evaluation Number 92-06 was approved to install a terminal barrier strip in the equipment pit and to terminate the three south fuel box thermocouple with a barrier strip in the pit and run new wire from the equipment pit to the core to reterminate the wiring to the thermocouples on the south side of the core which was completed. Per the modification document, plans are eventually to terminate the remaining three north core area thermocouple leads in the pit area and to replace all six core area thermocouples with quick disconnect leads to limit future dose commitments. After repairs, the core shielding was restacked and radiation surveys used to confirm proper replacement of shielding. By performing the fuel inspection during the same core area entry as for the thermocouple wiring replacement, dose commitment and outage time were considerably reduced. Replacement of the remaining wiring from the north core fuel boxes was delayed for a future core area entry with no further problems noted. The final report to NRC on this event is in Appendix E.

Although unusual occurrence Entries 3, 5 and 8 are probably the most significant, Entry 3 was not regarded as promptly reportable. Entries 4, 5 and 8 were promptly reported although Entry 4 is mostly administrative in nature. Entries 3 and 8 represent significant dose commitment for repair and recurrence of a failure while Entry 7 represented loss of temperature monitoring and Entry 5 represents a brief loss of the overpower trip on Safety

Channel 2 meter. Some of these events such as Entry 3 were informally promptly reported to keep NRC updated on UFTR status. They are all officially reported via this report. In some cases these may not need to be reported at all except as required by recommendation of the UFTR Reactor Safety Review Subcommittee and good practice to document and assure proper facility management control of operations and maintenance of good communications with regulatory agency representatives. None of these events is considered to have adversely affected reactor safety or the health and safety of the public.

No uncontrolled releases of radioactivity have occurred from the facility and controlled releases remain well within established limits. The personnel radiation exposures for 1991-1992 have been maintained at a relatively low yearly level despite the fact that there were two occasions requiring unstacking of the biological shielding, once early in the year to repair a failed point #2 thermocouple and again near the end of the year to again repair a failed point #2 thermocouple as well as to access the core for fuel inspection. There was also no waste or special nuclear material shipped from the reactor this year. Although waste was expected to be shipped in the past reporting year to prepare the facility for the HEU-to-LEU fuel conversion activities to commence within the next two years, this has been delayed and is now expected to occur late in the next reporting year. With the corrective action implemented following the NRC Health Physics Radiation Safety Inspection in February, 1987, the upcoming waste shipment is assured to be properly controlled and documented as a revision of the applicable SOP-D.5 "UFTR Reactor Waste Shipments: Preparations and Transfer" was implemented in April, 1992. It was also expected that the remainder of the LEU SPERT fuel would be transferred for shipment in the past year under the SNM-1050 license after 1200 SPERT fuel pins were transferred for shipment on May 17, 1990. This did not occur and, because of difficulties in getting DOE acceptance of the fuel, it may not occur in this next year. Again this activity will be directed and controlled by UFTR personnel assisted by personnel from the Radiation Control Office. Quality Assurance Program Approval Number 0578, Revision 1 will no longer be available for this transfer to assure meeting all shipping requirements as it is due to expire on October 31, 1992 so if transfer is to be completed in the next reporting year, the facility will need to renew the QA Program approval.

Environmental radioactivity surveillances continue to show no detectable off-site dose attributable to the UFTR facility as also noted in Section VII. Although environmental film badges and TLDs record occasional exposure, this dose is not directly attributable to UFTR operations as explained in Section VII since it does not correlate with energy generation. The change in the gaseous releases measurement methodology implemented in the 1988-1989 reporting year to account better for the gas standard and counting geometry utilized since August, 1988 in response to an NRC Health Physics Radiation Inspection in March, 1988 continues to be utilized. The current methodology used to measure gaseous releases is much improved and the results obtained have been reasonably consistent during the semi-annual measurements. Effluent levels for both the gaseous and liquid releases remain well within required limits with no solid waste shipment during the year. Overall, the facility continues to operate within ALARA guidelines with minimal exposure of staff and visitors as delineated in Section VII.

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

NOTE: The projects marked with one asterisk (*) indicate irradiations or neutron activations. The projects marked with two asterisks (**) indicate training/educational use. The projects marked with three asterisks (***) indicate demonstrations of reactor operations. "Experiment Time" is total time that the facility dedicates to a particular use; it includes "Run Time". "Run Time" is inclusive time commencing with reactor startup and ending with shutdown and securing of the reactor.

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**ENU-5176L - Dr. W.G. Vernetson, and Reactor Staff	Independent Reactor Operations Laboratory Course for Undergraduate and Graduate Nuclear Engineering Sciences Students	14.30 (3.45)	36.92 (7.33)
**CFCC Radiation Protection Technology Co-op Work Program - Mrs. R. Rawls/Mr. S. MacKenzie - Reactor Sharing	One Semester Long Reactor Operations-Based Radiological Control and Protection Training Program of Cooperative Work Exercises	4.57 (1.82)	45.75 (3.50)
SPERT Low-Enriched Fuel Conversion Related Efforts - Dr. W.G. Vernetson, and Reactor Staff	Radiation/Contamination Surveys, Property Surveys, Facility Checks, Fire Alarm System Maintenance, LEU SPERT Fuel Security System Checks. LEU Fuel Inventory and Visual Inspection Efforts and Responses To Security and Fire Alarms. Plus Visit by Eileen Yokuda to Check Facility Layout and for Subsequent Facility Review of Drawings	0.00	72.84 (5.59)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*ENU-4905 - Special Problems in Nuclear Engineering - NAA Research on Sediments- Dr. W.G. Vernetson/R. Ratner, T. Downing	Special Senior Project on Identification of and Determination of Rare Earth Element Content of Egyptian Sedimentary Mineral Deposits	7.32 (4.82)	9.92 (6.33)
ENU-4930 - Special Topics In Nuclear Engineering or Reactor Operations Laboratory Upgrade - W.G. Vernetson, D. Simpkins, R. Lower, University of Florida	Special High Honors Project to Evaluate the Independent Reactor Operations Laboratory Course and to Upgrade the Course and Laboratory Materials to Facilitate Its Effectiveness	0.35	6.42
*ENU-4905 - Special Problems in Nuclear Engineering for NAA Research on Seashells - W.G. Vernetson, R. Ratner, Reactor Staff, University of Florida	Special Senior Project to Perform Trace Element Analysis on Various Age Seashells to Evaluate Possibility of Identifying Key Elements for Tracing the Source of Such Shells	12.92 (6.81)	20.34 (8.75)
ENU-6937 - Special Topics In Nuclear Engineering Sciences to Implement the Software System for An Automatic Sample Changer - W.G. Vernetson, D. Ekdahl, R. Ratner, University of Florida	Special Graduate Project to Develop and Implement the Software System Necessary to Utilize an Automatic Sample Changer in Connection with One HPGe Detector System in the NAA Laboratory	0.00	0.25

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*NAA Research For Biogeochemical Assessment of Pollard, AL Oil Field - Dr. Gary Cwick, S.E. Missouri State University and Dr. Michael Bishop, University of Wisconsin, Eau Claire - Reactor Sharing	NAA to Evaluate and Identify Elemental Constituents In Second Large Set of Vegetation and Soil Samples Taken From the Pollard, Alabama Oil Field for Geochemical Analysis and Correlation with Satellite Imaging for Geochemical Analysis and Hydrocarbon Exploration Systematics	25.91 (12.35)	32.91 (15.08)
Research on Properties of Materials - Dr. S. Turner, Mr. J. Wallis, NUSURTEC, Inc.	Use of Neutron Radiography, Transmission and Scattering Experiments and Other Analytical Techniques to Examine and Characterize Used and Unused Boraflex and Boral Absorber Liner Samples and Coupons For Use in Utility Spent Fuel Pools (About Half of the Experiment Time is for Experimental Efforts to Improve Radiography System Capability)	77.99 (6.72)	193.17 (20.09)
**Jacksonville Bolles High School Physics Class - Mr. Ellis Lanquist, Mrs. J. Luepke - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations and Power Maneuvering Plus Discussion of Research Usage and Projects Using Research Reactors	0.00	1.50
*NAA Research of Sedimentary Mineral Deposits, Dr. A. Dabous, Florida State University Chemistry - Department Reactor Sharing	NAA To Evaluate and Quantify Rare Earth Elemental Content of Egyptian Sedimentary Mineral Deposits	25.18 (4.83)	30.42 (7.00)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**Hillsborough Community College Nuclear Medicine Radiation Therapy Technology Program - Dr. M. Lombardi - Reactor Sharing	Lecture, Tour and Demonstration of Facility Operations With Radiation Surveys and Exercise in Use of Rabbit System for Trace Element Analysis of Hair Samples Using NAA Techniques and Demonstration of Neutron Radiographic Techniques	0.78	3.83
**Union County High School Physics Class - Mrs. Renae Allen - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers	1.32	4.58 (1.00)
**Sante Fe Community College Medical Radiological Technology Program - Mr. S. Marchionno/Ms. Rochelle Sturm - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers Plus Neutron Radiography Demonstration	0.73	4.42
**Crystal River High School Chemistry Classes - Mrs. A. Butler/Mr. Steve Richardson - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers	1.87	7.25 (1.00)
**Chamberlain High School (Tampa) Advanced Physics Class - Mr. T. Jordan - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers	0.63	5.75 (0.75)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*NAA Research To Perform Trace Element Analysis of Fertilizer Samples - Mrs. Renae Allen, R. Wade, Union County High School - Reactor Sharing	NAA Evaluation For Trace Element Analysis of Fertilizer Samples for Quantification of Heavy Metal Content and Buildup From Continued Application of Synthetic Fertilizers To Crop and Pasture Lands For Science Fair Project	9.37 (1.52)	15.41 (5.42)
***Florida Foundation of Future Scientists - Dr. W.G. Vernetson, Mr. A. Arico (Piper High School), Mr. C. Caldwell, L. Chapman and E. Leonard (Mainland High School) - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Facility Operations and Experimental Capabilities For Seven (7) Honors High School Students Plus Summer Research Project Selection for Two FFFS High School Students (Frank Ayoung-Chee of Piper High School and Bruce Morehouse of Mainland High School)	2.00 (1.50)	9.50 (3.58)
**Florida Community College At Jacksonville (North Campus) - Physics Classes - Dr. C. Lee, Dr. O. Lee - Reactor Sharing	Lecture, Tour and Demonstrations of Reactor Facility Operations and Use of Rabbit System and PC Based Analyzers For Trace Element Analysis Using Previously Irradiated Samples	0.00	3.50
**Central Florida Community College Radiation Protection Technology Program - Mr. S. MacKenzie - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers Using Previously Irradiated Samples	0.00	3.75

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**Heritage Christian High School Science Department (Gainesville) - Dr. G. Featherston, Dr. B. Tucker, Mr. B. Jones, Ms. Juanita DeLott - Reactor Sharing	Various Lectures, Tours and Demonstrations of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Methodology of Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers As Well As Radiation Survey and Contamination Control Exercises	0.53	18.00 (0.50)
**P.K. Yonge High School Government Class - Mr. D. Anderson - Reactor Sharing	Lecture, and Demonstration of Reactor Operations and Capabilities Including Surveys and NAA Laboratory Facility Operations For Understanding of Nuclear Energy Usage	0.00	3.00
**Jacksonville University Physics and Chemistry Departments - Dr. Paul Simony (Physics) and Dr. John Pelphry (Chemistry) - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Laboratory Facility Operations Using Rabbit System and P.C. Based Analyzers for Trace Element Analysis of Several Samples and Demonstration of Basic Radiation Detection and Mitigation Techniques As Well As Possible Research Applications	0.53	3.67
*Physics of Materials Properties Research - Dr. Hans Plendl, Physics Dept., Florida State University and Dr. Peter Gielisse - Mechanical Engineering Department., FAMU/FSU - Reactor Sharing	Fast and Thermal Neutron Irradiations of Dielectric Materials Including Topaz and Beryl to Determine Optical Effects of Trace Elements on Rate and Types of Color Center Development for Basic Physics Understanding	73.99 (13.34)	94.50 (17.92)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**P.K. Yonge High School Science Department (Gainesville) - Dr. Paul Becht (Chemistry), Mr. G. Jones (Physics), Mr. D. Dodge (Science) - Reactor Sharing	Various Lectures, Tours and Demonstrations of Reactor Operations and Capabilities Including Surveys and NAA Laboratory Facility Operations Using the Rabbit System for Trace Element Analysis	1.30	14.50 (2.50)
***Tau Beta Pi Honor Society-Sponsored High School Scholars/parents Program - W.G. Vernetson/Reactor Staff - Reactor Sharing	Lecture and Tour of Reactor and NAA Laboratory Facilities for High School Scholars and Parents Visiting the UF College of Engineering to Learn About Advanced Technologies and Research	.00	1.50
**Santa Fe Community College (Gainesville) Physics Students(PHY-2054) - Dr. A. Ferrari - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations with Radiation Surveys and NAA Training Exercises, with Demonstrations of Trace Element Analysis Techniques Using the Rabbit System and PC Based Analyzers	1.35	4.00
**Santa Fe Community College(Starke) Science Students (ISC-1001)- Dr. A. Ferrari - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations with Radiation Surveys and NAA Training Exercises, with Demonstrations of Trace Element Analysis Techniques Using the Rabbit System and PC Based Analyzers	0.77	3.58
*NAA Research For Determination of Trace Elements In Hair Samples - Mrs. Renae Allen, Union County High School - Reactor Sharing	NAA Evaluative Research For Trace Element Analysis of Several Hair Samples For Possible Identification and Quantification of Anomalous Heavy Element Concentrations	2.60 (1.30)	3.00 (1.75)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*Florida Foundation of Future Scientists - NAA Research On Elemental Aluminum Content In Canned Carbonated Beverages - Mr. Anthony Arico, Piper High School Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Summer 1992 Student Research Program: Evaluation of Carbonated Beverages For Aluminum Content Under Different Storage Conditions Prior To Opening the Beverage Can and After Opening the Can	4.85 (2.00)	6.00 (2.33)
*Florida Foundation of Future Scientists - NAA Research on Mercury Content of Canned Tuna - Mr. C. Coldwell, L. Chapman and E. Leonard, Mainland High School, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Summer 1992 Student Research Program: Evaluation and Quantification of the Elemental Mercury Content In Canned Tuna Fish	3.10 (1.60)	11.83 (2.67)
*Physics of Superconducting Materials Properties Research - Dr. Halinea Niculescu, Physics Dept., Florida State University and Dr. Peter Gielisse Mechanical Engineering Dept., FAMU/FSU - Reactor Sharing	Neutron Irradiation of Polycrystalline High Temperature Superconductor Material(YBaCuO: 1:2:3;7) To Increase Pinning Site Density of Fluxoids To Increase Critical Current Density To Determine Possible Improvements In Shielding Characteristics of the Superconducting Material	83.37 (39.88)	100.84 (46.50)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
***Second Annual Florida Accelerated Initiatives Student Seminar On Energy Issues For Outstanding High School Students - Mr. David Murray, Cocoa Beach High School - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Facility Capabilities and Applications For Group of Outstanding High School Students Examining Energy and Other Political Issues	0.00	2.00
***Demonstration of Reactor Facility Operations - Mr. Spencer Reeder, Dunnellon High School - Reactor Sharing	Series of Lectures, Tours and Demonstrations of UFTR Operations and Capabilities For Trace Element Analysis Using the Rabbit System and PC Based Analyzers	0.23	1.75 (0.33)
***Demonstration of Reactor Facility Capabilities and Usage For Industrial Arts Program Mr. Jim McMullen, Mrs. Ann Marie Heller, Eastside High School - Reactor Sharing	Lecture, Tours and Demonstration of Reactor and NAA Laboratory Facility Operational Capabilities For Innovative Industrial Arts Industry-Oriented High School Technology Program	0.00	3.25 (0.08)
***Demonstration of Reactor and NAA Laboratory Facility Capabilities and Usage - Mr. S. Tureki, Ridgewood High School - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Facility Operational Capabilities To Support Potential Science Fair Projects	0.00	2.50

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
***Florida Regional Junior Science, Engineering and Humanities Symposium - Dr. W.G. Vernetson/B. Abbott - Reactor Staff	Series of Lectures, Tours and Demonstrations of Facility Operations and Capabilities for High School Students, Teachers and Other Professional Participants in 29th Annual Florida Science, Engineering and Humanities Symposium.	0.00	1.75
**ENU-6935 - Nuclear Seminar - Prof. J.S. Tulenko, UF	Detailed Lecture, Tours and Demonstration of Reactor Operations and Facility Capabilities For Possible Research Projects For NES Graduate Students	0.30 (0.15)	4.84 (0.83)
*ENU-4505L/6937 - Nuclear Engineering Laboratory I, Dr. W. H. Ellis, Dr. G. R. Dalton Dr. R. Pagano and Dr. W.G. Vernetson - University of Florida	Senior Level Nuclear Engineering Laboratory Exercises and Experiments Including Foil Irradiations, Flux-Mapping, Hot Channel Factors, Reactor Calorimetry, Blade Reactivity Worth Calibration, Diffusion Length in Graphite, 1/M Approach to Critical and Neutron Activation Analysis	14.22 (0.23)	54.51 (3.84)
ENU-4934 - Nuclear Engineering Seminar - Dr. G. R. Dalton and Prof. J. S. Tulenko, University of Florida	Introductory Lecture, Tours and Demonstrations of Facility Capabilities for New Students Entering the Nuclear Engineering Sciences Curriculum	0.00	5.75 (1.75)
ENU-6516L - Nuclear Engineering Laboratory II - Dr. R. Pagano, Dr. W.H. Ellis and Dr. W. G. Vernetson - University of Florida	Graduate Level Nuclear Engineering Laboratory Experiments Including Experiment Design for Half-Life Measurement, Diffusion Length in Graphite and Approach-to-Critical Measurements	3.12	8.33

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*NAA Research Support - Dr. W. G. Vernetson, R. Ratner	NAA Evaluative Research to Determine Trace Element Content In Experiment Holding Devices Used to Support Irradiations In the Vertical UFTR Ports	2.96	5.83 (0.67)
*NAA Research to Quantify Mercury Content in Rat Tissues - Dr. Bamiduro Oguntebi, Dr. Karl Soderholm, Endodontics Dept., Dental School, University of Florida	NAA Evaluative Research to Conclude Simple Preparation and to Quantify Mercury Content in Rat Kidneys and Brain Tissue Following Bone Implantation of Mercury Amalgams	31.13 (17.31)	40.50 (21.50)
*Copper-64 Production for PET Scanner - Dr. John Kuperus, Radiopharmacy Dept., and W. Drane, Radiology Dept., Shands Hospital, University of Florida	Irradiation of Pure Copper to Generate Copper-64 for Positron Emitting Source Production for Positron Emission Tomography (PET) Scanner Calibration in the Radiopharmacy Department at Shands Teaching Hospital	6.45 (3.13)	11.25 (4.00)
*NAA Research on Heart-Lung Machine Tubing - Dr. Edward D. Staples, Surgery Dept., J. Hillis Miller Health Center, University of Florida, M. Patton, Santa Fe Community College, R. Ratner, University of Florida, NES Department	NAA Evaluative Research to Determine the Chlorine Content of Particles Filtered From the Tubing of a Heart-Lung Machine to Determine the Source of the Particulate Material	2.33 (0.53)	2.75 (0.75)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
Benchmark Calibration of Radiation Detectors - Dr. W. H. Ellis, A. Ferrari, Nuclear Engineering Sciences Department, University of Florida	Research to Evaluate Response and Provide a Benchmark Calibration for Future Developmental Work of a Compensated Ion Chamber and a Fission Chamber As Part of the Plasma Kinetics Parameters Determination Research Project	7.72	20.92 (4.83)
92-26 NAA Service Research for Elemental Analysis of Corrosion Products - Dr. E. Verink and R. Harrahan, Materials Consultants, Inc.	NAA Evaluative Research to Determine the Chromium and Iron Concentration in Samples of Aqueous Corrosion Products (Rust) Provided by Materials Consultants, Inc., to Support a Legal Action on Source of Damages	2.88 (1.42)	3.33 (1.50)
*NAA Research To Evaluate SiC Fiber Samples For Constituents and Trace Elements - Dr. W. Toreki, Materials Science and Engineering Department, University of Florida, R. Ratner	NAA Research Evaluation of Special Pure Silicon Carbide (SiC) Fiber Samples To Determine the Capabilities of the INAA Technique for Identifying and Quantifying Macro Constituents As Well As Trace Elements Of Interest For Various Baseline Material Data Tests	2.35 (0.80)	4.00 (1.33)
*ENU-6905 NAA Research To Characterize Oyster Shells At the Atomic Level - Dr. D.E. Hintenlang, Dr. P. Achey, W. Coughlin, R. Ratner	NAA Evaluation To Quantify Trace Elements To Characterize Oyster Shells At the Atomic(Elemental) Level As Obtained From Various Locations Around Florida	2.57	6.17 (1.75)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**ENV-6215 Health Physics - Dr. C.E. Roessler, Environmental Engineering Science Department, Dr. W. G. Vernetson, Nuclear Engineering Sciences Department	Lecture, Tour and Demonstration of Reactor Operations Emphasizing Radiation Monitoring and Protection Features of the Facility Plus Sample Preparation and Use of NAA and the Rabbit System To Perform Trace Element Determinations of Hair Samples on the PC Based Analyzer Systems	0.68	2.50
**UFTR Reactor Operator Candidate Training - Dr. W.G. Vernetson/Reactor Staff/Rad Con Staff	Individual Reactor Operator License Training for UFTR Reactor Operator Candidates, D. Simpkins(now SRO), D. Cronin(now SRO), and J. Wolf (in training) Plus Administration of NRC License Exams for Simpkins and Cronin	26.66 (20.63)	84.92 (36.17)
**ENV-6932 - Special Problems In Environmental Engineering - Dr. W.S. Properzio, D.L. Munroe, W.G. Vernetson, University of Florida	Series of Experimental Health Physics Exercises Related To Reactor Operations Including Demonstration of Reactor Operations with Emphasis on Radiation Monitoring and Protective Features, Development of Accident Scenarios and Emergency Response Plus Characterization and Measurement of Facility Gaseous Effluent	5.53 (2.50)	9.75 (2.75)
**Licensed Operator Requalification and Recertification Program Training Including Staff Planning/Review Meetings - Dr. W.G. Vernetson/Reactor Staff/Rad Con Staff	NRC Requalification and Recertification Training Requirements Including Lectures, Practical Training, Examinations, Startups, Shutdowns and Reactivity Manipulations as Necessary to Maintain Operator Qualification and Assure Operator Recertification Plus Various Staff Planning and Review Meetings	5.21 (0.50)	167.86 (15.25)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
NRC, ANI and Other Inspections - W.G. Vernetson, D. L. Munroe, Reactor and Radiation Control Staff	Biennial NRC Inspection of Operations and Radiation Safety Program, ANI Nuclear Safety and Property Inspection, Reactor Safety Review Subcommittee Annual Audit, Fire Marshall Inspection and University Environmental Health and Safety Division Laboratory Safety Survey Plus Completion of EPA Vent Exhaust Report and Measurements As Well As IAEA Questionnaire on UFTR Characteristics	1.13 (1.13)	55.50 (27.00)
**ENU-4101/5005- Principles of Nuclear Reactors, Dr. R. Pagano, Dr. W.G. Vernetson, NES Department Plus FEEDS Personnel	Lecture, Tour and Demonstration of UFTR Operations Emphasizing Dynamic Response Characteristics such as Prompt Jump, Steady Period, Critical Position, Delayed Neutron Effects and Prompt Drop Effects Plus Potential Uses of UFTR Facility for Research and Laboratory Exercises, for Trace Element Analysis Using the Rabbit System and PC Based Analyzers For Neutron Activation Analysis With Filming by Two(2) FEEDS Photographers for Replay for Off-Site Students	0.45	2.42
**ENV-4201 - Introduction to Radiological Health - Dr. C.E. Roessler, EES Department, Dr. W. G. Vernetson, Nuclear Engineering Sciences Department	Lecture, Tour and Demonstration of Reactor Operations Emphasizing Radiation Monitoring and Protection Features of the Reactor Facility Including Control of Radioactive Materials, Labelling of Materials/Areas, Traffic Flow, Use of the Rabbit System and Parameter Indication Changes in Starting Up and Reaching Full Power	0.37	1.75

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
***University of Florida Engineers Fair - W.G. Vernetson/Reactor Staff	Lectures, Tours and Demonstrations of Reactor and NAA Laboratory Operations For Various Visitors to the 1992 College of Engineering/Benton Engineering Council Engineer's Fair	0.00	5.08 (0.58)
Facility Upgrades - Dr. W.G. Vernetson, Reactor Staff	Various Facility Upgrade Efforts To Improve Facility Operation To Improve or Expand Experimental Capabilities and To Better Meet Regulatory Requirements To Include Installation of Push Button Telephones, a Telephone in the Cell, Darkroom Improvements, Checkout/Test of the New Solder Station, Installation of an Integral Shield in the NAA Laboratory Plus Work on a New Water Sample Evaporation Dish System	0.00	33.92 (6.75)
*Irradiation of Nitrogeneous Compounds For Nuclear Quadrupole Dosimetry Measurements - Dr. David Hintenlang, K. Jamil, NES Department	Investigation of Effects of Neutron Dose on Nitrogeneous Compounds Such as Urea and Thiourea Using Nuclear Quadrupole Resonance Spectroscopy To Correlate Dose and NQR Spectroscopic Response	32.15 (2.17)	61.16 (7.09)
Maintenance Activities To Preserve and Refurbish The Reactor Cell Appearance and Maintain Good Housekeeping - W.G. Vernetson/ Reactor Staff	Maintenance Efforts To Preserve and Refurbish Appearances Plus Various Housekeeping Efforts in the Cell and Control Room Including Updating Status Boards and Operations Logs, Performing Property Inventory, Performance of Special Surveys and Other Non-Operations Facility Activities	0.00	172.17 (23.93)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
***Miscellaneous Tours and Demonstrations - Dr. W. G. Vernetson	Miscellaneous Tours Involving Facility Demonstrations for Various Visitors Including Groups of Students Representing Various Special Interests, Alumni, Potential New Staff Members, Potential New NES Students, NES Seminar Speakers, ROTC Instructors and Students, UPD Officers, NRC Visitors, Visits by Potential or Actual Facility Users and Various Other Interested Individuals and Small Groups Including Salespersons, Utility Recruiters, and Various Physical Plant and other Maintenance Worker Individuals and Groups Involved in Service of UFTR Facilities Plus a Tour for Pictures Relative To an Overview of University Reactors That Appeared in the Chronicle of Higher Education	7.17 (4.83)	71.41 (24.43)
Emergency System Surveillances - W. G. Vernetson, Reactor Staff, Physical Plant Division Personnel, UPD Personnel	Scheduled Surveillances of Facility Fire Protection Equipment, Quarterly Manual Checks of Fire Alarm System and Inspections By Physical Plant Representatives and State Fire Marshall Plus Periodic Responses to Security and Fire Alarm Actuations	0.00	19.57 (3.83)
Test, Surveillance and Checkout Activities - W.G. Vernetson/ Reactor Staff	Scheduled UFTR Facility Component and System Tests, Surveillances, Calibrations and Related Measurements and Verification Activities Required by Technical Specifications, Procedures, NRC Commitments or Good Maintenance Practices	48.58 (9.78)	307.58 (76.37)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**Special Training For UFTR Facility Support Staff, External Support Groups and Contractors - Dr. W.G. Vernetson, Reactor Staff	Training on Radiation Worker Instructions (10 CFR Part 19) for Support Staff Including Radiation Control Personnel, Contractors, Physical Plant Division Personnel and Non-Licensed Facility Staff, Training as Rad Con Technician for One Staff Member, Training On Rabbit System For NAA Laboratory Personnel, and Second Person Qualification Training For Radiation Control and Other Support Personnel, Training on Chemical Hazards and Right-To-Know For All Facility Personnel, Training on Emergency Response and Security for UPD and Other Personnel Plus Training on Emergency Response for Gainesville Fire Department Personnel As Well As Briefing for NES Chairman on Physical Security Status	3.77 (3.77)	50.66 (23.58)
Maintenance Activities - Reactor Staff	Preventive and Corrective Maintenance and/or Replacement of UFTR Facility Components Excluding Minor Maintenance Items and Those Listed Individually to Include System Testing as Necessary	5.76 (3.05)	297.64 (71.32)

TABLE III-1 (CONTINUED)

SUMMARY OF FACILITY UTILIZATION
(September 1991 - August 1992)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
Maintenance Activities to Repair Temperature Monitoring System - W. G. Vernetson, Reactor Staff	Corrective Maintenance to Reterminate the Leads to Thermocouple Number 2 (South Center Fuel Box Outlet) Two Times with Modifications Installed (Partial Only) on the Second Occasion for ALARA Considerations for Future Failures	2.44	97.17 (14.25)
	TOTAL	**573.86 (173.87)**	**2430.03 (536.05)**
	TOTAL ACTUAL	**399.99**	**1893.98**

1. Values in parentheses represent multiple or concurrent facility utilization (Run or Experiment time); that is the reactor was already being utilized in a primary run or activity for a project so a reactor training or demonstration utilization could be conducted concurrently with a scheduled NAA irradiation, course experiment, or other reactor run. Thus, the actual reactor run time for the 1991-1992 reporting year is 399.99 hours, an increase of nearly 20% over the previous year. In contrast, the actual experiment time for the 1991-1992 reporting year is decreased slightly at 1893.98 hours, a decrease of about 0.5% indicating maintained utilization of staff time this year for reactor usage and other projects including good record keeping of project times and other activities using the facility but not the reactor especially maintenance and support-related efforts. Indeed, over 65 hours of experiment time was devoted to non-reactor services such as work with or related to the LEU SPERT fuel. The run time and experiment time before the reduction for concurrent usages shows many simultaneous multiple usages assured optimal application of staff time despite no full time SRO Reactor Manager since October, 1990 and the much reduced effort and unavailability of the Acting Manager/SRO after February, 1991. Of course, the experiment time continues to include considerable reactor usage for corrective maintenance and surveillance activities which continues at a high level; however, the numbers this year also indicate high levels of quality facility usage directed to research, education, training and service, especially as driven by the Reactor Sharing Program usages. The other driver this year was a large reduction in reactor operator training as two new SROs were licensed early in the reporting year resulting in a 50% reduction in training hours with the time picked up in research activities primarily.

2. Exp. Time is run time (total key on time minus checkout time) plus set-up time for experiments or other reactor or facility usage including checkouts, tests and maintenance involving the reactor facility.

TABLE III-2

UFTR UTILIZATION SUMMARY
(September, 1991 - August, 1992)

	Utilization Categories	Run Time (hours)		Experiment Time (hours)	
1.	College Courses and Laboratories (18)	48.05	(8.15)	242.38	(20.00)
2.	Research Activities (21)	417.14	(120.53)	674.50	(177.26)
3.	UFTR Operator Training and Re-qualification for Recertification Plus Support Staff and Other Training (3)	35.64	(24.90)	303.44	(75.00)
4.	UFTR Maintenance, Testing and Surveillance Activities, Plus Various Extended Inspection Activities (7)	57.91	(13.96)	983.55	(223.45)
5.	HEU-to-LEU Fuel Conversion Related Efforts Including SPERT Fuel Checks (1)	0.00		72.84	(5.59)
6.	Reactor Tours and Demonstrations Including High School Classes (16)	15.12	(6.33)	152.32	(34.75)
	TOTAL	573.86	(173.87)	2430.03	(536.05)

NOTE 1: The same meaning is attached to values in parentheses in Table III-2 as in Table III-1. Values in parentheses adjacent to topic areas indicate the number of entries from Table III-1 that were collapsed into this utilization category.

NOTE 2: The first two categories of College Courses and Laboratories as well as Research Activities plus the last category for high school group demonstrations include significant usages sponsored under the Department of Energy UFTR Reactor Sharing Program which allowed twenty-three(23) schools to have 106 usages of the UFTR facilities as delineated in Table III-3. This usage by 23 schools is one of the most diverse usages yet recorded under the University of Florida Reactor Sharing Program and represents by far the most total time commitment of UFTR facilities of any effort other than maintenance/surveillance activities and training of operating staff.

NOTE 3: In some cases the assignment of items to one of the six (6) categories is somewhat arbitrary especially for non-college tour groups for whom lectures and other training is conducted or research performed to aid facility modification or development and can sometimes involve extensive and relatively sophisticated usage of the facility. Indeed, a number of the high school projects have won awards at regional and state science fairs.

NOTE 4: Routine preoperational checks are generally excluded from this Utilization Summary but are estimated to account for about 15 hours additional utilization per month or approximately 180 additional hours per year.

TABLE III-3

REACTOR SHARING PROGRAM
SUMMARY USAGE OF UFTR FACILITIES
(September, 1991 - August, 1992)

School[1]	Usages[2]	Users	
		Faculty	Students
Bolles High School(BHS)	1	2	7
Central Florida Community College (CFCC)	12	2	15
Chamberlain High School (CHS)	1	2	17
Crystal River High School (CRHS)	1	2	37
Dunnellon High School (DHS)	1	1	64
Eastside High School (EHS)	2	2	12
FFFS Science Engineering & Humanities Symp. (High School)	1	1	18
Florida Accelerated Initiatives Seminar (High School)	1	2	45
Florida A&M University (FAMU)	12	1	1
Florida Comm. College at Jacksonville North Campus (FCCJ)	1	2	19
Florida State University (FSU)	44	6	3
Heritage Christian School (HCS)	3	4	44
High School Scholar Group	1	1	31
Hillsborough Community College (HCC)	1	1	11
Jacksonville University (JU)	1	2	6
Mainland High School(MHS)	5	2	5
Piper High School (PHS)	3	1	4
Ridgewood High School (RHS)	1	1	2
Santa Fe Community College - Gainesville (SFCC-G)	2	3	38
Santa Fe Community College - Starke (SFCC-S)	1	1	18
Southeast Missouri State University (SEMSU)	4	1	1
Union County High School (UCHS)	4	1	22
University of Wisconsin, Eau Claire (UWEC)	3	2	1
TOTAL	106	43	421

1. School abbreviation in parenthesis can be used elsewhere in this report to determine appropriate user designations in the details of usage delineated in Table III-1.

2. Usage is defined as utilization of the University of Florida Training Reactor facilities for all or any part of a day with the average being about four (4) hours. In many cases a school can have multiple usages but all related to the same research project or training program such as three projects for Florida State University that involved long term irradiations as did others such as for Union County High School or the multiple usage training programs conducted for Central Florida Community College radiation protection technology students and Union County High School students.

TABLE III-4

MONTHLY REACTOR ENERGY GENERATION[1]
(September, 1991 - August, 1992)

Monthly Totals	Energy Generation Monthly Ranking[2]	KW-Hrs	Hours at Full Power
September, 1991	8	1354.710	12.351
October, 1991	10	1204.924	11.817
November, 1991	9	1280.480	12.584
December, 1991	11	549.889	5.017
January, 1992	6	1611.500	14.483
February, 1992	7	1537.596	15.001
March, 1992	5	1985.192	19.434
April, 1992	4	2376.244	21.783
May, 1992	1	4479.289	44.483
June, 1992	3	2421.342	22.600
July, 1992	2	3038.176	29.952
August, 1992	12	50.891	0.450
YEARLY TOTAL		21,904.233[3]	209.955

1. The yearly total energy generation of 21.904 Megawatt-hours for the 1991-1992 reporting year represents a significant 25% increase over the last year's total of 17.52 Megawatt-hours, while the 209.96 hours at full power represent a similarly significant though smaller 7.0% increase over the previous yearly total of 196.21 hours. These values for the 1991-1992 reporting year are still among the lowest in several years. Nevertheless, with overall availability at only 72.68% (see Table III-6) plus the availability of two (2) new senior operators for most of the year, this year's energy generation and usage is much improved. The large time commitments for training efforts to prepare additional operators to be licensed was reduced this year. Several outages due to failures in the nuclear instrumentation, in the temperature monitoring system, in the secondary cooling system and in the stack diluting fan caused some lost facility usage and hence affected energy generation negatively, though not excessively during the year. The largest problem by far was two failures of in-core thermocouples during the year. However, the increase in energy generation from last year was primarily due to the availability of additional operating personnel as two new operators were licensed as SROs early in this reporting year. The total run time for the facility increased considerably above the previous year at 399.99 hours (see Table III-5) for this reporting year; nevertheless, there was considerable low power run time too for neutron radiography, interrogation of spent fuel pool absorber coupons, teaching laboratories, and various demonstrations and experiments as well as UFTR operator training; overall, the indication is toward a combination of low and high power usage and continued high utilization of the reactor when the reactor and the necessary licensed operators are available. With the licensing of two-new SROs early in the reporting year, the availability of operating personnel was improved; as a result training hours were greatly reduced and research hours nearly doubled. Nevertheless, the inability to hire a full-time Reactor Manager continues to limit facility usage. Efforts continue to hire such a full-time person. With the continued high utilization and with the good availability experienced over most of the reporting year, coupled with adequate licensed personnel, an increased yearly energy generation value can be expected next year. With expected hiring of a new Manager (SRO) early in the next year, great improvement of these statistics can be expected.

2. This column showing the ranking of monthly energy generation is included for correlation with results of environmental monitoring in Chapter VII.

3. The 21,904 kW-hrs energy generation is one of the lowest values for the past decade, ranking seventh for this period. However, the increase over the previous year is the first such increase since the 1986-1987 years and is especially encouraging after the 17,519 kW hrs. for the 1990-1991 year was the lowest in eight years. Never- theless, it is still ranked relatively high at number 13 for the last 23 years.

TABLE III-5

MONTHLY REACTOR USAGE/AVAILABILITY DATA
(September, 1991 - August, 1992)

Monthly Totals	Key-On Time	Exp. Time[1]	Run Time[2]	Availability[3]
September, 1991	26.60 hrs.	165.50 hrs.	20.23 hrs.	59.17%
October, 1991	28.10 hrs.	164.08 hrs.	22.50 hrs.	60.48%
November, 1991	27.10 hrs.	146.58 hrs.	22.05 hrs.	41.67%
December, 1991	21.20 hrs.	141.08 hrs.	18.70 hrs.	50.00%
January, 1992	43.30 hrs.	149.00 hrs.	38.87 hrs.	99.19%
February, 1992	32.60 hrs.	160.17 hrs.	27.40 hrs.	77.59%
March, 1992	52.00 hrs.	181.08 hrs.	46.18 hrs.	99.19%
April, 1992	46.40 hrs.	157.25 hrs.	42.27 hrs.	94.17%
May, 1992	61.30 hrs.	139.50 hrs.	55.14 hrs.	85.48%
June, 1992	53.20 hrs.	150.58 hrs.	49.68 hrs.	98.33%
July, 1992	47.00 hrs.	142.83 hrs.	42.45 hrs.	82.26%
August, 1992	18.10 hrs.	186.33 hrs.	14.53 hrs.	27.42%
TOTALS:	455.90 hrs.	1893.98 hrs.	399.99 hrs.	72.91%

1. Experiment Time is Run Time (Total Key-On Time minus Checkout Time) plus set-up time for experiments, tours, or other facility usage including checkouts, tests and maintenance involving reactor running or facility usage.

2. The three categories of facility usage data in this table show general significant increases over the previous year, especially those related to reactor operations. Key-on time is up nearly 16.5% while run time is similarly up nearly 19.9%, primarily due to increased availability of the reactor and the licensing of two new reactor operators in October, 1991 together with the continued growth of interest in the facility; experiment time is actually decreased very slightly by nearly 0.53% over the previous year, showing no great changes though the experiment time is much better used for research, training and education during this past year.

3. Monthly Average availability is 72.63%; **however, unlike in previous years, this availability accounts for lost availability for administrative reasons as well as for repair and maintenance related reasons.** This unavailability has significant contributions due to administrative unavailability caused by unavailability of personnel (23.50 days or 6.44%) with forced unavailability at only 72.25 days or 19.80% and planned unavailability at only 4.25 days or 1.16%. On the basis of days of forced outage for the year, the forced unavailability is only 19.74% as indicated in Table III-6. The yearly availability has remained relatively constant from the value of 74.00% in the last year to 72.68% for this reporting year though 7.60% of the unavailability is planned or administrative in nature in this year's total. Overall the availability represents an improvement of the average availability recorded for the last reporting year. This is due to avoiding any long outages though the two periods of forced unavailability in September/October and again in July/August for failed fuel box thermocouple connection repairs were significant in length with the first over a week and the second the longest for the year at over three weeks. Other than this outage, the remainder of the year saw the usual variety of maintenance activities and equipment failures in several systems including the nuclear instrumentation systems, the stack diluting fan system and the deep well pump with a number of outages several of which were for the better part of a week each. Nevertheless, the large value of experiment time especially shows continued high utilization of the UFTR facility as does the reasonably high overall availability of 72.68% which includes administrative unavailability for this reporting year.

TABLE III-6

UFTR AVAILABILITYSUMMARY
(September, 1991 - August, 1992)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
September, 1991	59.17%	12.25 days	Maintenance to correct the Safety Channel 2 trip indicator (3-1/4 days). Maintenance to check out and recalibrate the stack radiation monitor and then reschedule and assure proper calibration of the system a second time (2-1/4 days). Maintenance to isolate the cause of the lost temperature indication from the south center fuel box including unstacking structure and shielding, repairing failed thermocouple connection, restacking the reactor shielding and performing radiation surveys following restacking (6-3/4 days).
October, 1991	60.48%	13.25 days	Maintenance to complete recovery from failed thermocouple connection on the south center fuel box (1 day). Administrative shutdown for checks to answer questions about the existence of and performance of surveillance checks on the deep well pump trip on loss of power alone raised by NRC License Examiner to assure and document proper evaluation and response to this potential abnormal occurrence (5 days). Maintenance to replace the cell overhead lights (1/4 day).

TABLE III-6

UFTR AVAILABILITYSUMMARY
(September, 1991 - August, 1992)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
			Maintenance involving planned unavailability to secure the Reactor Vent System for asbestos removed in Room 9 (1 day).
			Administrative shutdown (planned unavailability) due to unavailability of Director/Reactor Manager to attend a meeting (6 days).
November, 1991	41.67%	17.50 days	Maintenance to check out the compensated ion chamber following power cutoff (1/4 day).
			Maintenance to correct low reading of Safety Channel #2 percent power meter in calibrate (1-1/2 days).
			Maintenance to check out and correct problems with the Safety Channel #2 meter circuit following loss of circuit pegged downscale at full power (6-3/4 days).
			Maintenance to free a sticking indicator needle on the stack radiation monitor and then to adjust the stack monitor mechanical zero setting (1/4 day).
			Evaluation of unscheduled trip due to loss of secondary city water flow (3/4 days).
			Administrative shutdown (planned unavailability) due to absence of Director/Reactor Manager at a meeting (5 days).

TABLE III-6

UFTR AVAILABILITYSUMMARY
(September, 1991 - August, 1992)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
			Administrative shutdown for Thanksgiving Holiday (3 days).
December, 1991	50.00%	15.50 days	Maintenance to perform preventive maintenance on the temperature recorder (1/4 day).
			Maintenance to identify the failed +15 volt power supply in NI Channel 1, to identify and acquire an equivalent replacement and then install and check out the power supply (8 days).
			Maintenance to remove failed stack diluting fan shaft bearings and pillow blocks and then to locate replacements for the nonstandard items and have them installed by Physical Plant Division technicians (4-3/4 days).
			Administrati shutdown (planned unavailability) due to unavailability of Director/Reactor Manager at a meeting (1-1/2 days).
			Administrative shutdown for Christmas Holidays (1 day).
January, 1992	99.19%	0.25 days	Maintenance to repair, clean and lubricate the motor drive gear on the stack radiation monitor (1/4 day).
February, 1992	77.59%	6.50 days	Maintenance to replace failed secondary cooling system deep well pump and associated check valve and to adjust the flow indicator setting for the secondary cooling system (4-3/4 days)

TABLE III-6

UFTR AVAILABILITYSUMMARY
(September, 1991 - August, 1992)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
			Maintenance to refill the primary coolant storage tank (1/4 day - concurrent).
			Maintenance to replace the failed Safety Channel 1 high voltage power supply, repair the circuit and move the connection for the power supply to a better insulator (1 day).
			Maintenance to repair failed temperature recorder and then later to correct alignment of the temperature print wheel and reverse the ink pads (3/4 day).
March, 1992	99.19%	0.25 days	Maintenance to repair contacts in the overhead crane power controls to allow completion of the weekly checkout (1/4 day).
April, 1992	94.17%	1.50 days	Maintenance to replace two burned out fuses and check out the stack dilution fan system (1/4 day).
			Maintenance to restore the recording function of the North Area Radiation Monitor (1/2 day).
			Maintenance for preventive checks and maintenance inspections on the overhead crane (1/4 day - concurrent).
			Maintenance to check out and repair the S-1 and S-3 control blade position indicating circuits by replacing burnt out resistors (3/4 days).

TABLE III-6

UFTR AVAILABILITYSUMMARY
(September, 1991 - August, 1992)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
May, 1992	85.48%	4.50 days	Maintenance continued to check out and repair the S-1 and S-3 control blade position indicating circuits by replacing burnt out resistors (3-3/4 days). Evaluation and checks following unscheduled trip due to loss of power (1/4 day). Maintenance to test operation of the emergency diesel generator and automatic bus transfer (1/4 day). Maintenance to replace temperature recorder ink pads and maintenance to adjust the secondary flow low flow mercury switch (1/4 day).
June, 1992	98.33%	0.50 days	Maintenance to repair the East Area Radiation Monitor and perform circuit calibration and source calibration checks with the instrument installed (1/4 day). Maintenance to refill the primary coolant storage tank (1/4 day).
July, 1992	82.26%	5.50 days	Maintenance to evaluate and isolate the failure of thermocouple point #2 and then allow the reactor to cool awaiting the start of shield unstacking for fuel inspection and repair of the thermocouple system (3-1/2 days). Administrative shutdown due to unavailability of Facility Director/Reactor Manager on vacation (2 days).

TABLE III-6

UFTR AVAILABILITYSUMMARY
(September, 1991 - August, 1992)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
August, 1992	27.42%	22.50 days	Maintenance to evaluate and isolate the failure of thermocouple point #2 and then allow the reactor to cool awaiting the start of shield unstacking for fuel inspection and subsequent repair of the thermocouple system (21 days - 3/4 days concurrent). Fuel Inspection Activities (2 days - 1-1/4 concurrent). Maintenance by physical plant division personnel to replace/upgrade doors on the diluting fan room (1/2 day - concurrent). Maintenance to add demineralized water to the shield tank and maintenance to repair bad contactors in Breaker #9 to restore normal reactor cell power (1/4 day - concurrent). Maintenance to repair Breaker #9 and to review wiring and connections (1 day). Maintenance to install a service disconnect on Breaker #9 and to reroute the diesel generator sensing wire to avoid undesired repowering events (1/2 day).

TABLE III-6

UFTR AVAILABILITYSUMMARY
(September, 1991 - August, 1992)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
			Maintenance to refill the primary coolant storage tank (1/4 day - concurrent).

TOTAL ANNUAL UNAVAILABILITY:	100 days = 27.32%
1. TOTAL FORCED UNAVAILABILITY:	72.25 days = 19.74%
2. TOTAL PLANNED UNAVAILABILITY:	4.25 days = 1.16%
3. TOTAL ADMINISTRATIVE UNAVAILABILITY:	23.50 days = 6.42%

NOTE 1. This availability summary neglects all minor unavailability for periods smaller than one quarter day. In most cases these periods are for much less than an hour as some minor problem is corrected, usually during or after a preoperational checkout. This availability summary also neglects unavailability for scheduled tests and surveillances except where noted.

NOTE 2. The 100.00 days unavailability, were basically for forced (72.25 days) and planned (4.25 days) outages due to maintenance for repairs, delay awaiting parts arrival, trip evaluations, etc., plus an additional 23.50days of administrative shutdown delineated in this table for holidays and associated personnel vacations or unavailability of management to approve operating where the reactor was or could have been made operational if really needed.

NOTE 3. It should be noted that only Category 1 and 2 unavailability values were listed under repair and maintenance related (loss of reactor) unavailability last year. The total unavailability in these categories is down considerably this year from 94.25 days (25.82% unavailability) to 76.50 days (20.90% unavailability). The lost availability for administrative reasons remains relatively unchanged as it has increased only from 23.25 days to 23.50 days.

TABLE III-7A

UNSCHEDULED TRIPS

During this reporting year, the UFTR experienced three unscheduled trips described below. There were three unscheduled trips reported in the first three months of the 1989-1990 reporting year but none during the 1990-1991 reporting year. So, it is worth noting that these three trips are the first experienced in nearly 24 months. These trips are not considered to have significantly affected reactor safety or the health and safety of UFTR personnel or the public. All safety systems responded properly for each trip and a full review was conducted prior to restart in each case to include prompt reporting as considered necessary or advisable. It is worth noting that the three trips described and evaluated in this table are the only trips for the current reporting year and all are evaluated to be due to building power loss or fluctuations, not due to equipment failure. Although a number of failed components were replaced to complement replacement of degraded components along with preventive cleaning and repair of circuit connections in the 1989-1990 reporting year, the effort clearly represented time well spent with no further spurious trips for the 24 months following the last trip on November 29, 1989 and none due to facility equipment failure in nearly three years.

Number	Date	Description of Occurrence
1.	18 Nov 91	After a startup begun at 1210 hours intended to measure the temperature coefficient of reactivity (A-1 Surveillance), an unscheduled reactor trip occurred at 1234 hours due to the secondary cooling water flow dropping below the 8 gpm minimum as required by the Limiting Safety System Setting (LSSS). Power level was only slightly above 1 kW. Previously the secondary city water had been valved back to assure higher temperatures for the A-1 surveillance. A daily checkout had been completed with both the well water and the city water supplying the secondary cooling water. The secondary cooling water logic had been placed in the city water mode of operation and had been tested satisfactorily, signifying city water flow was above the 8 gpm trip point. The well water warning light and the flow scram (well water) light were on as is normal in city water mode operation. When reactor power was brought above one kilowatt (where the secondary water LSSS protective function actuates), the reactor tripped automatically. The cause was evaluated to be that the city water flow rate had dropped below the 8 gpm setpoint and had caused a trip on low flow. In normal city water secondary cooling operation, the only indications of flow are the 60 gpm light (well water FLOW SCRAM) and the SEC PRESS scram light. When flow is 8-60 gpm, there was no indication of the correct flow - only yes or

TABLE III-7A (CONTINUED)

UNSCHEDULED TRIPS

Number	Date	Description of Occurrence
		no on 8 gpm. The actual flow could have been slightly above the trip setpoint and subsequently fell below with a slight variation in city water pressure. All safety and control systems functioned properly and all procedures were followed prior to this event with no safety or radiological problems associated with this event. The cause of the trip was evaluated to be related to the lack of good variable flow determination in the city water system as well as expected fluctuations in water pressure from the local utilities.
		In order to avoid this trip occurrence in the future two recommendations have been made and approved by the Reactor Safety Review Subcommittee (RSRS) Executive Committee. The first is to install a flow meter on the city water line on the secondary piping system. This device will allow an accurate determination and indication of actual flow. The second recommendation is to install a throttle or globe valve on the line. Currently there is a gate valve, which is used for isolation but does not give good throttling characteristics. These two adjustments will assure more accurate flow rate information for operation in the city water mode and assure better valving of the flow rate. Use of this city water cooling mode for reactor protection is committed to be discontinued until these or equivalent changes are implemented. Since it is very infrequently used, this restriction is not a problem; as a result, the requirement that city water flow be used for the A-3 Surveillance has been removed from SOP-E.7 per approval of the RSRS Executive Committee at its meeting on 25 November 1991.
		It was decided to report this event to NRC Region II in the same way as for a potential Tech Spec violation although the evaluation of the UFTR Staff and Reactor Safety Review Subcommittee Executive Committee was that it did not require prompt notification. NRC Region II was notified of this event per a telephone conversation on 18 November 1991 and agreed with our evaluation and the decision to make a prompt report on the occurrences. On this basis and since the RSRS Executive Committee had evaluated the event as not promptly reportable at its meeting on 18 November 1991 and with no

TABLE III-7A (CONTINUED)

UNSCHEDULED TRIPS

Number	Date	Description of Occurrence
		violation involved, the requisite preoperational checks were performed and the UFTR was approved for restart on 18 November 1991. Craig Bassett of Region II was apprised of this change in an unrelated telephone call on 26 November 1991. Reactor Management and the RSRS Executive Committee agreed there was no compromise to reactor safety in the occurrence, nor to the health and safety of the public. Other than making the improvements to the city water cooling system to allow better flow-control and flow monitoring, as well as committing not to use the system for reactor operation until improvements are made, this occurrence is now considered closed with a final report submitted to NRC dated November 27, 1991 (See Appendix C).
2.	13 Dec 91	After a second startup begun at 1445 hours to support detector calibration measurement experiments in progress at the south beam port at various power levels, a reactor trip occurred at 1611 hours due to momentary reduction of AC power dropping out the PC pump relay and yielding a trip on the PC PUMP limiting safety system setting. The perceptible flickering of the overhead lights noted by the SRO at the console and the RO supporting the experimental effort supported this evaluation as the voltage drop was just sufficient to drop out one trip relay for the PC PUMP trip. Following the trip, the reactor was secured at 1612 hours and the event evaluated to be a trip from a known cause not requiring prompt reporting but to be reported in the annual report to NRC. Following completion of UFTR Form SOP-0.6A (Unscheduled Reactor Trip Review and Evaluation) and successful completion of the preoperational checkouts, the reactor was approved for restart. Since the experimenters felt their detector assembly had yielded as much information as possible in the given configuration and would have to be removed and reconfigured prior to performing further measurements, the reactor was not restarted on 13 December 1991, primarily due to nearing the end of the work day.

TABLE III-7A (CONTINUED)

UNSCHEDULED TRIPS

Number	Date	Description of Occurrence
3.	19 May 92	At 1522 hours after 17 minutes operation and while holding critical at 1 watt for sample insertion, all power was lost in the reactor cell with lights out for a brief period of time (several seconds) resulting in a full trip of the reactor. All control and safety systems responded properly with emergency lights (required) and diesel generator (not required) responding as expected. After evaluation of this trip from a known cause and completion of UFTR Form SOP-0.6A, (Unscheduled Reactor Trip Review and Evaluation), a daily checkout was completed with subsequent approval for return to normal operations which was accomplished on 20 May 1992 after another successful daily checkout with no further problems noted. This event is evaluated to have negligible safety impact on the reactor and no radiological safety consequences on reactor staff or members of the public. Though not a promptly reportable event, this unscheduled trip was evaluated as reportable in the annual report.

TABLE III-7B

SCHEDULED TRIPS

There were no scheduled trips performed for training or experimental purposes during this reporting year. Part of the reason for this lack of scheduled trips was the failure to schedule any large utility operator training programs where such trips are a designed part of the training program. It was expected that some training trips would be included in the ENU-5176L Reactor Operations Laboratory course for the upcoming reporting year to demonstrate similarities and differences in power response for trips versus normal shutdown as well as in various student laboratory exercises to demonstrate rapid decay and recovery of stack count rate with power reduction and increase as part of Argon-41 stack effluent measurement exercises, but this did not occur. It is expected these training trips may occur in the 1992-1993 reporting year. Such trips can also be used to provide training in control room presence and awareness of changing conditions and responses in training UFTR operator license candidates and may be utilized as time permits in the next reporting year.

Number	Date	Description of Occurrence
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TABLE III-8

LOG OF UNUSUAL OCCURRENCES

During this reporting year there were no events which are considered to have compromised reactor safety or the health and safety of the public. Several events, classified as unusual occurrences or abnormal occurrences in one case per the definition in the UFTR Technical Specifications, are described below as they deviated from the normal functioning of the facility and are included here as the most important such deviations for the reporting year. Unscheduled shutdowns are included here as well. Trips are not addressed here since they are included in Table III-7 along with corrective and preventive maintenance and surveillances implemented in response to the trips. Administratively the most important occurrence (classified as an abnormal occurrence) was the potential tech spec violation for apparent failure to check adequately as part of the quarterly scram checks (Q-1 Surveillance) whether loss of secondary coolant well pump power causes a trip and also for failure to conduct the requisite quarterly operability tests on the loss of secondary pump power trip; however, this occurrence (See Number 4) had no safety or health related impact as the Q-1 surveillance was modified to perform the required tests. The most significant occurrences actually were those associated with equipment failure (#3, #5, #6 and #8) and the related modifications and corrective actions necessitated by aging of system components. The most significant occurrences would be the two failures of thermocouple system point #2 (occurrence #3 and #8) plus the momentary loss of safety channel #2 and its trip capability resulting in an unscheduled shutdown (occurrence #5). Overall, none of these eight (8) unusual/abnormal occurrences is considered to have had significant impact on the safety of the reactor or on the health and safety of the public. In addition, all have been reviewed to assure adequate consideration of their effects with four (4) reported promptly to the NRC (#3, #4, #5 and #8).

Number	Date	Description of Occurrence
1.	6 September 1991	During the daily checkout, the Safety Channel 2 Meter trip indication was noted to be above 125 kW at approximately 128 kW. Under MLP #91-51 the trip indication was adjusted and verified to be correct on 9 September 1991 for several checkouts. The adjustment did not impact the previously performed calibration for which voltages were confirmed per documentation on MLP #91-51 with the reactor returned to normal operation following a successful daily checkout on 10 September 1991 with no further problems noted.
2.	18 September 1991	Following a startup to full power, the stack high level alarm actuated after 1 hour 14 minutes at full power. The operator on duty noted the indication on the stack monitor was the normal

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		value of about 2000 cps, not the 4000 cps at which the alarm is set. The operator performed an unscheduled shutdown and noted the stack alarm would not reset until the stack count rate was well below 2000 cps at about 1500 cps. Per the unscheduled shutdown evaluation and MLP # 91-53, the stack monitor detector was checked out with the alarm indication found to have drifted down to about 2100 cps (conservative). After recalibration and a check on 18 September 1991, a calibration check was performed again on 20 September 1991 to confirm the problem was not recurring. Subsequently the UFTR was returned to normal operation on 20 September, 1991 but with no further operation until radiation levels were checked at stepped power levels of 1, 10 and 100 kW following restacking for the unrelated thermocouple repair project on 30 September 1991 with no further problems noted with the stack monitor.
3.	24 September 1991	During the weekly checkout on 24 September 91, point number 2 (south center fuel box outlet line) on the temperature recorder was noted to drift upscale for an alarm. Under MLP #91-54 the recorder was checked out and continuity of cables was confirmed back to the equipment pit. Subsequently under RWP #91-07-I, the core shielding was unstacked, a connection on the thermocouple lead for point #2 was repaired on 27 September, 1991, the thermocouple was verified to be operational and the core shielding restacking was completed on September 30, 1991. Radiation surveys were performed around the restricted area at 1 kW, 10 kW and 100 kW to confirm proper shielding configuration on September 30, 1991. After completion of radiation surveys in restricted as well as key unrestricted areas, the reactor was returned to normal operations on October 1, 1991 with no further problems noted.

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
4.	2 October 1991	Following completion of administration of two SRO Licensing Examinations on 2 October 1991, the NRC License Examiner raised a question about whether a loss of pump power on secondary deep well cooling would cause a trip as required by Tech Specs - primarily because both SRO candidates seemed unknowledgeable on this point. This question caused evaluation of whether the requisite surveillance in Table 3.2 of the Tech Specs had been performed properly; that is, whether loss of secondary coolant well pump power causes a trip and whether it has been the subject of operability tests at the required quarterly intervals. Previously the daily checkout was the only regular check on the secondary cooling trip where the loss of flow/loss of pump power were checked as one check; this check still seems valid since a loss of pump power gives a loss of flow. Nevertheless, the trip checks on the primary coolant system do involve separate LOW FLOW and Loss of Primary Coolant Pump Power checks on the Q-1 Quarterly Scram Checks so it was decided to implement separate checks simply to insure the most restrictive interpretation of the Tech Spec surveillance requirements are met. This event was reported to NRC Region II as a potential Tech Spec violation although the feeling of UFTR staff was that it was not a violation since the intent of the Tech Specs for both trips was considered to be met by the check of the secondary coolant low flow trip on the daily checkout. Nevertheless, reactor management agreed that the exact operation of the trip should be verified and checked with an update of the Quarterly Scram Checks (Q-1 Surveillance) implemented as necessary. The examiner also needed this information for his examination results.

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		On 3 October 1991 NRC Region II was informed of the occurrence as well as the question as to whether the Tech Spec surveillance requirements had been being met on loss of secondary coolant well pump power per Section 3.2.2(2). Mr. Klein and Mr. Collins of NRC Region II were told the current feeling is that the existing surveillance has been adequate and agreed we could restart upon RSRS Executive Committee approval. The situation was discussed with Mr. Craig Bassett on 4 October 1991 and he also agreed with how it was being addressed and that we would submit a final report on our determinations within the requisite two weeks required for potential violations of the Tech Specs per Section 6.6.2(3)(g).
		On 7 October 91 this trip on loss of secondary cooling pump power alone was verified by turning on city water ~75 gpm, adjusting the wide range drawer test signal above 1 kW and then turning off the deep well pump while still on deep well cooling logic and with no loss of flow. Since the trip occurred as required by loss of secondary pump power alone, the UFTR was then considered to meet fully the surveillance requirements in Table 3.2 of the Tech Specs when subjected to the most restrictive interpretation. This check of the trip on loss of secondary coolant pump power alone was committed to be incorporated, into the surveillance data sheet for the Quarterly Scram Checks (Q-1 Surveillance) prior to next performing the Q-1 checks. It was to be delineated to allow using city water to bypass the LOW FLOW secondary trip or, if city water does not exceed the 60 gpm trip point, then the LOW FLOW trip will be bypassed to test the trip on loss of secondary pump power alone. Following RSRS Executive Committee approval on 7 October 1991, the UFTR was returned to normal

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		operations on 8 October 1991 with the final report to NRC submitted as a letter dated 16 October 1991 (See Appendix B) with only an update of the Q-1 Quarterly Scram Check Surveillance Form remaining to be completed. This change was incorporated into the Surveillance Data Sheet in time for the Q-1 Surveillance performed on 1 January 1992. It should be noted that this occurrence is not considered to have affected the safety of the facility or the health and safety of UFTR staff or the public.
5.	19 November 1991	On 19 November 1991, after the second startup of the day was begun at 1340 hours and after 32 minutes of operation at full power and irradiation of several samples in the rabbit system, the Safety Channel #2 meter was noted to flicker and then drop out hard downscale (pegged). Because this event represented a loss of Safety Channel #2 overpower trip capability, an unscheduled reactor shutdown was initiated at 1432 hours with the reactor shutdown and secured at 1433 hours. The event was noted immediately with two operators present to observe the shutdown and system responses. All operator responses in the event were proper. During the shutdown with power at about 10 kW some 20 seconds or so after commencing the unscheduled shutdown, the Safety Channel #2 meter was noted to return to read normal.
		After completion of the unscheduled shutdown, Maintenance Log Page #91-61 was opened and the test trip of Safety Channel #2 was noted to be operating normally. Because of the hard downscale nature of the channel failure and no indication on any other monitoring, recording, or trip channel, the fault was isolated to the Safety Channel 2 meter circuit which contains two amplifiers whose failure was initially thought to

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		be a possible cause of the event. At this point, in agreement with input from several members of the Reactor Safety Review Subcommittee (RSRS), reactor management decided to report this event to NRC Region II as a potential Tech Spec violation. Subsequently, during extended bench testing and checks of the meter circuit assembly, an intermittent fault in the fine adjust potentiometer of the circuit was isolated, although it was not the source of the Safety Channel failure. Per 10 CFR 50.59 Evaluation and Determina- tion No. 9109 (Safety Channel #2 Calibration Module), both the coarse and fine gain potentiometers were replaced with sealed potentiometers to provide better resistance to environmentally-driven degradation. The coarse gain potentiometer was replaced with an identical component, only sealed; the fine gain potentiometer was also replaced but with a 250Ω versus a 200Ω sealed adjustable potentiometer. This change was evaluated to represent only about 0.33% change in sensitivity with the circuit response left unchanged - only the adjustable setting is slightly different to provide the proper full power calibration from a verified unchanged voltage input to this point in the circuit. Extensive additional analysis and checks were performed on the meter and related circuits. Subsequently, the Safety Channel #2 amplifier card was reseated and further checks performed including circuit run checks, heat and cold tests and checks of all Safety Channel #2 harness assemblies and connectors with no further faults noted. Since oxidation/corrosion on contacts has occasionally been a problem with the instrumentation in this console and since this intermittent type failure could have been caused

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		by such oxidation of contacts, it was evaluated that the cleaning of the contacts by reseating the Safety Channel amplifier card had corrected the fault with no further repair or maintenance needed especially in light of the extensive checks that had been run.
		On 25 November 1991 the RSRS Executive Committee met to review the occurrence and corrective actions taken prior to approving restart. In particular, the specifics of the occurrence were reviewed per the completed Unscheduled Shutdown Review and Evaluation (UFTR Form SOP-O.6B). The Executive Committee also concluded it to be a potential abnormal occurrence and a potentially reportable occurrence per UFTR Technical Specifications, Section 6.6.2delineating requirements for special reports and per SOP-O.6, Section 3.2.3.3.3 indicating certain safety system failures are promptly reportable. The communications with Region II as documented in the prompt notification letter and in a telephone conversation on November 20, 1991 with Mr. Ed McAlpine were also reviewed. Subsequently the unrelated corrective action to replace both the coarse and fine gain potentiometers in the Safety Channel #2 calibration module with sealed potentiometers for better environmental protection was reviewed and approved under 10 CFR 50.59 Evaluation and Determination No. 91-09 to include replacement of the two potentiometers. Based on the extensive circuit checks, the nature of the failure indicating the probable cause to be failure in the meter circuit and the corrective action involved in cleaning the meter circuit and other contacts, the RSRS approved restart subject to resetting the meter circuit assuming the channel calibration was unchanged, performing a valid preoperational check and providing NRC Region II with notification of restart and subject to the

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		recommendation to observe the safety channel for a period with an extra person following reaching power; UFTR management agreed to do this. NRC Region II (Craig Bassett) was notified of the intent to restart with a commitment of a second reactor operator to be present for the first two hours at full power to assure noticing any recurrence of the failure. Subsequently the restart was successful as Safety Channel #2 responded properly. The UFTR was then considered to be returned to normal operations. The cleaning of contacts is considered to have corrected the cause of this Safety Channel #2 failure. The occurrence has been evaluated as a potential abnormal occurrence; however, the loss of the trip function on Safety Channel #2 was brief, the reactor was promptly shutdown and secured and the other reactor protection system channels were all operable. Therefore, the event is considered to have negligible effect on reactor safety and no effect on the health and safety of the public. The fact of the successful restart was communicated to NRC Region II (Craig Bassett) on 2 December 1991 with a final 14-day report of the event submitted to NRC via a letter dated December 3, 1991 (See Appendix D).
6.	16 December 1991	During the weekly checkout the lamps for the SAFETY 1, HIGH VOLTAGE and PERIOD trips or Limiting Safety Systems Settings (LSSSs) could not be reset after being in the normal operational condition earlier in the morning. Although there had been a PC PUMP trip due to a momentary AC power reduction on the previous Friday (13 December 1991), the subsequent successful preoperational checkout on 13 December and the normal status of the trip indication lights earlier on 16 December were

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		evaluated to indicate this occurrence was unrelated to the trip. Under MLP #91-65, the cause of the problem was traced to a failed +15V power supply (+15 volt capability) in Nuclear Instrumentation Channel 1. Due to the lack of a stocked spare and the unavailability of this power supply from normal suppliers, an alternate but equivalent power supply was finally obtained on December 20, 1991. Under 10 CFR 50.59 Evaluation Number #91-10, the new +15 volt power supply was evaluated to meet or exceed all the required specifications for the failed power supply and was considered an acceptable replacement. Subsequently the appropriate modifications were made to accommo- date the slightly different shape and physical size of the supply; after installation, the appropriate voltages were verified to agree with those of the last system power calibration so the reactor was approved for restart on December 24, 1991. Subsequently a successful power run was conducted on December 26, 1991 to verify normal operations after the lengthy shutdown with no further problems noted.
7.	26 February 1992	At 1458 hours after 2.63 hours operation and over 2 hours at full power to irradiate samples, the temperature recorder stopped recording. With all other monitoring, control and safety systems operating normally, an unscheduled shutdown was completed by reactor operator G.W. Fogle with an unscheduled shutdown review and evaluation indicating the event did not involve any radiological or other hazard and all other systems responding properly. Under MLP #92-08 the cause of the failure in the recorder was determined to be a set screw anchoring the bar holding the temperature recorder print wheel which had worked loose. After reinserting and tightening the set screw, the reactor was authorized to run to full power for monitoring the

Eileen Yokuda from EG&G Idaho to visit for two days in December, 1991 to see the unique difficulties involved in trying to check the UFTR core and sub-core connections and dimensions due to the unstacking of shielding and removal of fuel required plus review of fuel drawings sent by Ms. Yokuda in August, 1992. It now appears a complete dummy core may be necessary to assure the fuel will fit in the core.

The level of administrative work dedicated to regulatory and licensing activities is expected to remain at a similar or even higher level during the next reporting year. The efforts to update the UFTR SAR and the Emergency Plan will continue as will review and evaluation of SOPs and other facility documents. Of course, considerable facility management effort will be devoted to performing calculations and preparing the license amendment package for HEU-to-LEU conversion during the upcoming year, though the safety analysis submittal may have to be delayed to the following reporting year. In addition, it is likely that shipment of the remaining fuel from the SNM-1050 SPERT facility, as well as shipment of waste from the UFTR will involve considerable administrative effort. The net result is that administrative efforts directed at compliance with NRC requirements will not be reduced but will likely be significantly increased during the next reporting year, especially as efforts begin to prepare for the implementation of the revised 10 CFR Part 20 in January, 1994.

The considerable test, maintenance and surveillance activities required by the facility license, Technical Specifications and other regulatory requirements also contributed significantly to usage and personnel commitments. Details on these surveillance and maintenance usages are presented in Section V of this report, while any associated modifications or evaluations of potential unreviewed safety questions are tabulated in Section IV. This contribution has been considerably reduced from last year with no really large outages. Despite the lack of any single really large outage during this year, and despite elimination of some previously recurring problems such as console two-pen recorder failures, the total time spent on maintenance activities is significant, especially for two repairs of thermocouple #2 in the core area in September, 1991 and again in July/August, 1992 accounting for nearly a full month of forced outage time though partial implementation of a modification involving terminal strips and quick disconnects should begin to facilitate future repairs of this nature while minimizing dose commitment. The objective here is to meet the intent of keeping radiation doses as low as reasonably achievable (ALARA). There was also significant time spent on corrective and preventive maintenance on the nuclear instrumentation circuits for various failures as well as for the annual nuclear instrumentation calibration check, on the secondary cooling system to replace the deep well pump and associated check valve, on repairs of the control blade position indicating circuits, on the stack radiation monitor and on the area radiation monitoring system with most problems not recurring to demonstrate effective corrective action for most failures.

E. Facility Summary Overview

The reactor and associated facilities continue to maintain a high in-state visibility and strong industry relationships. With the DOE Reactor Sharing Program to support UFTR-related research by faculty and students at other academic institutions as well as training for various high school, community college and university programs around the state, the reactor facility is also maintaining high in-state visibility with other educational institutions. This situation is particularly true among high school science departments where reactor sharing supported usage has increased significantly in the last few years with even larger increases in size and diversity of usages expected during the upcoming year. The interactions of several small externally supported research programs as a result of the Reactor Sharing work is further proof of its effectiveness as is the continued generation of proposals to obtain external funding based on results of research obtained under Reactor Sharing support.

The description of various projects associated with the UFTR is given in Section VIII; the listing of projects continues to be quite extensive. Although several projects are listed without having associated reactor use, all had some level of staff and/or facility involvement during the year. The same is true of the list of publications and reports associated with the UFTR; the listing given in Section IX of this report is one of the more extensive lists in the last ten years and generally delineates the diversity and quantity of facility usage, including a number of publications in respected journals and transactions.

With the sustained statewide interest, the facility is being included in several proposals to provide for funded usage of the UFTR and the NAA Laboratory. Several such usages occurred during each of the past six reporting years (1986-1992). The Reactor Sharing Program began in late 1983 and is directly responsible for the generation of a number of these proposals. As more of these proposals are submitted and funded, further increases in UFTR usage can be expected. In any case, on-campus research and service usage of the UFTR is also increasing because of the visibility generated via the Reactor Sharing Program. Each year more faculty utilize the reactor for a significant class-related usage or a research project. Continuity of Reactor Sharing Program funds at the 11% increased level for the next year gives the facility renewed expectations for increased external usage as does the continued licensing of two new senior reactor operators and expectations to hire a reactor manager. In general, the level of interest in the facility is high though expanded on-campus usage for funded research is a continuing objective. Nevertheless, the role of the facility in attracting quality high school students to seek careers in science and engineering at the University of Florida should not be ignored.

Finally, it is hoped that more direct industry training will be accomplished in the upcoming year. One small usage was conducted in each of the three years prior to the 1989-1990 reporting year but none are scheduled yet for next year; nevertheless, the lack of utility interest in training programs other than operations usage for SRO certification makes it unlikely significant growth will occur in this area. With the rabbit system and the associated NAA and neutron radiography facilities plus the DOE Reactor Sharing Program and expectations for increased research funding from other agencies, expansion and diversification in facility usage are realistic expectations and could be significant, especially with the increased number of licensed senior reactor operators continuing for the next reporting year. Implementation of a prompt gamma facility is perhaps two years away but it too could make a significant impact on usage as several individuals would like to use such a facility.

The expectations for the 1992-1993 year are positive. Significant opportunities for expanded education and research usages are apparent. The significant possibilities for continued growth in existing and new program areas are a challenge that is being addressed vigorously with efforts to hire a reactor manager. With sufficient support, there is no limit to possibilities for growth in facility usage.

II. UNIVERSITY OF FLORIDA PERSONNEL ASSOCIATED WITH THE REACTOR

A. Personnel Employed by the UFTR[1]

W. G. Vernetson	-	Associate Engineer and Director of Nuclear Facilities/Reactor Manager (September 1, 1991 - August 31, 1992)
R. Piciullo[2]	-	Senior Reactor Operator and Acting Reactor Manager - Administrative Consultant (1/20 time) (September 1, 1991 - August 7, 1992)
D. Simpkins[3]	-	Student Senior Reactor Operator Trainee (3/4 time) (September 1, 1991 - October 16, 1992)
	-	Senior Reactor Operator (3/4 time) (October 17, 1991 - August 31, 1992)
	-	Acting Reactor Manager (3/4 time) (August 11, 1992 - August 31, 1992)
D. Cronin	-	Student Senior Reactor Operator Trainee (1/2 time) (September 1, 1991 - October 16, 1991)
	-	Senior Reactor Operator (1/2 time) (October 17, 1991-August 31, 1992)
G. W. Fogle	-	Reactor Operator (1/3 time) (September, 1991 - August, 1992)

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[1]In October the two student senior reactor operator trainees D. Simpkins and D. Cronin, both with U.S. Navy experience, took and passed the NRC-administered SRO license examination and were certified on October 17, 1991.

[2]A letter indicating Mr. Piciullo's license was no longer needed was submitted to NRC via letter dated August 18, 1992. Mr. Piciullo's notification of license expiration dated August 27, 1992 was received on August 31, 1992.

[3]A letter indicating Mr. Simpkins has assumed the Acting Reactor Manager position was submitted to NRC dated August 10, 1992.

J. Wolf[4]	-	Student Reactor Operator Trainee/Technician (1/4 time) (August 17, 1992 - August 31, 1992)
T. Becker	-	Student Radiation Control/Facility Technician/ Facility Clerk (1/2 time) (September 1, 1991 - December 17, 1991)
T. Downing	-	Student Radiation Control/Facility Technician (1/2 time) (May 30, 1992 - August 31, 1992)
P. Merrow	-	Secretary Specialist (3/4 time) (September, 1991 - August, 1992)

B. Radiation Control Office

D. L. Munroe[5]	-	Radiation Control Officer (September, 1991 - August, 1992)
J. A. Keeley	-	Radiation Control Technician (September, 1991 - June, 1992)
S. E. Martin	-	Radiation Control Technician (September, 1991 - May, 1992).
M. M. LaFranzo	-	Nuclear Technician (May, 1992 - August, 1992)
M. Raja	-	Nuclear Technician (September, 1991 - August, 1992)

Basic routine health physics is performed by UFTR staff; however, assistance from the Radiation Control Office is required for operations where a significant dose (Level I RWP) is expected or possible and where certain experiments are inserted or removed from the reactor ports. These personnel are also required for certain operations where high contamination levels may be expected. They also periodically review routine UFTR radiation control records and operations and assist in performance of certain radiation safety and control related surveillances. As a result, a number of radiation control office personnel are noted and though employed 1/3, 1/2 or full time, only a small fraction of their work effort supports UFTR activities. Several others with only infrequent contact at the UFTR are not listed though they are available for backup purposes.

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[4]At years' end a student reactor operator trainee, J. Wolf, with U.S. Navy experience has begun training, whether for an RO or SRO license is undecided.

[5]The specified alternates for the Radiation Control Officer position are Ms. Kathleen Buckley, J. Keeley and W. Coughlin. Note that J. Keeley ceased employment in June, 1992.

C. Reactor Safety Review Subcommittee (RSRS)

M. J. Ohanian	-	RSRS Chairman (Associate Dean for Research, and Administration, College of Engineering and Professor, Department of Nuclear Engineering Sciences
W. G. Vernetson	-	Member (Reactor Manager and Director of Nuclear Facilities
J. S. Tulenko	-	Member (NES Department Chairman)
W. E. Bolch	-	Member-at-Large (Professor, Environmental Engineering Sciences)
D. L. Munroe	-	Member (Radiation Control Officer)

D. Line Responsibility for UFTR Administration

J. V. Lombardi	-	President, University of Florida
W. M. Phillips	-	Dean, College of Engineering
J. S. Tulenko	-	Chairman, Department of Nuclear Engineering Sciences
W. G. Vernetson[6]	-	Director of Nuclear Facilities/Reactor Manager
R. Piciullo	-	Acting Reactor Manager (September, 1991 - August 7, 1992)
D. Simpkins	-	Acting Reactor Manager (August 11, 1992 - August 31, 1992)

E. Line Responsibility for the Radiation Control Office

J. V. Lombardi	-	President, University of Florida
G. Schaeffer	-	Vice President, Administrative Affairs
W. S. Properzio	-	Director, Environmental Health and Safety
D. L. Munroe	-	Radiation Control Officer

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[6]Dr. W. G. Vernetson continues to serve as Director of Nuclear Facilities and Reactor Manager with Mr. Piciullo serving as part-time Acting Reactor Manager on an administrative consultant basis only until August 7 1992. Mr. Simpkins assumed the Acting Reactor Manager status on August 11, 1992.

III. FACILITY OPERATION

The UFTR continues to experience a high rate of utilization especially when compared to several years such as the 1985-1986 reporting year when large outages for corrective maintenance limited reactor operation. Total utilization continues at or near the highest levels recorded in the early 1970's in most areas; most indicators are up for the year because of the increase in licensed operations staff during the reporting year. This continuation of a high rate of UFTR facility usage has been supported by a variety of usages ranging from research and educational utilization by users within the University of Florida to research, educational and training utilization by users around the State of Florida through the support of the Department of Energy Reactor Sharing Program with over half of the costs of this latter usage not covered by Reactor Sharing. Again this year, several externally supported usages have also continued to impact reactor utilization and support the continued diversification of facility activities and capabilities, especially through the hiring of part-time laboratory assistants for support work in the analytical laboratory and to provide funding for facility improvements. A Department of Energy Instrumentation Grant also provided support for instrumentation upgrades during the year.

As noted over the last eight years, the refurbishment of the Neutron Activation Analysis Laboratory has impacted favorably on all areas of utilization from research projects using NAA to training and educational uses for students at all levels especially for student design-related projects. With successful implementation of an improved remote sample-handling "rabbit" facility, efforts to advertise availability and encourage usage of the UFTR (especially for research) have proceeded in a favorable light though always less quickly than hoped over the last eight years. Implementation of the standard rabbit capsule size with larger carrying capacity during the 1986-1987 reporting year further supported use of the facility. The additional implementation of two state-of-the-art PC-based spectrum analyzer systems with complete ORTEC software packages for spectrum analysis and data reduction has been a key support factor for reactor utilization during the last five reporting years for education and training uses as well as research and service projects, several of which constitute ongoing but promising seed projects to support proposals for external support. The 1987-1988 reporting year was the first full year for availability of the PC-based analyzers using ORTEC software with standardized rabbit system capsule size. The NAA Laboratory was also outfitted with its own independent sample and standards drying facility during the 1987-1988 reporting year with full implementation accomplished during the 1988-1989 reporting year. The result of these various improvements has been an easier and faster turnaround of samples submitted to be irradiated for Neutron Activation Analysis. In addition, the shielding around the pneumatic sample insertion (rabbit) system used to facilitate short irradiations for neutron activation analysis was upgraded during the 1988-1989 reporting year.

The experimental neutron radiography facility was also upgraded during the 1988-1989 reporting year. With installation of a semi-permanent shielding cavity as well as design and implementation of a movable table to position objects to be radiographed along with movable shielding blocks, the UFTR neutron radiography facility has reached a level of mature application with much reduced installation time and more reliable results. Not only has it been used for several demonstrations, exercises and experiments for university classes, as well as for visitors from other educational institutions (Reactor Sharing) and for two senior projects to document implementation, but, perhaps more significantly, it has been used extensively for one externally funded user with reasonably consistent results over the past few years. Further improvements were implemented in the radiography facility during the 1990-1991 reporting year to improve the beam quality in an attempt to reduce the exposure times needed for various types of radiography with further improvements planned to improve beam quality, reduce installation time and standardize exposure time during the upcoming year. This work was at a much reduced level in the last two years due to the need for funding to support the effort as well as efforts to train new personnel in radiography techniques.

During the 1989-1990 reporting year, a senior project was completed to design an automatic sample changer for the NAA Laboratory. Before the last reporting year began, the manufacture of this device was completed and it was partially implemented but its timing circuit would only allow it to insert a single sample. During the 1991-1992 reporting year plans were partially implemented to redesign the timing circuit to provide a fully automated sample changer to eliminate technician time to change samples overnight, thereby greatly increasing the sample throughput in the analytical laboratory. During the 1991-1992 reporting year, this redesign has been continued but only partially complete as the effort has been refocused to include software development for the attached computer system to assure samples are properly counted and the data stored for later analysis. This effort is now complete but some work remains to be completed on the timing circuit to make the software and the sample changer compatible. During the 1990-1991 reporting year, the newly released and improved next generation ORTEC software package (OMNIGAM) for spectrum analysis was acquired and implemented on the PC-based analyzers to improve analysis capability and sensitivity; this upgrade assured these PC-based analyzer systems remain state-of-the-art in analysis capability though the computers themselves were now in need of replacement and/or upgrade to speed analysis of samples and save analysis time while maintaining throughput.

During the 1991-1992 reporting year further NAA Laboratory improvements were made. First, additional storage capacity was obtained for the laboratory computers to improve the speed with which analysis is performed along with a new monitor to replace a failed one. These were obtained with facility funding. A 92X Spectrum Master spectroscopy system was obtained to provide computer-controlled gamma spectroscopy with user friendly, yet sophisticated capabilities. A model 919 Spectrum Master multichannel buffer was also obtained for high performance data acquisition in nuclear spectroscopy applications. It interfaces with a personal computer and up to four (4) HPGe detectors for data processing, giving the laboratory the capacity for future expansion. An analysis upgrade package was also obtained. The SyncMaster 3 is a key multifaceted upgrade in laboratory analysis because it provides extensive graphics capabilities, high resolution, easy-to-read commands, and the ability to alternate back and forth between programs during analysis. It is especially useful for students and researchers working on projects in the NAA Laboratory and significantly reduces experiment time expended by students and laboratory personnel. There is still a great need for at least one new computer. However, two other pieces of equipment were obtained. The most important was an integral shield for one of the PC-based detector-analyzer systems. This integral shield was obtained with funding from the DOE University Reactor Instrumentation Grant and represents a significant improvement in the sensitivity that can be reached in analyzing samples by reducing interferences from external radiation sources, lowering detection limits and reducing counting time. It is hoped that a second shield can be obtained for the other detector in the next reporting year. These last three items were all obtained with DOE support using the University Reactor Instrumentation Grant. In addition, a desiccator station was obtained for the NAA Laboratory as a donation from another researcher. The desiccator increases the capacity to store both standards and samples with the added assurance of preventing moisture intrusion. By increasing the storage capacity there should be a better possibility of developing more projects. All of these improvements were designed to increase laboratory throughput while enabling laboratory workers to address experiment design, improve student laboratory experiences and generally assure better results are obtainable with optimal effort.

Several other significant items were also obtained under the University Reactor Instrumentation Grant. These included an electronic maintenance repair tool kit which has saved hundreds of hours of maintenance effort during the year. The facility also obtained a high speed chart recorder to facilitate time allocated to several surveillances as well as a portable neutron sensitive survey meter to avoid delays when the previously borrowed instrument was not available. This equipment support has greatly facilitated operations during the reporting year.

With the continued support of the DOE Reactor Sharing Program in the 1991-1992 reporting year (at a slightly increased level from the 1990-1991 grant year), there was continued significant usage by a wide variety of users from a broad spectrum of schools for educational as well as research purposes; again, several proposals for separate research funding are in progress. During the 1991-1992 reporting year, there has also been continued slow growth in reactor usage for both educational and research programs sponsored by the University of Florida but spurred by Reactor Sharing users. One relatively large funded project from the Endodontics Department in the Dental School has been utilizing the reactor and NAA Laboratory to examine mercury content of laboratory rat brain and kidney tissues following bone implantation of mercury amalgam. Another smaller project in the pharmacology department has used the UFTR to generate radioactive copper-64 for calibration of its positron-emission tomography (PET) scanner. The research area shows several relatively large projects with proposals awaiting funding and/or demonstration of feasibility using UFTR facilities.

Plasma kinetics research has been an active area in the past; though relatively inactive in the 1989-1991 reporting years, it saw renewed activity in this last year as a doctoral student performed part of the research for his degree. There is also a proposal for instrumentation development in this area of plasma kinetics, which still may be funded. Finally, there were also several commercial research irradiations and related projects again this year with one utilizing the radiography facility and beam transmission facilities for over 75 hours. When combined with the computational analysis capabilities for NAA, it is hoped more such usages will be forthcoming during this next year to complement further UFTR research and educational utilization activities whether supported by the University of Florida, Reactor Sharing or externally funded sources.

The level of administrative work dedicated to regulatory activities is expected to be at a similar or increased level during this next reporting year. Although the facility received one NRC inspection during the reporting year in February, 1992 in the areas of Reactor Operations and Radiation Safety, it was cited for no violations. The inspection in February, 1992 was one of the better inspections in that several areas such as management involvement in facility operations, low contamination levels and low personnel radiation doses were called out as noteworthy with no program weaknesses noted. The inspection report (see Appendix A) did note two non-cited violations, one of which was for failure to follow the procedure for checking control blade interlocks prior to startup when the daily checkout is omitted. The other was for failure to adhere to surveillance requirements to check whether a loss of pump power on secondary deep well cooling would cause a trip. Both violations were licensee reported, the latter violation as a result of the observations of NRC operator license examiner P. Isaac following administration of SRO license examinations for D. Simpkins and D. Cronin.

Activities in response to the NRC inspection as well as various efforts to maintain facility compliance and responsiveness occupied significant facility management and staff time during the reporting year. In particular, the time devoted for SRO license examinations for D. Simpkins and D. Cronin by NRC license examiner P. Isaac, in October, 1991, the subsequent response to the examination, the documented incorporation of subjects identified incorrectly as "generic program weaknesses" and the various checks, documentation and final report on the failure to perform the required surveillance of the limiting safety system setting on Loss of Secondary Coolant Pump Power (see report to NRC in Appendix B) involved much commitment of resources. Although this non-cited "violation" was considered primarily a matter of semantics, response to it along with documenting response to the "generic weaknesses" involved many days of effort. In addition, the occurrences and reporting to NRC on the unscheduled trip on loss of secondary flow on city water in November, 1991 (see Appendix C for the report to NRC), the potential violation of technical specifications for a Safety Channel #2 circuit failure (see appendix D for the report to NRC) and failure of fuel box outlet thermocouple (see Appendix E for the report to NRC) all involved considerable commitments of time for review, corrective action and communications with NRC.

Development and submission of Physical Security Plan Revision 10 in September, 1991 (approved in October, 1991), Emergency Plan Revision 7 in December, 1991 (approved in June, 1992) and Safety Analysis Report Revision 7 (submitted as information not requiring approval in June, 1992) along with subsequent incorporation in the master documents following approval each required considerable time commitments. Documentation for UFTR Emergency Plan Revision 7 is in Appendix F while documentation for UFTR Safety Analysis Report Revision 7 is in Appendix G.

One of the largest commitments of time was in response to NRC Project Manager Ted Michael's letter of November 13, 1991 listing a series of eleven questions resulting from review of the UFTR Reactor Operator Requalification and Recertification Training Program. As a result the Program was completely reviewed and rewritten to reflect the Program as implemented, including many items added to nearly double the number of scheduled training sessions over the past six years. Although the Program Plan did not appear to meet Part 55 requirements as originally submitted for renewal in the previous reporting year, it was always considered to do so. The rewritten Training Program fully documenting the Program as implemented was submitted in December, 1991 with NRC approval received via a letter from Project Manager Ted Michaels in February, 1992. The documentation for this rewritten Plan is contained in Appendix H.

Some additional time was also spent updating the estimated cost of decommissioning to meet the new requirements of 10 CFR 50.33 and 50.75 first promulgated in the 1990-1991 reporting year. As required, the updated cost was produced and documented in a memorandum dated August 25, 1992 to the UFTR Decommissioning Information File showing the estimated decommissioning cost has been increased to $2.18 million. These special responses to and communications with NRC were in addition to the usual information supplied periodically via telephone calls, the quarterly safeguards reports, the updated HEU to LEU Conversion Proposal submitted in March, 1992 to meet the requirements of 10 CFR 50.64(c)(2), as well as response to an Oak Ridge National Laboratory request for completion of an NRC National Profile on Mixed Waste Questionnaire resulted in a commitment of more time in the 1991-1992 reporting year for responses and communications with NRC than in most previous years despite not having to respond to the major biennial inspection of facility operations.

Other regulatory agencies also affected the UFTR in the reporting year. Responses in September, 1991 to an American Nuclear Insurers (ANI) inspection of the previous year as well as responses to an inspection in May, 1992 involved considerable time. Though both inspections agreed the facility was operated and maintained acceptably, addressing a total of eleven recommendations for improvement including dismissing several recommendations occupied considerable time as did completion of an ANI records retention questionnaire in November, 1991. Completion of an EPA Survey form for input on their review of standards controlling radionuclide air releases in October, 1991 also took a number of hours.

During the 1991-1992 reporting year, considerable effort was also spent in following up the decision made three years ago not to utilize the pin type SPERT fuel for conversion of the UFTR from HEU to LEU fuel. Subsequent efforts in transferring 1200 SPERT fuel pins to Oak Ridge National Laboratory plus revising the SNM-1050 "storage only" license and then moving the fuel to a new location in the Nuclear Research Field Building and then decontaminating the facility involved nearly 140 hours of experiment time, as well as considerable administrative effort. In the 1990-1991 reporting year this effort was reduced to about 60 hours though considerable administrative effort was expended in attempting to arrange shipment of this unneeded fuel to a secure DOE facility like Oak Ridge National Laboratory without success. Similar efforts were expected in the 1991-1992 reporting year with no success as the Department of Energy apparently has no room for the SPERT fuel and even requested to be allowed to return the 1200 pins from ORNL. This latter effort was not allowed as the current storage facility does not have sufficient room for accepting the 1200 pins back.

After the loss of the student performing the neutronics safety analysis for the UFTR HEU-to-LEU conversion at the end of the 1988-1989 reporting year, there was also considerable management effort involved in training a new student and then rechecking the computational methodology and essentially starting from scratch on the actual core calculations to support the HEU to LEU conversion. Although this project had been further delayed, real progress was made in the 1990-1991 reporting year in essentially completing the static neutronics calculations based on efforts in the previous year to assure the computational methodology is adequate to analyze the existing core as a benchmark for further calculations. With the previous completion of static neutronics calculations and production of a masters project, efforts during this reporting year were directed toward thermal hydraulics analysis as a 14-plate fuel bundle of standard silicide fuel plates was selected as the final design for the LEU core. It was expected that considerable facility management effort would again be devoted to the analysis and then to preparing the license amendment package for the HEU-to-LEU conversion during this reporting year. The thermal hydraulic analysis was essentially completed during the year. However, completion of documentation of the analysis for the license submittal was delayed though the writeup was begun with the assistance of one graduate student who only worked on the project part-time for about two months. Another extension for the submittal of the safety analysis to NRC was noted in the proposal submitted in March, 1992 to NRC with another no cost extension of funding for this work submitted to DOE in April, 1992. One other area requiring considerable time was for Eileen Yokuda from EG&G Idaho to visit for two days in December, 1991 to see the unique difficulties involved in trying to check the UFTR core and sub-core connections and dimensions due to the unstacking of shielding and removal of fuel required plus review of fuel drawings sent by Ms. Yokuda in August, 1992. It now appears a complete dummy core may be necessary to assure the fuel will fit in the core.

Shown in Table III-1 is a summary breakdown of reactor utilization for this reporting period. The list delineates UFTR utilization divided into sixty-six (66) different educational, research, training, tests, surveillances and facility enhancement operations and general tour/demonstration and educational activities. The total reactor run-time was just under 400 hours while various experiments, surveillances, maintenance and other projects used nearly 1894 hours of facility time, not counting a large block of time devoted to routine daily and weekly checkouts. In addition, there were many concurrent usages during the year to optimize utilization of available personnel. The run time represents a significant increase of nearly 20% from last year due primarily to the licensing of two senior reactor operators early in the reporting year though the lack of a regular Reactor Manager separate from the Director for nearly all of the year for all except non-licensed consultant-type activities as the Acting Reactor Manager continued to limit usage. The large increase in run time is in agreement with an increase from the relatively low availability for the last two years (67.2% and 74.0%, respectively) to a closer-to-normal level of availability this year (72.91%) despite accounting for lost availability for administrative reasons for the first time. Otherwise, the value would be about 79.35% availability.

With the efforts to finish training two new senior reactor operators (SROs) early in the year and beginning training of another late in the year plus administrative activities and the usual large educational component of facility usage not requiring or involving only minimal reactor operation, the size of the increase in run time was somewhat to be expected. In contrast, the experiment time represents a very slight decrease of over 0.5% without accounting for over 536 hours of concurrent experiment time in a variety of areas. This concurrent time is one of the highest ever showing good use of facility personnel especially for educational activities, many involving the Reactor Sharing Program. The only slight decrease in experiment time is primarily attributed to the relatively high reactor availability (72.91%) for the year, plus utilization of all part-time personnel has resulted in reaching a ceiling on hours of facility usage without a full-time Reactor Manager. Although two senior reactor operator candidates were licensed (October 17, 1991) and certified (October 28, 1991) early in the reporting year, one additional operator candidate was hired and began training in mid-August, 1992 to assure an adequate staff level. The sustained level of experiment time is also attributed to continued improvement in record-keeping of project times using the facility or its staff but not the reactor, such as tour groups, and over 67 hours for project work with the LEU SPERT fuel for checks at the Nuclear Research Building.

Despite the lack of any single really large outage during this year, the total time spent on maintenance activities is significant, especially for two repairs of thermocouple #2 in the core area in September, 1991 and again in July/August, 1992 accounting for nearly a full month of forced outage time though partial implementation of a modification involving terminal strips and quick disconnects should begin to facilitate future repairs of this nature while minimizing dose commitment. There was also significant time spent on corrective and preventive maintenance on the nuclear instrumentation circuits for various failures as well as for the annual nuclear instrumentation calibration check, on the secondary cooling system to replace the deep well pump and associated check valve, on the stack radiation monitor and on the area radiation monitoring system with most problems not recurring to demonstrate effective corrective action for most failures.

The large increase in run time along with no real decrease in experiment time are directly attributable to the combination of reasonably good reactor availability (72.9%) for the year coupled with the licensing of two new SROs in October, 1991 and the continued high interest in the usage of the UFTR for education, training, research and service activities. The outlook is reasonably good for increased run time in the next year also as both new SROs will be present for the full year with one SRO trainee already hired and beginning training at year's end. In addition, the new year should see a renewal of the advertisement to seek a permanent replacement for the Reactor Manager (SRO) to assure adequate staff supervision.

In summary, these figures in Table III-1 indicate continued high and diverse utilization of the UFTR facility with research and educational usage maintained in most areas and increased in many areas despite the inability to hire a permanent Reactor Manager and overall availability at 72.9% including administrative shutdowns when the necessary staff was not available or when response to a safety question was in progress as for the investigation of the failure to check the LSSS on pump power. The design and implementation of various new facilities as well as the refurbishment of existing facilities continue to play a key role here to enhance and promote educational, training and research utilization at all levels. In addition, the newly implemented neutron radiography facility has been available for the entire year; it still needs to be further upgraded to facilitate usage as it is now nearing optimization to provide a strong base for continued growth and diversification of usage during the upcoming year as the facility is further optimized to attract more users, several of whom have again expressed interest in its use for research projects. It is hoped that the donation by Rhone-Poulene of various vacuum cassettes and gadolinium screens can be effectively used during the upcoming year to acquire better quality radiographs. Of course, the Reactor Sharing Program is planned to continue to play a key overall support role in encouraging facility usage in all categories as this support has been renewed, again with an increased level after the decreased budget levels in the 1989-1990 reporting year and this past year following the previous peak level in the 1988-89 reporting year. This increase is small but well-deserved considering that the past four years have seen the most diverse facility usage in the last twenty years, primarily due to the synergistic effect of the Reactor Sharing Program as it causes others to also investigate usage of the facility. As in the current year, the facility expects to utilize the UFTR facilities for reactor sharing supported activities for well over twice the usage time covered by program funding; the remainder is essentially an inducement to support future growth in facilities utilization among those who can be made cognizant of its unique capabilities. In past years these latter usages were frequently delayed due to unavailability of sufficient support personnel or facilities; these delays except for unfunded seed projects were greatly reduced during this reporting year.

Table III-2 summarizes the different categories of reactor utilization: (1) college and university teaching, (2) research projects, (3) UFTR operator training, requalification and recertification, experimental facilities enhancement plus UFTR testing, maintenance, surveillance activities, (5) HEU-TO-LEU fuel conversion related efforts, and (6) various tours, reactor operations demonstrations and educational activities which is a final category to account for all other planned usages. The absence of any utility operator training is a point that continues to be noteworthy versus ten years ago; efforts continue periodically to interest utilities in usages and will continue during the upcoming year but, other than an occasional SRO requiring a few hours of usage-type training for a utility management position, there is little interest by utilities in training programs. Although one utility asked for a proposal for a large training program four years ago, this is not a likely area for large scale increases in facility usage, especially with the installation of multi-million dollar simulators at all power reactor sites and the inability of utility training departments in Florida to include such minimal training costs at the UFTR in their budgets.

College course utilization involved 18 different courses, some many times to account for over 40 hours of actual run time, an increase of more than 60% over the previous 1990-1991 year, which had itself shown a significant increase from the 1989-1990 reporting year. The research utilization consisted of some 21 projects using over 296 hours of actual reactor run time exclusive of internal research into reactor characteristics. This number of usage hours is also increased significantly by over 50% from the previous year, primarily because of increased availability of the reactor and facility personnel to meet diverse operational needs while also addressing other activities including regulatory agency needs, increased requalification program training activities for the two new SROs and one new SRO trainee as well as various UFTR facility administrative, surveillance and maintenance efforts. Both of these categories include considerable concurrent usage to optimize personnel utilization still further. As noted, there are decreases in several areas from the last reporting year, especially in the UFTR operator training area with two senior reactor operator trainees licensed early in the year and another SRO-candidate not beginning training until near the end of the year. As indicated earlier there was no significant change in the maintenance, testing and surveillance activities, primarily because of the extensive maintenance efforts on the nuclear instrumentation channels and related circuits primarily as part of the annual nuclear instrumentation calibration check plus extensive and repeated maintenance efforts on the Reactor Vent System including the stack radiation monitor, diluting fan bearings and the diluting fan tachometer-generator in the 1990-1991 reporting year.

As indicated earlier, the most significant maintenance efforts this year included two repairs of thermocouple #2 connections in the core area plus partial implementation of a modification to simplify future repairs plus corrective maintenance on the nuclear instrumentation circuits, the blade position indicator circuits, replacement of the deep well pump an check valve and on the stack and radiation monitoring systems. No other maintenance efforts required large commitments of resources or extensive outage commitments. Though the only maintenance effort that involved more than a week or so was the work associated with the repair of thermocouple #2 connection and associated modification, the other projects did involve considerable unavailability though there were few recurring failures this year. The remaining surveillance and maintenance time for the year was at a relatively low level.

The HEU-to-LEU fuel conversion related efforts also involved relatively low though significant levels of efforts involving reactor facility time as shown in Table III-2; nevertheless, considerable analysis efforts were expended in advancing this project. Finally the last category of reactor tours and demonstrations in Table III-2 showed another significant increase as the number of university-sponsored groups as well as high school classes visiting the facility for substantive demonstrations and experiments continues to increase.

Of course, the training and operational programs supported under the DOE Reactor Sharing Program, the large amount of internally supported usage for education and research plus several service activities all contribute to maintain the total facility utilization at high levels especially since growth in University of Florida course usage continues at a slower rate. With many educational and several large research projects (including several sponsored by Reactor Sharing and several others possibly deriving from the University of Florida Endodontics and Pharmacology Departments) already scheduled for the upcoming year, this next year promises to produce facility utilization at a higher level than that experienced during this most recent reporting year, again dependent on availability of licensed personnel as well as personnel trained to work in the NAA Laboratory to support reactor operations. A single utility operator training program could also produce a substantial increase in usage time by itself, though this is unlikely. With several significant maintenance projects completed and performed during past years, replacement of the two-pen recorder two years ago plus significant maintenance this year on the nuclear instrumentation circuits and the thermocouples in the core outlet cooling lines with plans to replace several key systems dominating maintenance activities during the upcoming year, this high usage expected for the 1992-1993 reporting year is realistic especially in the areas of educational usage for college courses and for research and service activities, both on and off campus.

Table III-3 contains a breakdown delineating the 23 schools and their 106 usages of the UFTR facilities which were sponsored under the Department of Energy Reactor Sharing Program Grant DE-FG07-83ER75103. These Reactor Sharing usages account for nearly 170 hours of run time in Categories 1, 2 and 6 in Table III-2 with over 79 additional hours of concurrent run time, exclusive of the even larger quantities of non-run, facility usage experiment time involved, especially for visiting classes in categories 1 and 6 of Table III-2. Reactor Sharing usages have resulted in maintaining and fostering improved visibility for the UFTR around the State of Florida and also among researchers and other users at the

University of Florida, many of whom are just beginning to recognize the unique capabilities of the UFTR facilities. The total experiment time for reactor sharing usage, not counting concurrent usages, was over 450 hours; this is excellent considering the reactor availability of 72.9% which makes the renewal of the Reactor Sharing grant funds at a higher level for the next year all the more encouraging. Several new inquiries for involvement in the Reactor Sharing Program have been received again this year; several new users have also been accommodated. In all, the 106 usages represent an increase from last year with the diversity and length of individual usages with the total of 43 participating faculty continues at an all time high level. The 421 students involved also represent a large increase from the large number generated in each of the last two years and with the diversity of groups involved again demonstrating the broad based role of the Reactor Sharing Program as a key factor in UFTR utilization and education in nuclear science and engineering around the State of Florida.

Much of the increased diversity is due to the effort to involve high school science students in research and education programs at the UFTR, which received continued emphasis for the fourth straight year resulting in several high school research projects in addition to the usual educational usages. Obviously this DOE Program remains a key driving force behind the continued utilization and growth of interest in the UFTR facility. This publicity is certainly a key factor in explaining the continued large number of visitors (1432 versus 1067 in the previous year) of all types who toured the facility again this year; this is one of the largest numbers of visitors in facility history and accounts for the increase in the sixth category in Table III-2 for substantive demonstrations, experiments and tours, many of which occupied a half day or more. By maintaining and even increasing further the number of visitors this year, the facility is continuing to increase the number of persons who are familiar with the facility and its capabilities. Therefore, the UFTR facility continues to build and support a base for long-term permanent growth and support of facility utilization with the Reactor Sharing Program serving as the catalyst for this growth but by no means the only source of visitors. The implementation of the various facility improvements such as the PC-based analyzers and improved software in the NAA Laboratory, the integral shield, the redesigned rabbit system capsule, the drying ovens, sample desiccator and standards storage containers as well as the radiography facility are simply spinoffs from the various expressed needs of those visiting the facility in conjunction with staff interests in diversification of capabilities and can only serve to increase opportunities for new usage. The ability and willingness to tailor experimental usages and demonstrations also plays a significant role in fostering interest among high school and college groups. Similarly, as the neutron radiography facility has become functional, though some optimization and final design efforts continue, plans are continuing to investigate the feasibility of implementing a prompt gamma analysis facility at the UFTR with continuation of preliminary design considerations begun at the end of the last reporting year. Interest has been expressed in such a facility by researchers at the University of Florida Materials Science and Engineering Department, at the University of South Florida (Tampa) and by one industry user, all of whom could use such a facility. It would clearly complement the normal NAA capabilities and facilitate further growth and diversification of usage. Again, funding support and facility personnel time for design work are the limiting factors.

Detailed in Table III-4 are the monthly and total energy generation figures, as well as the hours at full-power per month and totals for this past year. The UFTR generated 21.904 MW-hrs during this twelve month reporting period, up over 25% from last year and the first increase since the 1986-1987 reporting year, the lowest yearly value since the 1982-

1983 reporting year prior to implementation of the Reactor Sharing Program. Although not as high as most years during the 23-year period (ranking seventh in the last ten years) for which the UFTR has been licensed to operate at 100 kW, and considering the lack of a full-time Reactor Manager for the full year, the lack of licensed SROs until late October, 1991 and only the 72.9% availability for the year, the energy generation in this reporting year relative to previous years is indicative of high facility usage, especially when compared to years prior to initiation of the DOE Reactor Sharing Grant in the 1983-1984 reporting year. This fact is emphasized by the high numbers of hours of educational facility usage for which licensed personnel are involved in other than reactor operation and for which reactor operation is only a small but integral part. Since there were several research usages such as Neutron Radiography projects as well as extensive operations laboratories and operator training seasons where the usage was lengthy but at relatively low or fluctuating power levels, the power generation could have been considerably higher. Indeed, even with a 72.9% availability factor for the year, the real limitation on usage has been a combination of Reactor Manager/Facility Director unavailability, licensed personnel unavailability, lack of funded support for desired usages especially for some of the reactor sharing projects and time lost for maintenance as well as scheduled surveillances and inspections of all kinds (NRC, ANI, RSRS, etc.) as well as for responses to regulatory agencies (NRC, EPA, ANI, etc.) for which time commitments continue to increase, especially for the NRC component.

Described in Table III-5 is a monthly breakdown of usage and availability data. As noted in Section I of this report, there was only one relatively large individual outage (close to a month) for the second repair of thermocouple point #2 plus partial implementation of a modification to facilitate future repairs. Except for the first repair of point #2 and replacement of a safety channel power supply, no other outages approached a week in length during the year so the overall availability should be and is up considerably from 74% in the previous reporting year. Though only quoted as 72.9% availability in Table III-5, one point is important. Unlike in previous years, this availability accounts for lost availability for administrative reasons as well as hardware problems. At 23.50 days of administrative shutdown (6.42%) for vacations, absences of personnel and evaluations of records, this contribution is significant. If not counted, availability would be over 79% since forced and planned unavailability for maintenance was reduced from 94.25 days to only 76.50 days with no single month at 100%. For the year the availability is still far below the historically high level of 91.5% recorded in the 1987-1988 reporting year.

Similarly, Table III-6 contains a detailed breakdown of days unavailable each month with a brief description of the primary contributors. The overall availability of 72.68% in this table is based on days per year and is again somewhat below the average of close to 80% over the last five years; however, this value would also be some 6.42% higher if administrative shutdowns were not included. Improvement is expected in the upcoming year as several outages were utilized to perform corrective and preventive maintenance projects on various components in the thermocouple system and the nuclear instrumentation and control channels as well as the deep well pump cooling system, and the area and stack radiation monitoring systems. As shown in the data in Table III-6, key causes of failures have generally been isolated and corrected to limit recurrences of related failures. Such a maintenance philosophy is expected to assure a return to high availability, hopefully exceeding 90% in the next year; nevertheless, it is planned to seek funds during the next year to replace the temperature recorder as well as the area and stack radiation monitoring system as they continued to be significant contributors of unavailability.

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	During the shutdown at about 10 kW some 20 seconds after commencing shutdown, the Safety Channel #2 meter was noted to return to normal. Subsequently under MLP #91-61, the meter circuit trip test was noted to be operating normally. The pegged downscale nature of the failure isolated the fault to the Safety Channel meter circuit. During extended bench testing and checks of the meter circuit assembly an unrelated intermittent fault in the circuit fine adjust potentiometer was isolated and was noted as the likely intermittent failure causing the low reading addressed in MLP #91-59. Per 10 CFR 50.59 Evaluation and Determination No. 91-09, both the coarse and fine adjust gain potentiometers were replaced with sealed components to provide better resistance to environmental degradation. The coarse pot was replaced with an identical component while the free gain pot was replaced with a 250Ω versus 200Ω adjustable potentiometer, representing only about 0.33% change in sensitivity with unchanged circuit responses. Extensive additional analysis and checks were performed on the meter and related circuits. Subsequently, the Safety Channel #2 amplifier card was reseated and further checks were conducted including circuit run checks, heat and cold tests as well as checks of all Safety Channel #2 harness assemblies and connectors with no further faults noted. Cleaning of the various contacts was considered to have corrected the downscale pegged failure of the meter circuit. After proper adjustment of the meter circuit following reseating in the console and successful completion of preoperational checkouts, the reactor was restarted to 100 kW on 26 November 1991 with a second SRO observing the restart and present for the first two hours at full power to provide additional observation of the Safety Channel #2 meter to assure no unobserved failure occurred per commitments to the NRC and the RSRS. Subsequently, the reactor was returned to normal operations with no further problems noted per the final 14-day report to NRC dated December 3, 1991 (See Appendix D to this report) (26 Nov 91, MLP #91-61).
25 November 1991	During the weekly preoperational check, the stack radiation monitor needle was noted to be sticking. Under MLP #91-62 the sticking needle was released and assured to be responding properly with no further problems noted (25 Nov 91, MLP #91-62).
27 November 1991	During the restart to full power following completion of the repair work on the Safety Channel #2 meter circuit (MLP #91-61) the stack monitor

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CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	was noted to be reading somewhat high due to shifting of the mechanical zero which was adjusted. Under MLP #91-63 following shutdown from the restart run, the stack monitor mechanical zero was adjusted with no further problems noted(27 Nov 91, MLP #91-63).
9 December 1991	During completion of a reactor run on December 7, 1991, some smearing of the temperature recorder points was noted. Under MLP #91-64, the temperature recorder slide wire was cleaned with contact cleaner and the pulleys were oiled to improve clarity of the printed temperature points with no further problems noted including during checks on the system prior to the next run later in the week (12 Dec 91, MLP #91-64).
16 December 1991	During the weekly checkout, the lamps for the SAFETY 1, HIGH VOLTAGE and PERIOD Limiting Safety System Settings (LSSSs) could not be reset. Although there had been a PC PUMP trip due to a momentary AC power reduction on the previous workday (13 December 1991), a subsequently successful dally checkout on that day and the fact the LSSS lamps in question had been reset until midway through the weekly checkout were evaluated to indicate this failure was unrelated to the trip. Under MLP #91-65 the cause of the problem was traced to a failed +15V power supply in Nuclear Instrumentation Channel 1. Because there was no stocked spare for this no longer available power supply, an alternate supplier of an equivalent power supply was finally located. Under 10 CFR 50.59 Evaluation Number 91-10, this equivalent +15V power supply was evaluated to be acceptable to replace the failed supply and the appropriate modifications were made to accommodate the different shape and physical size of the power supply. Subsequently, after installation, the appropriate voltages were assured to agree with those from the last system calibration so the reactor was approved for restart on December 24, 1991. Subsequently a successful power run on December 26, 1991 verified normal operations with no further problems noted (23 Dec 91, MLP #91-65).
27 December 1991	Prior to starting the preoperational checkout, noise from the stack dilute fan enclosure indicated the fan was out of balance. Under MLP #91-66, UFTR staff and Physical Plant Personnel (D. Sprague and P. Runge) noted the fan motor shaft pillow block bearings were failed as were the pillow blocks which were not in stock. After obtaining replacement bearings and pillow blocks, they were installed by Physical Plant personnel and the

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Date	Maintenance Description
	proper fan RPM verified. The bearings were then broken in with frequent observation of the fan by UFTR staff with no further problems noted (31 Dec 91, MLP #91-66).
16 January 1992	When the new DOE - supported safety channel replacement was purchased from General Atomics in November, 1991, it contained a 0 - 120% power meter as standard installation. A 0-150% power meter was backordered and finally arrived in January, 1992. Under MLP #92-01, the factory-installed 0-120% power meter was replaced in-house with the new 0-150% power meter. With successful tests of meter installation, the safety channel is now ready for installation in the UFTR console subject to preparation of the necessary modification package with approvals (17 Jan 92, MLP #92-01).
17 January 1992	During initial daily checks of the control room the stack radiation monitor recorder was noted to be progressing too slowly. Under MLP #92-02, the motor drive gear on the recorder was repaired so it contacted the gear train properly. In addition, the entire gear train was cleaned and lubricated to restore proper movement to the recorder chart paper with no further problems noted (17 Jan 92, MLP #92-02).
10 February 1992	During the weekly preoperational checkout, the deep well secondary cooling system was noted to be inoperative. Under MLP #92-03, the cause of the problem was traced to the pump/motor in the well. After a determination by Physical Plant Division via Mr. Charlie Shore that maintenance on the well water cooling system is reactor management responsibility (not part of the University system), Hare Well Drilling as the original installer was contracted to pull the well and determined the pump was failed. Under 50.59 Evaluation and Determination #92-01, an equivalent pump using the same motor was installed in the well. The check valve in the system was also replaced with a duplicate. Subsequently the secondary system flow indicator was noted not to be responding due to corroded connections which were cleaned and realigned. Subsequently after verifying all scrams on the secondary system and performing a valid preoperational checkout, the reactor was restarted to full power to demonstrate temperatures were as expected on the primary with somewhat reduced temperature difference across the heat exchanger demonstrating somewhat improved flow with the new pump as a

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Date	Maintenance Description
	conservative check of system operation with no further problems noted (14 Feb 92, MLP #92-03).
10 February 1992	During the weekly preoperational check the primary coolant storage tank coolant level was noted to be low. Under MLP #92-04, 60 gallons of demineralized water were added to the storage tank to restore proper level with no further problems noted (10 Feb 92, MLP #92-04).
10 February 1992	Following use of the primary coolant demineralized water makeup system, the resistivity was noted to be low during other usage. Under MLP #92-05 the resins in the two makeup system demineralizers were replaced to restore the source of high resistivity makeup water with no further problems noted (10 Feb 92, MLP #92-05).
17 February 1992	During the weekly checkout the wide range drawer was noted to be inoperable. Under MLP #92-06 the cause of the problem was traced to electrical arcing at the insulated connection point resulting in a failed resistor and a failed Safety Channel 1 high voltage power supply along with a damaged insulated connection board. Under 50.59 Evaluation #92-02, the failed connection point was moved to a free space in the wide range drawer which involved drilling three holes and mounting an improved insulating connection. Subsequently the power supply and resistor were replaced with on-hand spares. Following system checkouts and successful completion of a daily preoperational checkout, an SRO-monitored restart to full power was conducted to demonstrate proper circuit operation prior to return to normal operations with no further problems noted (17 Feb 92, MLP #92-06).
19 February 1992	Following removal of the failed Safety Channel 1 high voltage power supply under MLP #92-06, it was decided to repair the power supply for future use. Under MLP #92-07, the power supply was repaired, tested and returned to inventory as a spare for reactor use at a future time (24 Feb 92, MLP #92-07).
26 February 1992	At 1456 hours after 2.63 hours operation and over 2 hours at full power to irradiate samples, the temperature recorder stopped recording. With all other monitoring, control and safety systems operating normally, an unscheduled shutdown was performed. Under MLP #92-08 the cause of the failure in the recorder was determined to be a set screw anchoring the

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Date	Maintenance Description
	bar holding the temperature recorder print wheel which had worked loose. After reinserting and tightening the set screw, the reactor was authorized to run to full power for monitoring the operation of the recorder. Following a successful daily checkout on 27 February 1992, a monitored restart to full power was conducted at 1410 hours by SRO D. Cronin with NRC Inspector C. Bassett observing. Although the traces on the temperature recorder were as expected, the printed numbers designating thermocouple location were noted to be reversed at 1441 hours. After completion of an unscheduled shutdown at 1443 hours, MLP #92-08 was reopened to disassemble the temperature recorder print wheel, realign the temperature points and verify two of them. The ink pads in the recorder were also reversed to restore clear recorder printing. The system was then returned to operation. Subsequently the reactor was restarted at 1735 hours and all temperature recorder points were noted to be tracking and recording normally with no further problems noted (27 Feb 92, MLP #92-08).
2 March 1992	After performance of periodic prevention maintenance on the overhead crane by Physical Plant Division Technician D. Sprague, the crane was later found not to be responding. Under MLP #92-09 a bad connector was located in the overhead power supply for the crane and was repaired by D. Sprague with no further problems noted (2 Mar 92, MLP #92-09).
26 March 1992	As part of the quarterly scram checks (Q-1 surveillance), the shield tank was noted to require addition of water. Under MLP #92-10, about 21 gallons of demineralized water were added to the shield tank to restore it to full level with subsequent continuation of normal operations (26 Mar 92, MLP #92-10).
10 April 1992	Prior to the daily preoperational checkout, the stack dilute fan was noted to be inoperable. Under MLP #91-11 the circuits were checked and two burned out thirty (30) amp fuses were replaced with spares with no further problems noted (10 Apr 92, MLP #92-11).
13 April 1992	During the weekly preoperational checkout the UFTR high volume air sampler was noted to be inoperable. Under MLP #92-12 the air sampler was checked out and finally transferred back to radiation control for repair with a substitute air sample left for UFTR use until the UFTR air sampler is repaired and its calibration checked. Repairs on this air sampler were not ultimately successful so it has been replaced with a permanent

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Date	Maintenance Description
	substitute air sampler with closeout of the maintenance log page and no further problems noted (20 Jul 92, MLP #92-12).
15 April 1992	During the daily checkout the north area radiation monitor (ARM) was noted not to be recording. Under MLP #92-13 various circuit checks were accomplished and four bad fuses were replaced but were not the source of the problem. Subsequently, the cable connectors were cleaned to remove corrosion and the recorder was repaired and the system returned to normal with no further problems noted (15 Apr 92, MLP #92-13).
22 April 1992	Following 10 CFR Part 19 training for PPD Construction Cost Estimator Jack Thompson and crane service technician Merlin Bowman of J. Herbert Corporation, MLP #92-14 was opened to document the annual service inspection and preventive maintenance check of the overhead crane with no problems noted. The crane was noted to be in good condition with a report to be supplied by J. Herbert Corporation (22 Apr 92, MLP #92-14).
24 April 1992	During an extended irradiation for NAA of rare earth and other elements in sedimentary mineral deposits, the south area radiation monitor (ARM) was noted to have become inoperable. The SRO-On-Call was notified immediately and a replacement survey meter was put in place to serve as the required third monitor with the irradiation continued. Under MLP #92-15, the South ARM was noted to return to operation periodically so the connection to the detector was checked and found to be loose. The detector connection was then tightened and the South ARM response checked to be normal for the remaining hour of operation. Subsequently, the calibration check of the South ARM showed it to be operating properly prior to return to official service with no further problems noted (27 Apr 92, MLP #92-15).
30 April 1992	During performance of the S-1, S-5, and S-11 surveillances in making connections for the S-1 surveillance to measure the control blade drop times, the control blade position indication circuits for both the S-1 and S-3 control blades were found to have arcing in a circuit resistor causing smoking and overheating preventing completion of the surveillances. Under MLP #92-16 the circuits were checked and the failing resistors identified. Since identical resistors could not be located, equivalent resistors were identified and approved for replacement in the circuit under 10 CFR 50.59 Evaluation #92-03 (Safety Blade Position Indicating Circuit

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Date	Maintenance Description
	Resistor Change). Under MLP #92-16 the burnt resistors on S-1 and S-3 control blade position indicating circuits were replaced and the S-1, S-5, and S-11 surveillances were then concluded successfully with no further problems noted (4 May 92, MLP #92-16).
20 May 1992	Under MLP #92-17 the ink pads in the twelve (12) point temperature recorder were replaced with new pads to restore proper legibility to the temperature recorder printout with no further problems noted (20 May 92, MLP #92-17).
20 May 1992	Following activation of the emergency diesel generator in response to the loss of normal electrical power to the reactor cell causing an unscheduled trip on 19 May 1992, it was decided to check operation of the system in more detail though no credit for it is claimed in the safety analysis report. Under MLP #92-18, operation of the emergency diesel generator and automatic bus transfer were tested and verified to operate properly with no problems noted (20 May 92, MLP #92-18).
26 May 1992	Under MLP #92-19 following sticking discovered during the daily checkout, the secondary flow low flow mercury scram switch was adjusted to assure proper response with no further problems noted (26 May 92, MLP #92-19).
1 June 1992	During the weekly preoperational checks the East Area Radiation Monitor (ARM) was noted to be giving no response to its check source. Under MLP #92-20, the problem was isolated to be in the East ARM instrument itself. Subsequently a failed capacitor was replaced in the bias power supply coupling circuit on the amplifier input. Two other stressed capacitors were also replaced, all with exact replacements. Module calibration and trip settings should not have been affected by this maintenance. Subsequently, following the manual procedure, the +15 volt bias supply in the East ARM was recalibrated by changing out the R202 resistor with a different resistance value to assure calibration. Similarly, the -15 volt bias supply was recalibrated changing out the R207 resistor and the +600 volt bias supply was recalibrated by replacing the R244 resistor. Although following the manual procedure, these recalibrations were controlled under 10 CFR 50.59 Evaluation No. 92-05 since the circuit was changed though following the manual procedures. Following successful completion of the source calibration check(Q-2) surveillance, the East

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Date	Maintenance Description
	ARM was returned to service with no further problems noted (3 Jun 92, MLP #92-20).
29 June 1992	During the weekly preoperational check the water level in the primary coolant storage tank was noted to be at 21-1/2 inches nearing the level requiring refill. Therefore, under MLP #92-21, twenty-five gallons of demineralized water were added to the PC tank to restore the tank level to normal with no further problems noted (29 Jun 92, MLP #92-21).
29 June 1992	Installation of an optical tachometer to operate in parallel with the mechanical tachometer to monitor the vent diluting fan motor shaft was approved as a modification via 10 CFR 50.59 Evaluation and Determination No. 88-24. During June, 1992 a bracket was manufactured to support the tachometer in the dilute fan room but was not installed. However, MLP #92-22 was opened on June 29, 1992 to control installation of the optical tachometer monitoring meter in the temperature recorder console in the control room; during July, the bracket to hold the optical tachometer was redesigned, manufactured and installed on the stack wall. During August, 1992 no additional work was performed; at year's end it only remained to install the optical tachometer and connecting lines in the near future and to operate both in series for some time prior to requesting a license amendment as necessary to allow use of one or the other to meet monitoring requirements and hence reduce outage time due to tachometer failure (MLP #92-22 remains open).
17 July 1992	Near the end of reactor operations on 16 July, 1992 using the rabbit system for trace element analysis of seashells, the normal hand held GM Survey meter (E-530/1879) failed.On 17 July 1992, under MLP #92-23 the meter was transferred out and found to have failing batteries in poor contact. After replacing the batteries, taping them in place and recalibrating the survey meter, it was returned to use with no further problems noted (17 Jul 92, MLP #92-23).
27 July 1992	At 1609 hours after 35 minutes of a scheduled two-hour irradiation at full power, the SRO noted that temperature recorder point #2 (south center fuel box) was failed downscale. After performing an unscheduled shutdown and securing the reactor at 1610 hours, it was noted that the point had been reading downscale for the last 7-8 minutes of a full power run completed at 1430 hours but had not been noticed due to the downscale nature of the

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Date	Maintenance Description
	failed indication. Under MLP #92-24, the recorder was checked out and continuity of cables was confirmed back to the equipment pit. After UFTR staff and RSRS evaluations and NRC agreement that no tech spec violation was involved and with NRC approval, several short irradiations were approved and completed on July 30-31, 1992. The reactor was then put on administrative shutdown awaiting sufficient cooling time to begin unstacking shielding to perform the fuel inspection originally planned for mid-August. Additional thermocouple wire and replacement thermocouples were ordered. The 14 day final written report on the event itself was submitted to NRC via a letter dated August 10, 1992. See Appendix E. Since repair of the thermocouple system required the core shielding to be unstacked, both the fuel inspection (B-2 Surveillance) and work under MLP #92-24 were completed during one unstacking of the core shielding which was accomplished on August 11, 1992. After the fuel inspection (B-2 Surveillance) was completed on August 12, 1992 under RWP 92-1-I, work under MLP #92-24 and RWP-92-2-I was undertaken to isolate the temperature monitoring system failure to the wiring and connection to thermocouple number 2. After several unsuccessful attempts to reterminate the connection with existing wiring including stripping additional small quantities of excess wiring, the decision was made to replace the wiring and reterminate the connections to all three (3) thermocouples (#1, #2 and #3) on the south side of the reactor core. Under 10 CFR 50.59 Evaluation Number #92-06, a terminal barrier strip was installed in the equipment pit made of the same material as the thermocouples and the three south fuel box thermocouple readouts on the control room temperature recorder were connected to the barrier strip in the pit and new wire was run to the core where all three thermocouples were reconnected to restore proper operation of thermocouple #2 on the south center fuel box outlet as well as on thermocouples #1 and #3 on August 19, 1992. Subsequently, all shielding was replaced along with the superstructure on August 20 with the confirmatory radiation surveys performed during the stepped approach to full power on August 21 along with completion of the detailed restricted area radiation survey (Q-5 Surveillance) and verification of proper thermocouple response during full power operation with no further problems noted. Plans are eventually to terminate the remaining three (3) north core area thermocouple leads in the pit area, to replace all six (6) core area thermocouples with quick disconnect leads and then install quick disconnect leads on all six lines to minimize future dose commitment for

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Date	Maintenance Description
	repairs to this temperature monitoring system in the core area. Current plans are to implement the remainder of these modifications under 10 CFR 50.59 Evaluation No. 92-06 when the core is unloaded for the HEU to LEU conversion unless other failures necessitate earlier implementation (21 Aug 92, MLP #92-24).
29 July 1992	Under MLP #92-25 a test of the backup battery system in the UFTR building fire alarm system was conducted for over 8 hours with no problems noted at the end of the test period. This surveillance was conducted at the request of ANI Inspector Dennis Eaves and will become an annual surveillance (29 Jul 92, MLP #92-25).
7 August 1992	During the quarterly calibration of the Stack Radiation Monitor, the slope required adjustment. Under MLP #92-27, the slope was adjusted to read 4000 cps with the Cs-137 calibration source in the 4000 position to assure proper detector response with no further problems noted (7 Aug 92, MLP #92-27).
20 August 1992	Following the fuel inspection activities (B-2 Surveillance) and completion of repairs to the temperature monitoring system, the shield tank was noted to have a reduced water level. This reduced level was expected as no water was added during performance of the quarterly scram checks on July 2, 1992 in anticipation of fuel inspection activities in August where lowering of the shield cask into the shield tank requires a lower level of water. Under MLP #92-28, 45 gallons of demineralized water were added to the shield tank to restore the full normal level with no further problems noted (20 Aug 92, MLP #92-28).
21 August 1992	As plans were underway to restart the UFTR on the afternoon of August 21, 1992, the cell including the console lost power several times due to failing contactors on Breaker #9 at the main building power distribution panel in the northwest corner of the radiochemistry laboratory. Under MLP #92-29 bad contactors in the breaker were repaired by electrician Mike Williams and his assistant of the Physical Plant Division. Normal power was restored to the cell and operations proceeded after completion of a valid daily checkout at which point MLP #92-29 was closed out. Subsequently a security alarm occurred at the beginning of the work day on August 26, 1992 due to a spurious electrical transient caused by operation of the diesel generator and opening of Breaker #9. MLP #92-29

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Date	Maintenance Description
	was reopened again and this time under MWO #92-5807 the 100 amp/three phase breaker was replaced and its wiring and connections to the emergency panel were renewed to restore reliable power to the reactor cell with no further problems noted. Subsequently, MLP #92-29 was reopened again on August 31, 1992 and MWO 92-5807 was used by Physical Plant Division Electrician Mike Williams to install a service disconnect between Breaker #9 (console power) and the console, so that if work is needed on the console, the disconnect can be opened instead of the breaker #9. Therefore, if power is lost to the bus and the diesel generator starts, the console would not be supplied with power. No further problems were noted with this system (31 Aug 92, MLP #92-29).
25 August 1992	During an ink test by Charles Shore to determine the flow path/direction for water draining from the reactor cell air handler condensate line, the route was determined to be the more restrictive flow to the storm sewer manhole in the Journalism Lot. Therefore, MLP #92-31 was opened with MWO #92-5761 issued by work management to control work for rerouting the line to the reactor holdup tanks. The cost estimate for MWO #92-5761 was performed by Harry Smith of the Physical Plant Division on August 27, 1992. At year's end no further work has been accomplished (MLP #92-31 remains open).
31 August 1992	Following installation of the service disconnect on Breaker #9 (MLP #92-29) and restoration of cell power at about noon on August 31, 1992, the security system was found to be continuously cycling and alarming so that the system would not be able to be reset for security when needed. Under MLP #92-32 the source of the problem was isolated to a single component in a system detector; since no spare was immediately available and the component is not considered essential to the integrity of the security system, the component was temporarily bypassed awaiting repair of the failed component (MLP #92-32 remains open).
31 August 1992	During a routine calibration check the probe on the E-140/911 GM detector survey meter was found to be failed. Under MLP #92-33 the survey meter was transmitted to the NES Electronics Shop for repair (MLP #92-33 remains open).

MLP #91-43 remains open from August 7, 1991.
MLP #91-52 remains open from September 17, 1991.

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Date	Maintenance Description

MLP #92-22 remains open from June 29, 1992.
MLP #92-31 remains open from August 25, 1992.
MLP #92-32 remains open from August 31, 1992.
MLP #92-33 remains open from August 31, 1992.

VI. CHANGES TO TECHNICAL SPECIFICATIONS, SAFETY ANALYSIS REPORT, STANDARD OPERATING PROCEDURES AND OTHER KEY DOCUMENTS

This Chapter contains a narrative description and status report on the various changes to key UFTR license-related documents that occurred during the 1991-1992 reporting year. As such, this Chapter provides a ready reference for the status of various license-related documents to include Technical Specifications, Safety Analysis Report, Standard Operating Procedures, Emergency Plan, Security Response Plan, Reactor Operator Requalification and Recertification Training Program, HEU-to-LEU Conversion Documents as well as Quality Assurance Program Approval for Radioactive Material Shipments and other key documents as they are generated or changed.

A. Changes to Technical Specifications

The new Technical Specifications for the UFTR were issued on August 30, 1982 and officially established on September 30, 1982. Two sets of requested corrections/-changes to the Technical Specifications were submitted to the NRC during the 1982-1983 reporting period. As noted in the 1983-1984 Annual Report, the UFTR facility received approval for Amendment No. 14 and No. 15 to the UFTR Technical Specifications during that reporting year. As noted in the 1985-1986 Annual Report, the UFTR facility requested and received approval for Amendment No. 16 to correct an error in numbering Section 3.5 which had been incorrectly numbered Section 3.4.

Approved license (Tech Spec) Amendment 17 was received on May 3, 1988 per a letter from NRC dated April 27, 1988. The approved amendment consisted of a revision to the Tech Specs to permit conducting certain activities when the reactor is shutdown, the reactor vent system is secured and the stack monitor is reading greater than 10 cps. This amendment 17 is basically a relaxation of UFTR Technical Specifications in Section 3.4.3 as a limiting condition for operation which states that "the vent system shall be operated until the stack monitor indicates less than 10 counts per second"; as a result, securing the vent system for drills and other events, tests and outages constituted a potential violation of Technical Specifications on Limiting Conditions for Operation (even though the reactor was not running) and had previously been reported as such. As requested by NRC and submitted by the licensee, the Tech Specs were also revised to include a backup means for quantifying the radioactivity in the effluent during abnormal or emergency operating conditions in addition to administrative changes. The backup core vent sampling system was installed on May 4, 1988 and available for all subsequent reactor operations. The process of incorporating the Amendment 17 changes into the UFTR Standard Operating Procedures was completed on December 19, 1988 when the SOP changes were approved with training completed on January 4, 1989 at which point the changes were fully implemented in the Standard Operating Procedures as they substantially affect UFTR SOP-A.1, SOP-A.4 and SOP-B.1 in relaxing requirements on running the Reactor Vent System above 10 cps on the stack monitor and enabling sampling of the core vent system during emergencies.

No further requests for changes in the approved Tech Specs are anticipated for the operation of the UFTR with its present high-enriched fuel at a rated power level of 100 kWth. However, one will be necessary to assure compatibility with the revised 10 CFR Part 20 requirements when these regulations are implemented on January 1, 1994. It is expected, however, that another substantive amendment to the Technical Specifications will be required before the UFTR can be converted from utilizing high-enriched MTR plate-type fuel to utilizing low-enriched silicide plate-type fuel. During the last reporting year neutronics analysis of the existing HEU core and the proposed LEU core were nearing completion as various thermal hydraulic analysis were nearly completed during the current year with additional work in progress at year's end.

B. Revisions to UFTR Safety Analysis Report

FSAR Revision 5 was submitted to NRC and inserted in the UFTR Safety Analysis Report in 1988 to incorporate changes that were the result of ongoing reviews of the UFTR Safety Analysis Report to assure updated accurate contents.

Revision 6 of the FSAR comprises a complete updating of Chapter 11 (Radioactive Waste Management) of the UFTR Safety Analysis Report as part of a continuing effort to assure an accurate document for controlling facility operations. This revision was submitted to NRC with a letter dated September 18, 1989 and was incorporated into all official copies of the UFTR Safety Analysis Report in September, 1989 since it was reviewed and evaluated by Reactor Management and the RSRS under 10 CFR 50.59 Evaluation/Determination No. 89-10 not to involve any unreviewed safety questions. Revision 6 consisted of a complete update of Chapter 11 of the Safety Analysis Report based upon internal review primarily to include up-to-date data for all releases and details on the improvements in gaseous effluent measurements.

During the current 1991-1992 reporting year, Revision 7 of the UFTR SAR was submitted with a letter dated April 3, 1992 as contained in Appendix G. Revision 7 consisted of changes to two pages. Both changes had previously been approved and implemented following UFTR management and RSRS review and approval. The first change was on Page 5-8 to allow use of an equivalent deep well pump per the slightly changed but equivalent description in Section 5.2 describing the UFTR Secondary Cooling System. Per 10 CFR 50.59 Evaluation and Determination Number 92-01, the use of a more efficient pump was necessitated by the failure of the secondary deep well pump in February, 1992 and the unavailability of an exact duplicate. The second change was to Page 9-6 in Sections 9.2.3 and 9.2.4 per 10 CFR 50.59 Evaluation and Determination Number 91-01 in January, 1991, to allow use of any resin in the Demineralized Water Makeup System and the Primary Coolant Purification System because the Amberlite IRN-150 nuclear grade resins previously specified for use in the purification systems are no longer available. There were no other revisions of the UFTR SAR in the reporting year. However, with completion of most neutronics and thermal-hydraulics analyses to support the HEU-to-LEU conversion, other SAR updates are planned as necessary to keep the SAR current and to support the planned HEU-to-LEU fuel conversion.

C. Generation of New Standard Operating Procedures

For only the second time in recent years, no new Standard Operating Procedures were generated during the 1991-1992 reporting year. This condition marks the maturity of the UFTR Standard Operating Procedures as great efforts have been undertaken to implement good practice requirements in generating new procedures.

At the end of the reporting year, also in contrast to most previous years, no further new procedures are in progress. The conclusion to be drawn here is that the expansion of procedures at the UFTR facility may be coming to a close which is an encouraging state of affairs.

D. Revisions to Standard Operating Procedures

All existing UFTR Standard Operating Procedures were reviewed and rewritten into a standard format during the 1982-1983 reporting period as required by a commitment to NRC following an inspection during that year. As committed to NRC, the final approved version of each SOP (except certain security response procedures which are handled separately) is permanently stored in a word processor to facilitate revisions and updates which are incorporated on a continuing basis in the standard format.

Table VI-1 contains a complete list of the approved UFTR Standard Operating Procedures as they existed at the end of the previous (1990-1991) reporting year exclusive of applicable temporary change notices (TCNs) since these do not change procedure intent. Table VI-2 contains a similar complete up-to-date list of the approved Standard Operating Procedures as they exist at the end of the current (1991-1992) reporting year. The latest revision number and date for each non-security (not withheld from public disclosure) related procedure is listed in Table VI-2. The latest revision number and date is in parentheses for each SOP; temporary change notices (TCNs) refer to minor changes made to an SOP in lieu of a full revision and are not noted on the two tables to simplify the presentation. A comparison of Tables VI-1 and VI-2 indicates that there was only one (1) revision to SOPs generated during this reporting year with no new procedures generated per the discussion in Section C of this Chapter. Although the one revision continues to represent a significant administrative effort on behalf of the UFTR facility staff, the number continues to decrease from previous reporting years and it is expected that the number of revisions should continue to be low in future years, though the implementation of the revised 10 CFR Part 20 will necessitate a number of changes not yet clearly delineated. It is noteworthy that for the third straight year all of these revisions were generated because of facility staff evaluations, sometimes spurred by new NRC regulations or records of inspections but none were so mandated by NRC inspections in contrast to some previous years. The basic reason for the one SOP revision is explained in the following paragraph with a copy contained in Appendix I of this report.

The only revision to UFTR Standard Operating Procedures generated during the 1991-1992 reporting year is UFTR SOP-D.5 (UFTR Reactor Waste Shipments: Preparations and Transfer). Revision 1 of this procedure was generated in April, 1992 to meet new requirements so the facility will be prepared should waste need to be shipped.

During the 1991-1992 reporting year, a number of minor changes were also incorporated into the UFTR Standard Operating Procedures as needs and/or errors were identified especially in response to the RSRS annual audit and facility evaluations and as a result of training on the Standard Operating Procedures. Only eleven (11) "Temporary Change Notices" were issued to correct minor discrepancies or better express the unchanged intent of six (6) different procedures, with only SOP-0.5 (QA Program) changed more than once, to include SOP-0.1, SOP-O.5, SOP-A.1, SOP-A.4, SOP-E.7, and SOP-F.1. It should be noted that the six (6) temporary change notices for SOP-O.5 implemented, among other things, improvements for several surveillances to add additional monitoring points for the unrestricted area radiation survey (Q-4) and the restricted area survey (Q-5) as well as add separate review and acknowledgement signature blocks for the Radiation Control Officer and the Facility Director on each surveillance. Other improvements included adding the quarterly check of the air handler condensate for contamination (Q-10) to the list of surveillances as well as adding the check of reactor trip for loss of secondary cooling well pump power to the quarterly scram checks (Q-1). Several other changes updated and clarified the quarterly scram checks (Q-1) to include requiring operator initials for all scram check entries per an RSRS audit recommendation.

The remaining Temporary Change Notices all involve relatively minor changes affecting one or a few sections of the respective SOP, sometimes as little as a single sentence. All were fully reviewed by UFTR facility management and approved by the RSRS. Because of the quantity of paper involved and the relatively minor nature of Temporary Change Notices, copies of these SOP changes or the SOPs as currently revised and implemented are not included in this report. A copy of each may, however, be obtained directly from the UFTR facility if desired, with the exception of UFTR SOP-F.1; they are briefly summarized in Table VI-3.

E. Revisions to UFTR Emergency Plan

One revision to the approved UFTR Emergency Plan was submitted to the NRC during this reporting year. With a letter dated December 17, 1991, Revision 7 was submitted to the NRC. Revision 7 consists of a set of updates and minor revisions to nine (9) pages (iii, v, 1-12, 8-1, 8-2, 8-3, 8-4, 10-3 and 10-6) as well as the addition of one new page to Chapter 8 (now Page 8-3).

First, Section 1.5 (Credible Accidents and Consequences) in item (3) on Page 1-12 was updated to reflect UFTR energy generation over a typical ten-year period (September, 1981 - August, 1991) versus "last seven years."

Second, Section 8.2 (Assessment Facilities) on Page 8-1 was updated to include referencing Table 8.1 listing equipment typically available from the Radiation Control Office for emergency dose and radiation level assessment and referencing a new Table 8.2 which lists the equipment typically available in the UFTR facility for dose and radiation level assessment. Table 8.1 on Page 8-2 was then updated to include equipment typically available from the Radiation Control Office while a new Table 8.2 was added as Page 8-3 to include equipment typically available in the UFTR facility for dose and radiation level assessment. These updated tables reflect better actual equipment available to address emergency events without requiring specific pieces of equipment.

Third, Section 8.3.1, Paragraph 2 on Page 8-3 (now Page 8-4 due to the addition of Table 8.2 and Page 8-3) was updated to allow transporting contaminated victims using the multiple blanket contamination isolation method "or equivalent." This allowance was obviously intended but is now explicit. Similarly, Page 8-4 has now become Page 8-5 due to adding Table 8.2.

Fourth, Table 10.1 on Page 10-3 was updated as several obvious typographical errors were corrected to include the first entry where "R eactor" should be "Reactor" and the first equipment entry which was not but should have been marked with an asterisk (*) per the footnote to Table 10.1.

Fifth, Table 10.3 on Page 10-6 is updated as the word "assume" is corrected to read "assure" in the Table footnote. In addition, the listing of two radiation detectors in Table 10.3 is changed to allow equivalent detectors as follows:

* Teletector or equivalent (High level survey meter)
* E-140 or equivalent (Low level GM meter)

This change assures that a specific meter is not unreasonably required and the contents of the Plan can be correct even when detectors are replaced temporarily for repair and calibration or replaced permanently with a new meter.

Finally, the Table of Contents (Page iii) is updated to reflect page changes per the new Table 8.2 and the List of Tables (Page v) is updated to reflect the addition of Table 8.2 <u>and</u> to add page numbers for all figures and tables which had been missing but not noted in the original version of the Emergency Plan from which all copies have been made.

All these changes were reviewed by UFTR management and by the Reactor Safety Review Subcommittee to assure no decrease in the effectiveness of the UFTR Emergency Plan. In general, these changes make the Plan better suited to assuring a proper response to emergencies at the University of Florida Training Reactor. In a letter dated June 22, 1992, the NRC notified the facility of their evaluation that these changes do not decrease the effectiveness of the Plan which maintains compliance with 10 CFR 50 Appendix E. Therefore, the approved changes were approved and could be incorporated into the current Emergency Plan. Revision 7 was then distributed to all holders of the Plan with a letter dated July 7, 1992. Revision 7 documentation is contained in Appendix F of this report.

As the Emergency Plan continues to be evaluated, it is likely that additional changes will be implemented during the upcoming year, especially as the Emergency Plan is reviewed for training purposes. At year's end Revision 8 is beginning to be prepared to update a number of operations-related sections in the Emergency Plan.

F. Revisions to UFTR Physical Security Plan

Revision 10 to the approved UFTR Physical Security Plan was submitted to the NRC with a letter dated September 18, 1991 as previously approved by the RSRS and verbally authorized by the NRC late in the previous reporting year. Only one small section on one page of SOP-F.1 was involved; this change was made in response to an internal surveillance to evaluate all SOPs on a biennial schedule.

The effect of the change is to update the procedure to require reporting Major Physical Security Events to the NRC Operations Center no later than one hour following determination of a Major Physical Security Event. Previously this requirement was to report to NRC Region II. A new subsection was used to continue the existing requirement to report Major Physical Security Events to Region II as well. This change was verified as appropriate with Mr. Dave McQuire of Region II on July 2, 1991. Since this change does not alter the original intent of the SOP, it was labeled as a Temporary Change Notice (TCN) within SOP-F.1 but treated as a Revision 10 to the Physical Security Plan to maintain Plan continuity. This change and its treatment were approved by the Safety Review Subcommittee at a meeting on August 27, 1991 and was inserted into the Facility copies of the Security Plan on August 30, 1991. The revision was acknowledged and approved by a letter from NRC dated October 29, 1991.

G. Biennial Reactor Operator Requalification and Recertification Program

The existing operator requalification and recertification program training cycle for the UFTR was scheduled to end in June, 1991. Therefore, renewal of the program with no changes was undertaken by submission to the NRC of the new two-year program cycle with a letter dated May 31, 1991. This renewed training program was contained in Appendix F to the 1990-1991 annual report and was to cover the training program from July 1, 1991 to June 30, 1993. It was also intended to be renewed for additional two-year periods as necessary.

Although there were no changes made to the Plan as written, it should be noted that a large effort had been ongoing throughout the 1990-1991 reporting year to generate objective question and answer banks for the various portions of the Program that are tested. During August and September, 1990 a major effort was undertaken to develop question and answer banks for two key newer parts of the requalification and recertification program: (1) Annual Walkthrough Examination and (2) Annual Practical Operations Examinations. The banks now contain sufficient numbers of questions to support NRC - administered requalification examinations. The first series of walkthrough examinations was conducted in September/October, 1990. These exams were all passed and seemed to be working well. The upgraded Annual Operations Tests were scheduled for December, 1990 and were administered later in the reporting year with similar success. In conducting license training for the two new SRO candidates who were licensed and certified in October, 1991, banks of objective questions and answers were generated for all segments of the lectures in the training program and these too seemed to be working well with much less effort expected to be required in generating and administering examinations in the 1991-1992 reporting year and beyond. Indeed, these banks were even further expanded and refined during the 1991-1992 reporting year.

In a letter dated November 13, 1991, NRC Project Manager Ted Michaels transmitted a list of eleven (11) questions on the UFTR Reactor Operator Requalification and Recertification Training Program. Since so much effort would have to be committed to providing answers to these questions and to convince the NRC of the adequacy of the Program as implemented, the decision was made to completely review and rewrite the Program as already implemented including addressing the many training items added to nearly double the number of scheduled training sessions over the past six (6) years. Although the Training Program did not appear to meet 10 CFR Part 55 requirements as originally submitted for renewal in May, 1991, it was always considered to do so. The perceived problem was with the text of the Training Program, whereas the only changes made in recent biennial updates submitted to NRC were in the master schedules contained in the appendix of the Training Program. The rewritten Training Program fully documenting the Program as already implemented was submitted to NRC in December, 1991 in response to Mr. Michaels' letter. It was emphasized that the Program as submitted represented what had already been implemented. It was subsequently fully approved via another letter from Mr. Michaels in February, 1992. The documentation for this rewritten Training Program is contained in Appendix H of this report.

H. <u>HEU to LEU Fuel Conversion Documents</u>

The original proposal submitted to NRC to meet 10 CFR 50.64 requirements for scheduling UFTR conversion from HEU to LEU fuel was accepted as meeting the legal requirements for submission in March, 1987. However, in a letter dated April 17, 1987 and received on April 22, 1987, the NRC claimed the scheduled span of time from receipt of funding to submittal of our application to convert was too long. The updated (reduced) schedule (Revision 1) showing a reduction of 8 months as presented in Table VI-4 was then submitted to NRC licensing in Washington with a cover letter dated May 14, 1987. No further response was received to this submittal which was considered acceptable. During the next reporting year, a new proposal updating the UFTR conversion schedule and work status per 10 CFR 50.64(b)(2) requirements was submitted to NRC with a letter dated March 22, 1988 to meet the annual March 27, 1988 deadline for such submission with no subsequent response from NRC during the remainder of the year. This new schedule (Revision 2) is presented as Table VI-5 and shows the schedule lengthened approximately two (2) months compared with Revision 1 which assumed receipt of funding on September, 1987.

The proposal for financial support of UFTR conversion from HEU to LEU fuel was submitted to the Department of Energy with a letter dated August 7, 1987. Official notice of funding for the first two years to support submission to NRC of the license amendment documentation for conversion was received on November 24 and effective November 15, 1987; however, the description of work was incorrect. A new grant description of work was finally received on December 29, 1987 when the grant document was signed for record purposes.

After receiving funding, work proceeded as quickly as possible though a shortage of graduate students to perform the neutronic and other analyses caused this work to lag. In addition, because of extensive efforts to decontaminate and remodel a room in which to store the SPERT LEU fuel, to change the license description of the SPERT storage facility, to move the fuel to the new facility, to release the previous storage room to unrestricted usage, to revise the facility security plan (SNM-1050) and then to perform a detailed pin by pin visual inspection and verification of serial numbers, the conversion analysis was further delayed.

The required visual inspection and identification of SPERT fuel pins was completed on September 19, 1988. Similarly, X-radiography was scheduled to be performed early in that reporting year so a decision could be made on whether to proceed with the HEU to LEU conversion analyses for the UFTR using SPERT 4.8% enriched UO_2 fuel pins or 19.8% enriched aluminum silicide plates. As expected, the delays in radiography necessitated obtaining an extension to the applicable SNM-1050 license. A copy of the relicensing letter dated October 14 was received on October 21, 1988 along with a copy of 10 CFR 70 and the one-page Safety Evaluation Report (SER). Basically Condition 4 of the license was revised to an Expiration Date of March 31, 1989 with all other license conditions unchanged. No further renewals of the current license were to be granted with the relicense application for "storage only" to be submitted by March 1, 1989.

As committed, a sufficient number of SPERT fuel pins was radiographed to provide an LEU core and replacement pins for the UFTR by March 31, 1989, when the SPERT usage license was to expire. As for the SNM-1050 license, a significant effort was involved as the renewal license application for renewal under "storage only" conditions was submitted with a letter on March 1, 1989 as required. License No. SNM-1050, as renewed, was dated June 23, 1989 and was received on June 29, 1989. The renewed license authorized "storage only" conditions and has an expiration date of June 30, 1994. The cover letter also specifies that any request for amendment to the SNM-1050 license should be submitted in the form of replacement pages to the renewal application submitted on March 1, 1989 with changes or new items clearly identified. Subsequently, in June, 1989, an engineering-based decision was finally made not to use the SPERT fuel but rather to use the alternate low enriched silicide plate-type fuel. As a result plans were developed to ship the fuel.

A proposal for support to provide 1200 SPERT fuel pins for transfer for shipment to Oak Ridge National Laboratory was submitted to Martin Marietta Energy Systems, Inc. in January, 1990 in response to Request For Proposal CO378-19 dated December 12, 1989. This proposal was submitted to Martin Marietta Energy Systems in January with a response finally received in mid-February accepting the proposal. Work was not scheduled to start until the shipping drums were received; they arrived on March 5, 1990. However, results of criticality calculations and licenses for the drums were not received until early April; caps on two (2) drums were finally removed by engineering shops in late April; loading of the drums was completed per approved UFSA SOP-U.4 on May 16, 1990 and the 1200 pins in 19 DOT type 6M drums plus one (1) empty drum were transferred to Mr. Leon Fair of Martin-Marietta Systems Inc. for shipment by truck to a secure DOE facility at Oak Ridge National Laboratory on May 17, 1990. Revision 3 of the Physical Security Plan (PSP) for the SNM-1050 License was then transmitted to the NRC with a letter dated June 7, 1990 to update the Special Nuclear Material on site following the May 17 transfer of 1200 pins to Martin-Marietta's control. Approval of Revision 3 to the University of Florida SPERT Assembly Physical Security Plan occurred with a letter dated June 20, 1990 and received on June 26, 1990.

An application to amend the storage-only SNM-1050 license to allow storage of the fuel in the North Quonset Hut (Room 6) versus Room 5 of the Nuclear Research Field Building was submitted to NRC with a letter dated June 6, 1990. This SNM-1050 license amendment making the smaller Room 6 an allowed storage location was approved per a letter and license amendment dated June 14, 1990. All of the remaining 4200 SPERT fuel pins not previously shipped were then moved to Room 6 and the wall between rooms 5 and 6 restored to normal on July 30. Revision 4 of the SNM-1050 Physical Security Plan was submitted to NRC with a letter dated September 13, 1990 while the response to several security allegations was submitted as a letter also dated September 13, 1990. In a telecom on October 19, 1990, NRC Region II Security Specialist Cynthia Perny indicated that NRC was closing out the SNM-1050 Physical Security Plan Revision 4 licensing action with all changes in the SNM-1050 Security Plan accepted except for deferring on various physical changes subject to a review during the next security inspection. This licensing action for the SNM-1050 license(Docket No. 70-1068) was documented in a subsequent letter dated October 26, 1990 and received on November 5, 1990. In the interim, the next security inspection was conducted on October 25, 1990 by NRC Security Inspector Orysia Masnyk, to investigate security violation allegations associated with the SNM-1050 license as well as to consider final approval of Revision 4 to the Physical Security Plan for the SNM-1050 license. In NRC Inspection Report No. 50-83/90-02 dated November 23, 1990, NRC Region II did close out the allegation and accept implementation of Revision 4 of the UFSA Security Plan.

When their storage racks are licensed, Rensselaer Polytechnic Institute (RPI) has also indicated a desire to obtain some of this fuel as backup for their low power critical assembly which uses SPERT fuel. Since the fuel has been moved to Room 6, the logistics for such transfers will be much more difficult to implement due to the smaller size of Room 6.

Throughout the 1988-1989 reporting year, the neutronics analysis to support the conversion had been progressing at a slow pace with the graduate student involved deciding to leave for another university when not approved to pursue a doctoral degree. This loss greatly hindered analysis work at the beginning of the 1989-1990 reporting year. As a result of the overall slow progress on this work related to UFTR HEU to LEU conversion and funded by DOE, the proposal submitted to NRC with a letter dated March 22, 1989 to meet the annual March 27 deadline per 10 CFR 50.64(b)(2) showed a further lengthening of the schedule (Revision 3) by six months as presented in Table VI-6. With the loss of a key student who had been trained in proper neutronics analysis methodologies and with the DOE grant extended through April, 1990, the Revision 3 schedule presented in Table VI-6 was further impacted negatively. As a result the schedule submittal required by March 27, 1990 per 10 CFR 50.64(b)(2) as Revision 4 showed a further schedule slippage from Revision 3 to April, 1991 as depicted in Table VI-7. Although progress in neutronics analysis was more or less satisfactory at the end of the 1989-1990 reporting year, a further extension would clearly be needed when the next submittal required by March 27, 1991 per 10 CFR 50.64(b)(2) was made.

An updated proposal was submitted to NRC with a letter dated March 26, 1991 explaining that a student thesis project had resulted in good progress in assuring neutronics methodology is adequate and the modelling of the existing core was nearly complete lacking only several confirmatory calculations and calculations to predict changes caused by temperature effects. NRC was also updated that only scoping calculations had been completed for the proposed LEU core with the number of fuel plates per bundle not yet set in March, 1991. It was expected that DOE-supplied funding support of this work would be extended beyond April 30, 1991 so this work could be concluded along with basic thermal hydraulics analysis to conclude the required HEU to LEU safety analysis. A no-cost extension of the Department of Energy Grant DE-FG05-88ER75387 entitled "Conversion of University of Florida Reactor to Low Enriched Uranium (LEU)" was submitted to Ms. Ann Rydalch via a letter dated April 25, 1991 with a copy supplied to Keith Brown. The extension was agreed to be until April 30, 1992 with notification of the extension not received until fall, 1991 making some plans and efforts difficult to implement. The updated proposed schedule submitted as required by March 27, 1991 per 10 CFR 50.64(b)(2) as Revision 5 therefore showed a further schedule slippage from Revision 4 to January, 1992 as depicted in Table VI-8.

The individual working on the neutronics analysis completed his benchmark calculations on the existing UFTR HEU core in April, 1991. Subsequently, he completed his thesis work in May, 1991 making his defense on May 10, 1991 but continuing his work until May 23, 1991. After the number of fuel plates per bundle was set at 14 from the neutronics analysis, thermal hydraulics analyses were begun late in the 1990-1991 reporting year. During the 1991-1992 reporting year, a graduate assistant continued working on the thermal hydraulics area on the 14 plate fuel bundle arrangement selected for the conversion with good progress made to nearly complete this work during the reporting year. Work on the NRC submission package was also begun with limited progress made. The delay of official grant extension made financial support of this effort more difficult so the latest updated proposal schedule submitted as required by March 27, 1991 per 10 CFR 50.64(b)(2) as Revision 6 therefore showed a further schedule slippage from Revision 5 to August, 1992 as depicted in Table VI-9. This further delay is because the basic thermal-hydraulics analysis proceeded more slowly than expected and because of DOE questions about fuel and core design arrangements that are requiring staff time to answer in preparation for approving the final fuel bundle design.

I. Quality Assurance Program Approval For Radioactive Material Package

During the middle of the 1987-1988 reporting year, plans were made by the University of Florida to ship ~1200 SPERT fuel pins held under the SNM-1050 license to Oak Ridge National Laboratory (ORNL). Since ORNL wanted the University of Florida to be the shipper of record, an approved Quality Assurance Program was needed with the University to be responsible to see that the shipment would meet all 10 CFR 71 requirements. ORNL was planning to have these pins shipped in 6M Type drums on which they would have performed the necessary criticality calculations. The initial request for QA Program approval to ship SPERT F-1 LEU fuel pins was submitted to NRC with a letter dated September 2, 1987; a resubmittal deleting the requirement that it be withheld from public disclosure was transmitted with a letter dated September 17, 1987. NRC Quality Assurance Program Approval for Radioactive Materials Packages No. 0578, Revision No. 1 with an expiration date of October 31, 1992 and dated November 5, 1987 was received on November 9, 1987 and remained in effect at the end of the reporting year.

Because of a forced shutdown of the Oak Ridge reactor in which the SPERT pins were to be used for an experiment, plans to ship this fuel were in abeyance until January, 1989 when a proposal was requested by Oak Ridge National Laboratory. This proposal to supply 1200 fuel pins in 6M Type drum was supplied in January, 1989 but at year's end ORNL had not yet responded and the proposal had been canceled. As explained earlier in Section H of this Chapter, these 1200 fuel pins were finally transferred to the Oak Ridge National Laboratory on May 17, 1990 under the existing QA Program approval. Efforts are underway to transfer the remainder of the pins but no specific acceptance has ever been received from DOE. Indeed, several inquiries were made by ORNL seeking to ship the 1200 fuel pins back to the University of Florida. Since there was no longer any room to store them in the smaller storage room, this return was categorically disallowed. Even if some or all of the remaining pins are not wanted by ORNL, the QA Program approval will also allow transfer shipment of the SPERT fuel to other secure facilities such as the low power training reactor at RPI. Therefore, it had been hoped that all of these pins could be transferred during this most recent year since they are no longer being considered for the HEU-to-LEU fuel conversion of the UFTR and since the QA Program Approval is to expire on October 31, 1992. However, because DOE has been unable to locate space at a storage facility and because RPI will not accept the fuel unless DOE funds a larger storage facility for them and pays for the fuel shipment, UFTR management is no longer hopeful these pins can be transferred before the QA Program approval expires. The presence of the remaining 4200 SPERT fuel pins in the more confining North Quonset Hut (Room 6) of the Nuclear Research Field Building promises to make the transfer more difficult, time consuming and costly whenever it occurs.

J. NRC Submittal on Estimated Decommissioning Costs

In accordance with the requirements of 10 CFR 50.33 and 50.75, the UFTR developed its official submittal estimating decommissioning costs and delineating the means of funding decommissioning and submitted them to NRC with a letter dated July 19, 1990. Considerable efforts were involved to obtain information on costs for decommissioning the UFTR facility, including asbestos removal. The estimated cost for the complete decommissioning of the UFTR facility was quoted at $2.02 million and assumed most work would be performed by contractors. Since the University of Florida is a state institution, the provisions of 10 CFR 50.75(e)(2)(iv) were used to indicate the funds needed for decommissioning would be requested from the Florida Legislature if and when a decision to decommission the facility is made. The submittal also stated that the cost estimate for decommissioning for 1991 and later years would be adjusted for inflation by the Consumer Price Index (CPI) and the new estimate kept on file at the facility as required. On this basis the 4.7% rise in the CPI from June, 1990 to June, 1991 was used as the basis for the new estimate to decommission the UFTR for July, 1991 determined to be $2.115 million. Similarly, the 7.93% rise in the CPI from June, 1990 to June, 1992 was used as the basis for the new estimate to decommission the UFTR for July, 1992 per an internal memorandum dated August 25, 1992 updating the cost estimate upward from $2.115 million to $2.18 million. This documenting memorandum is available at the UFTR facility. Per the requirements of 10 CFR 50.82, the UFTR also committed to submit an application for renewal of the R-56 license or a formal decommissioning plan at least two years prior to license expiration on August 30, 2002. A copy of the original submittal to NRC is contained in Appendix H of the 1989-1990 annual report.

TABLE VI-1

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(August 31, 1991)

O. ADMINISTRATIVE CONTROL PROCEDURES

- O.1 Operating Document Controls (REV 2, 7/91)
- O.2 Control of Maintenance (REV 4, 5/87)
- O.3 Control and Documentation of UFTR Modifications (REV 0, 10/85)
- O.4 10 CFR 50.59 Evaluation and Determination (REV 1, 5/86)
- O.5 UFTR Quality Assurance Program (REV 2, 7/91)
- O.6 Reactor Trip and Unscheduled Shutdown Review and Evaluation (REV 0, 5/87)
- O.7 Control of NRC 10 CFR 50 Written Communications Requirements (REV 0, 7/87)
- O.8 Operator Licensing Requalification Examination Controls (REV 1, 10/89)

A. ROUTINE OPERATING PROCEDURES

- A.1 Pre-Operational Checks (REV 14, 12/88)
- A.2 Reactor Startup (REV 12, 5/87)
- A.3 Reactor Operation at Power (REV 11, 5/87)
- A.4 Reactor Shutdown (REV 11, 10/89)
- A.5 Experiments (REV 4, 12/88)
- A.6 Operation of Secondary Cooling Water (REV 2, 10/89)
- A.7 Determination of Control Blade Integral or Differential Reactivity Worth (REV 1, 6/85)
- A.8 Pneumatic Rapid Sample Transfer (Rabbit) System (REV 0, 12/88)

B. EMERGENCY PROCEDURES

- B.1 Radiological Emergency (REV 4, 12/88)
- B.2 Fire (REV 8, 5/85)
- B.3 Threat to the Reactor Facility (Superseded by F-Series Procedures)
- B.4 Flood (REV 1, 4/83)

C. FUEL HANDLING PROCEDURES

- C.1 Irradiated Fuel Handling (REV 4, 2/85)
- C.2 Fuel Loading (REV 4, 4/83)
- C.3 Fuel Inventory Procedure (REV 3, 2/85)
- C.4 Assembly and Disassembly of Irradiated Fuel Elements (REV 0, 9/84)

TABLE VI-1 (CONTINUED)

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(August 31, 1991)

D. **RADIATION CONTROL PROCEDURES**

D.1 UFTR Radiation Protection and Control (REV 4, 7/91)
D.2 Radiation Work Permit (REV 10, 3/87)
D.3 Primary Equipment Pit Entry (REV 2, 5/85)
D.4 Removing Irradiated Samples From UFTR Experimental Ports (REV 5, 10/89)
D.5 UFTR Reactor Waste Shipments: Preparations and Transfer (REV 0, 4/87)
D.6 Control of UFTR Radioactive Material Transfers (REV 0, 12/88)

E. **MAINTENANCE PROCEDURES**

E.1 Changing Primary Purification Demineralizer Resins (REV 3, 6/85)
E.2 Alterations to Reactor Shielding and Graphite Configuration (REV 3, 5/87)
E.3 Shield Tank and Shield Tank Recirculation System Maintenance (REV 2, 4/83)
E.4 UFTR Nuclear Instrumentation Calibration Check (REV 1, 4/90)
E.5 Superseded
E.6 Argon-41 Concentration Measurement (REV 0, 1/84)
E.7 Measurement of Temperature Coefficient of Reactivity (REV 0, 5/85)
E.8 Verification of UFTR Negative Void Coefficient of Reactivity (REV 0, 12/85)

F. **SECURITY PLAN RESPONSE PROCEDURES (Reactor Safeguards Material, Disposition Restricted)**

F.1 Physical Security Controls (Confidential, except for UFTR Form SOP-F.1A)
F.2 Bomb Threat (Confidential, except for UFTR Form SOP-F.2A)
F.3 Theft of (or Threat of the Theft of) Special Nuclear Material (Confidential, except for UFTR Form SOP-F.3A)
F.4 Civil Disorder (Confidential)
F.5 Fire or Explosion (Confidential)
F.6 Industrial Sabotage (Confidential)
F.7 Security Procedure Controls (REV 2, 10/89)
F.8 UFTR Safeguards Reporting Requirements (REV 0, 9/87)

TABLE VI-2

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES (August 31, 1992)

O. ADMINISTRATIVE CONTROL PROCEDURES

- O.1 Operating Document Controls (REV 2, 7/91)
- O.2 Control of Maintenance (REV 4, 5/87)
- O.3 Control and Documentation of UFTR Modifications (REV 0, 10/85)
- O.4 10 CFR 50.59 Evaluation and Determination (REV 1, 5/86)
- O.5 UFTR Quality Assurance Program (REV 2, 7/91)
- O.6 Reactor Trip and Unscheduled Shutdown Review and Evaluation (REV 0, 5/87)
- O.7 Control of NRC 10 CFR 50 Written Communications Requirements (REV 0, 7/87)
- O.8 Operator Licensing Requalification Examination Controls (REV 1, 10/89)

A. ROUTINE OPERATING PROCEDURES

- A.1 Pre-Operational Checks (REV 14, 12/88)
- A.2 Reactor Startup (REV 12, 5/87)
- A.3 Reactor Operation at Power (REV 11, 5/87)
- A.4 Reactor Shutdown (REV 11, 10/89)
- A.5 Experiments (REV 4, 12/88)
- A.6 Operation of Secondary Cooling Water (REV 2, 10/89)
- A.7 Determination of Control Blade Integral or Differential Reactivity Worth (REV 1, 6/85)
- A.8 Pneumatic Rapid Sample Transfer (Rabbit) System (REV 0, 12/88)

B. EMERGENCY PROCEDURES

- B.1 Radiological Emergency (REV 4, 12/88)
- B.2 Fire (REV 8, 5/85)
- B.3 Threat to the Reactor Facility (Superseded by F-Series Procedures)
- B.4 Flood (REV 1, 4/83)

C. FUEL HANDLING PROCEDURES

- C.1 Irradiated Fuel Handling (REV 4, 2/85)
- C.2 Fuel Loading (REV 4, 4/83)
- C.3 Fuel Inventory Procedure (REV 3, 2/85)
- C.4 Assembly and Disassembly of Irradiated Fuel Elements (REV 0, 9/84)

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		operation of the recorder at 1600 hours on 26 February 1992. Following successful daily checkout on 27 February 1992, a monitored restart to full power was conducted at 1410 hours by SRO D. Cronin with NRC Inspector C. Bassett observing. Although the traces on the temperature recorder were as expected, the printed numbers designating thermocouple location were noted to be reversed at 1441 hours. After completion of an unscheduled shutdown at 1443 hours and an unscheduled shutdown review and evaluation indicating the event did not involve any radiological or other hazard, MLP #92-08 was reopened to disassemble the temperature recorder print wheel, realign the temperature points and verify two of them. After also inverting the ink pads for clearer recorder printing, the system was returned to operation. Subsequently the reactor was restarted at 1735 hours and all temperature recorder points were noted to be tracking and recording normally with no further problems noted in the temperature recorder.
8.	27 July 1992	After a successful daily checkout, the UFTR was started up at 1345 hours and run at 100 kW for 10 minutes for an irradiation from 1417 - 1427 with the reactor secured at 1430 hours. Subsequently, the reactor was restarted at 1505 intending to run an irradiation for two hours. After running at 100 kW from 1534-1609 hours, thermocouple point #2 in the outlet line of the south center fuel box was noted not to be tracking but rather was recording fully downscale in a failed position. The irradiation was then ceased with the reactor secured at 1610 hours. Subsequent checks noted the failure occurred several minutes after reaching full power for the first run at full power and had been failed for the

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		last 7-8 minutes of the first run and throughout the second run. This failure was difficult to note because the downscale position of thermocouple point #2 printout is difficult to see and not due to a lack of care on the part of the operations staff. Under MLP #92-24 the recorder was checked out and continuity of cables was confirmed back to the equipment pit. Subsequently the event was evaluated as not an abnormal occurrence. Though better vigilance might have noted the failure earlier, the occurrence was evaluated not to involve a violation of the technical specifications. Subsequently the unscheduled shutdown performed on July 27, 1992 was reviewed with the RSRS Executive Committee on July 28, 1992 with agreement that the failure downscale of the thermocouple for fuel box 12 was not a violation of the technical specifications. Dr. Vernetson indicated he would report the occurrence to Region II and follow any instructions they might have. There was considerable discussion about whether blockage of fuel box #2 could be detected in this case with indications in the negative reactivity effects of boiling, probable rupture disk breakage if any steam would be generated, flow changes due to increasing pressure differences long before boiling would occur and variations of the other temperature indications all giving the operator evidence of a flow blockage should such begin to occur. On this basis the committee approved restart with one failed thermocouple to complete several experiments provided the NRC would concur in this evaluation. The RSRS Executive Committee was to be notified prior to such a restart with running limited to no more than three hours in the power range.

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		NRC inspector Craig Bassett of Region II was notified of the occurrence on July 28, 1992 and the desire to restart for two short experiments - one for an hour at 100 kW and the other for an hour at 10 kW - subject to NRC approval. Thereafter, the UFTR would be shutdown and allowed to cool in anticipation of the scheduled fuel inspection (B-2 Surveillance) plus maintenance to repair thermocouples. The telephone notification was documented by a following telecopy and letter per Section 6.6.2 of the Tech Specs. Mr. Bassett generally agreed with UFTR Staff and RSRS evaluation on restart as the number and type of required operable measuring channels (thermocouples) quoted as an LCO in the Table on Page 7 of the tech specs was met. Other Sections considered were the instrumentation description under Chapter 5 Section 5.6.1 Paragraph of the Tech Specs and the LSSS Specification #3 on Page 5 of the Tech Specs indicating fuel box outlet temperature shall not exceed 155°F. Mr. Bassett agreed to consider the issue and in a return call on July 29 in which Project Manager Ted Michaels also participated, permission was given for the limited restart with extra vigilance. Subsequently the RSRS Executive Committee members were recontacted, updated and approved the two runs. A special memorandum documenting the need for added vigilance and the limited conditions for restart was provided for the staff, and all operators were required to read it prior to running. The 100 kW run for 1 hour was accomplished on 30 July and the 10 kW run for 1 hour was accomplished on 31 July without incident. At month's end, thermocouples and connecting wire were on order as the reactor was shutdown awaiting efforts to remove shield blocks for fuel inspection and thermocouple repair. The decision was also made to perform the fuel inspection first since less dose would be expected for this inspection

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		than for efforts to replace thermocouple wiring or thermocouples as might be needed. This plan was expected to minimize dose commitment giving more time for decay prior to commencement of the thermocouple work in a high radiation area. The 14-day final written report on the event was submitted to NRC via a letter dated August 10, 1992 (See Appendix E). Preparations for unstacking shielding were begun on 10-11 August with removal of the reactor superstructure, shielding blocks around the shield tank and setup of a control point at the control room door to the cell and another control point/stepoff pad/monitoring area at the top of the stairs. Under RWP 92-1-1, the shielding was unstacked leaving only two shield blocks above the core on 11 August 1992. Subsequently on 12 August 1992 the last shield blocks were removed and two fuel bundles were inspected (B-2 surveillance) to conclude the B-2 surveillance satisfactorily. At the conclusion of the B-2 fuel inspection, under RWP #92-2-I, maintenance on the temperature monitoring system was undertaken on 12 August 1992 without success as an open, badly oxidized/radiation embrittled wire to the thermocouple on the south center fuel box was found to be the problem. Additional efforts on 14 August 1992 to pull through some remaining wire from the equipment pit and to attempt retermination of the wiring to the thermocouple were unsuccessful as were efforts to scrape the wires on 18 August 1992. Since insufficient wire remained in the equipment pit to be pulled through to allow retermination of the thermocouple connection, the decision was made to replace the wiring to all the thermocouples for

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		the fuel boxes (#1, #2 and #3) on the south side of the core since the wire could not be pulled through for each one separately. Under 10 CFR 50.59 Evaluation No. 92-06, it was decided to install a terminal barrier strip in the equipment pit made of the same material as the thermocouples and to terminate the three south fuel box thermocouples with a barrier strip in the pit and run new wire from the equipment pit to the core and to reterminate the wiring to the thermocouples on the south side of the core. Per the approved 10 CFR 50.59 Evaluation No. 92-06, plans are eventually to terminate the remaining three (3) north core area thermocouple leads in the pit area and to replace all six (6) core thermocouples with quick disconnect leads and then install quick disconnect leads on all six lines to minimize future dose commitment for repairs to this temperature monitoring system in the core area.
		One last effort to use existing wire in the core and pit area were unsuccessful on 18 August 1992. Subsequently the terminal barrier strip was installed in the equipment pit and the three thermocouple lines for fuel boxes #1, #2 and #3 attached to the strip via lugs on 19 August 1992. The thermocouple wire for fuel boxes #1, #2 and #3 was replaced from the pit to the core area on 19 August 1992. After concluding various checks, the core shielding was reinstalled and the superstructure was reattached on 20 August 1992. Subsequently radiation surveys and decontamination checks at shutdown were completed on 21 August 1992 with the reactor then restarted in stages following notification of RSRS Executive Committee members, NES Department Chairman plus the NRC via Mr. Ed McAlpine. Radiation surveys in the restricted area were normal at 1 kW, 10 kW and at 100 kW where the temperature monitoring system was

TABLE III-8 (CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		verified to be operating properly and all shielding properly in place via a complete radiation survey in the restricted area (Q-5 surveillance) to close out both the fuel inspection (B-2 surveillance) and MLP #92-24 to allow the UFTR to return to normal operations on 24 August 1992 following checks of documentation packages. Subsequent operations have been normal with no recurrence of the problem.

IV. MODIFICATIONS TO THE OPERATING CHARACTERISTICS OR CAPABILITIES OF THE UFTR

A number of modifications and/or changes in conditions were made to the operating characteristics or capabilities of the UFTR and directly related facilities during the 1991-1992 reporting period. These modifications and/or changes in conditions were all subjected to 10 CFR 50.59 evaluations and then determinations (as necessary) to assure that no unreviewed safety questions were involved.

Carried over from the 1984-1985 Reporting Year:

(Modification 6: Replacement of Vent System Manometers) (Updated to Modification Number 92-04)
(Modification 7: Addition of Secondary Water Flow Sensors (Rotameters))

Carried over from the 1987-1988 Reporting Year:

(Modification 88-24: Installation of Optically Coupled Tachometer for Redundant Stack RPM Indication)

1. Replacement of Potentiometers in Safety Channel 2 Calibration Module (Permanent - Closed Item)

(Modification 90-4: Evaluation and Determination completed 22 May 1990)

This 10 CFR 50.59 Evaluation and Determination was generated to address the replacement of both the coarse and fine adjust gain potentiometers in the Safety Channel #2 meter circuit with sealed components to provide better resistance to environmental degradation.

On 19 November 1991, following 32 minutes operation at full power, the Safety Channel 2 meter was noted to fail pegged downscale by the reactor operator and by an SRO sitting in the control room. Since loss of this meter constituted loss of the overpower trip for this channel, an unscheduled shutdown was performed. During the shutdown at about 10 kW some 20 seconds after commencing shutdown, the Safety Channel #2 meter was noted to return to normal. Subsequently, under MLP #91-61, the meter circuit trip test was noted to be operating normally. The pegged downscale nature of the failure isolated the fault to the Safety Channel #2 meter circuit. During extended bench testing and checks of the meter circuit assembly, an unrelated intermittent fault in the circuit fine adjust potentiometer was isolated and was noted as the likely intermittent failure causing the low reading addressed in MLP #91-59 involving the cleaning of contacts to correct a low reading on the Safety Channel 2 percent power meter (94% versus 100%) in calibrate discovered during a daily checkout on 7 November 1991. Per 10 CFR 50.59 Evaluation and Determination No. 91-09, both the coarse and fine adjust gain potentiometers were replaced with sealed components to provide better resistance to environmental degradation.

The coarse pot was replaced with an identical component while the fine gain pot was replaced with a 250Ω versus 200Ω adjustable potentiometer, representing only about 0.33% change in sensitivity with unchanged circuit responses (See Figure 1). Extensive additional analysis and checks were performed on the meter and related circuits. Subsequently, the Safety Channel #2 amplifier card was reseated and further checks were conducted including circuit run checks, heat and cold tests as well as checks of all Safety Channel #2 harness assemblies and connectors with no further faults noted. Cleaning of the various contacts was considered to have corrected the downscale pegged failure of the meter circuit. After proper adjustment of the meter circuit following reseating in the console and successful completion of preoperational checkouts, the reactor was restarted to 100 kW on 26 November 1991 with a second SRO observing the restart and present for the first two hours at full power to provide additional observation of the Safety Channel #2 meter to assure no unobserved failure occurred. Subsequently, the reactor was returned to normal operations with no further problems noted per the final 14-day report to NRC dated December 3, 1991 (See Appendix D to this report).

Controlling Documents: Maintenance Log Page #91-61.
10 CFR 50.59 Evaluation/Determination No. 91-09
14 Day Report to NRC Dated December 3, 1991

2. Replacement of +15 Volt Power supply for Nuclear Instrumentation Channel I (CIC, SC#1, Period) (Permanent - Closed Item)

(Modification Number 91-10: Evaluation Completed: 19 December 1991)

This 10 CFR 50.59 Evaluation was generated to address the substitution of a different shape and size but equivalent +15V power supply in Nuclear Instrumentation Channel I on the UFTR console. On 16 December 1991, during the weekly checkout, the lamps for the SAFETY 1, HIGH VOLTAGE and PERIOD Limiting Safety System Settings (LSSSs) could not be reset. Although there had been a PC PUMP trip due to a momentary AC power reduction on the previous workday (13 December 1991), a subsequently successful daily checkout on that day and the fact the LSSS lamps in question had been reset until midway through the weekly checkout were evaluated to indicate this failure was unrelated to the trip. Under MLP #91-65, the cause of the problem was traced to a failed +15V power supply in Nuclear Instrumentation Channel I. Because there was no stocked spare for this no longer available power supply, an alternate supplier of an equivalent power supply was finally located. Under 10 CFR 50.59 Evaluation Number 91-10, this replacement +15V power supply was evaluated to be acceptable to replace the failed supply and the appropriate modifications were made to accommodate the different shape and physical size of the power supply which included a mechanical plate to cover the new power supply (found unnecessary during installation) and new holes drilled for access to the replacement power supply. Subsequently, after installation, the appropriate voltages were assured to agree with those from the last system calibration so the reactor was approved for restart on December 24, 1991. Subsequently a successful power run on December 26, 1991 verified normal operations with no further problems noted.

Controlling Documents: Maintenance Log Page #91-65 (Closed: 23 December 1991)
10 CFR 50.59 Evaluation No. 91-10

3. Secondary Deep Well Pump Replacement (Permanent - Closed Item)

(Modification Number 92-01): Evaluation and Determination Completed 13 February 1992)

This 10 CFR 50.59 Evaluation and Determination was generated to address replacement of the secondary cooling system deep well pump with an equivalent pump. On 10 February 1992, during the weekly preoperational checkout, the deep well secondary cooling system was noted to be inoperative. Under MLP #92-03, the cause of the problem was traced to the pump/motor down in the well. After a determination by Physical Plant Division via Mr. Charlie Shore that maintenance on the well water cooling system is reactor management responsibility, Hare Well Drilling was contracted to pull the well and determined the pump was failed. Under 50.59 Evaluation and Determination #92-01, an equivalent pump using the same motor was installed in the well. The Gould's 225 gpm, Series H, 10 HP, 3-Stage Model #225 H103F pump is the modern equivalent replacement for the failed Gould's 220 gpm, Series UG662, 10 HP, 4-Stage Model 2361339000 pump which failed. Equivalence was verified for evaluation purposes per communications with Hare Well Drilling and with Gould's Pumps, Inc. The check valve in the system was also replaced with a duplicate. Subsequently the secondary system flow indicator was noted not to be responding due to corroded connections which were cleaned and realigned. Subsequently, after verifying all scrams on the secondary system and performing a valid preoperational checkout, the reactor was restarted to full power to demonstrate temperatures were as expected on the primary with somewhat reduced temperature difference across the heat exchanger demonstrating somewhat improved flow with the new pump as a conservative check of system operation with no further problems noted.

Controlling Documents: Maintenance Log Page #92-03 (Closed: 14 February 1992)
10 CFR 50.59 Evaluation/Determination No. 92-01

4. Repositioning of Safety Channel #1 High Voltage Power Supply Terminal (Permanent - Closed item).

(Modification Number 92-02: Evaluation Completed 25 February 1992)

This 10 CFR 50.59 Evaluation was generated to address the movement of the failed/fused connection points on a damaged connection board to a free space in the wide range drawer to include drilling new holes for the connections and the use of improved ceramic insulator mounts. On 17 February 1992, during the weekly checkout, the wide range drawer was noted to be inoperable. Under MLP #92-06 the cause of the problem was traced to arcing at the insulated connection point resulting in a failed resistor and a failed Safety Channel 1 high voltage power supply along with a damaged insulated connection board. Under 50.59 Evaluation #92-02, the failed connection point was moved to a free space in the wide range drawer which involved drilling three holes and mounting an improved ceramic insulating connection (See Figures 2A and 2B). Subsequently the power supply and resistor were replaced with on-hand spares, leaving the electrical circuit unchanged except for the physical connecting location. Following system checkouts, including the high voltage calibration point on the wide range channel and successful completion of a daily preoperational checkout, an SRO-monitored restart to full power was conducted to demonstrate proper circuit operation prior to return to normal operations with no further problems noted.

Controlling Documents: Maintenance Log Page #92-06 (Closed: 17 February 1992)
10 CFR 50.59 Evaluation No. 92-02

5. Safety Blade Position Indication Circuit Resistor Change (Permanent - Closed Item).

(Modification Number 92-03: Evaluation Completed 28 May 1992).

This 10 CFR 50.59 Evaluation was generated to address replacement of failed resistors in the control blade position indication circuits with equivalent or better resistors. On 30 April 1992, during performance of the S-1, S-5, and S-11 surveillances in making connections for the blade drop time measurements (S-1 surveillance), the control blade position indication circuits for both the S-1 and S-3 control blades were found to have arcing in a circuit resistor causing smoking and overheating preventing completion of the surveillances. Under MLP #92-16 the circuits were checked and the failing resistors identified. Since identical resistors could not be located, equivalent resistors (ohm rating, watt rating and tolerance all equivalent or better) were identified and approved for replacement in the circuit under 10 CFR 50.59 Evaluation #92-03. Under MLP #92-16 the burnt resistors on the S-1 and S-3 control blade position indicating circuits were replaced (See Figures 3A, 3B.1 and 3B.2) and the S-1, S-5 and S-11 surveillances were then concluded successfully with no further problems noted.

Controlling Documents: Maintenance Log Page #92-16 (Closed: 4 May 1992)
10 CFR 50.59 Evaluation No. 92-03

6. Installation of New Manometers on Core Vent System (Permanent - Open Item)

(Modification Number 92-04: Evaluation Completed 28 May 1992)

This 10 CFR 50.59 Evaluation was generated to address replacement of the manometers and associated scales on the Core Vent System. Such a replacement is part of the planned upgrade of the overall facility equipment. The current manometer scales indicate in reverse 2.0-0.0 inches rather than 0.0-2.0 inches. This reversal is well known by all facility personnel but should be corrected. In addition the new manometers have much more accurate scales over the range of interest (0.0-0.5 inches). The smaller scale also gives a better indication of the slow opening damper valve. There are no excursions or accident-related events which would result in values greater than the proposed 0.5 inch reading. Therefore, installation of these manometers has been evaluated not to involve any unreviewed safety question as an update of Modification 6 from the 1984-1985 Reporting Year. Though not yet implemented, these manometers are on hand and will be installed and their proper operation verified as time and facility operations permit.

Controlling Documents: 10 CFR 50.59 Evaluation No. 92-04

7. Recalibration of the East Area Radiation Monitor Alarm Module (Permanent - Closed Item).

(Modification Number 92-05: Evaluation Completed 28 July 1992)

This 10 CFR 50.59 Evaluation was generated to address recalibration of the -15 volt/+15 volt and the +600 volt bias power supplies in the East Area Radiation Monitor (ARM) by changing out resistors in the instrument circuit. On 1 June 1992, during the weekly preoperational checks, the East Area Radiation Monitor (ARM) was noted to be giving no response to its check sources. Under MLP #92-20, the problem was isolated to be in the East ARM instrument. Subsequently a failed capacitor was replaced in the bias power supply coupling circuit on the amplifier input. Two other stressed capacitors were also replaced, all with exact replacements. Module calibration and trip settings should not have been affected by this maintenance. Subsequently, following the manual procedure, the +15 volt bias power supply in the East ARM was recalibrated by changing out the R202 resistor with a different resistance value to assure calibration. Similarly, the -15 volt vias supply was recalibrated changing out the R207 resistor and the +600 volt bias supply was recalibrated by replacing the R244 resistor (See Figures 4A and 4B). Although following the manual procedure, these recalibrations were controlled under 10 CFR 50.59 Evaluation No. 92-05 since the circuit was changed though following the recommended manual procedures. Following the subsequent source calibration check (Q-2 surveillance), the East ARM was returned to service with no further problems noted.

Controlling Documents: Maintenance Log Page #92-20 (Closed: 3 June 1992).
10 CFR 50.59 Evaluation No. 92-05

8. <u>Modification to UFTR Thermocouple System: Implementation of Terminal Strips and Quick Disconnects</u> (Permanent - Open Item)

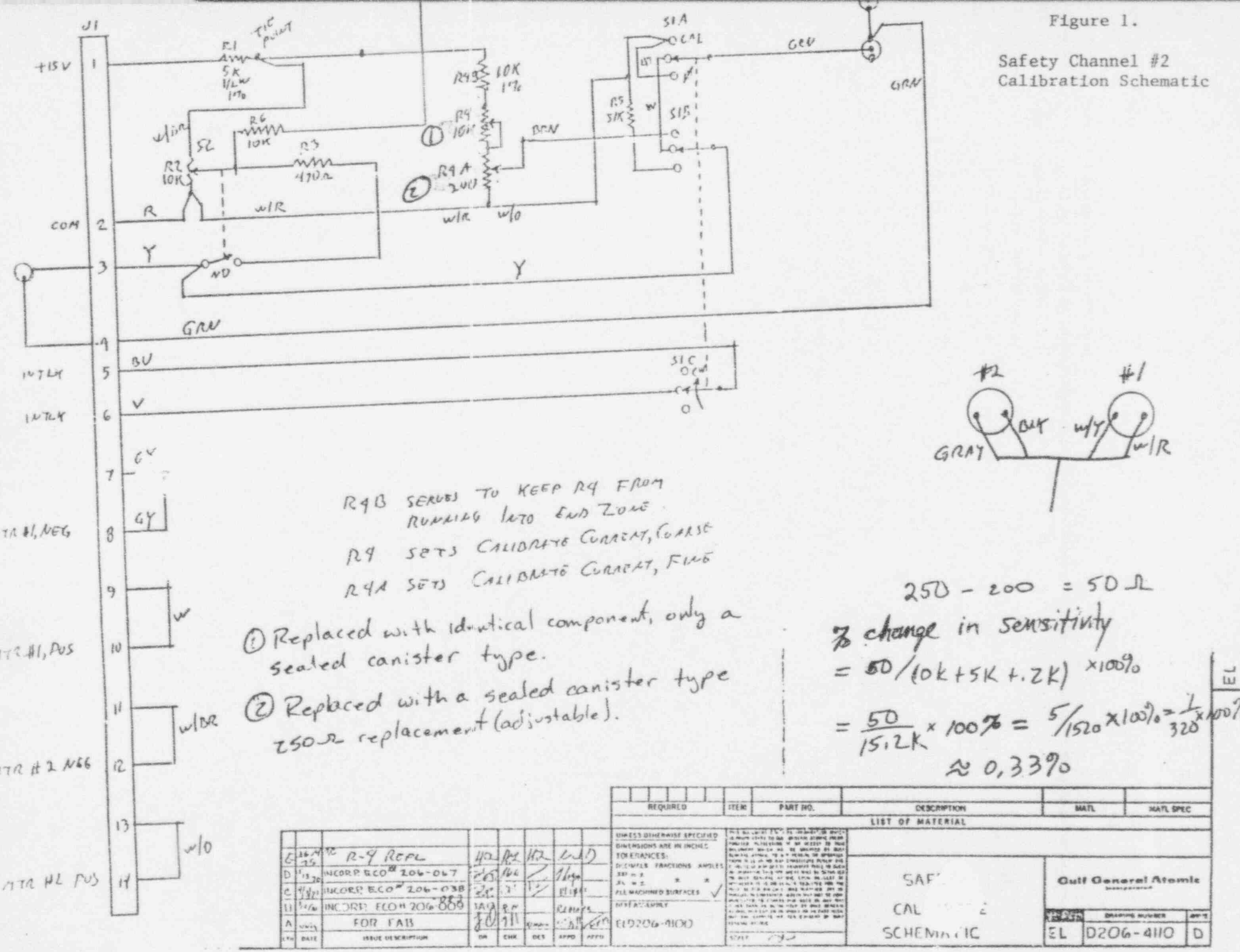
(Modification Number 92-06: Evaluation Completed 17 August 1992)

This 10 CFR 50.59 Evaluation was generated to address installation of a barrier strip in the equipment pit for the core area thermocouple leads and to replace all six (6) core area thermocouples with quick disconnect leads and then install quick disconnect leads on all six lines in the interest of ALARA to minimize dose commitments for periodic repairs required to this temperature monitoring system in the core area. On 27 July 1992, at 1609 hours after 35 minutes of a scheduled two-hour irradiation at full power, the SRO noted that temperature recorder point #2 (south center fuel box) was failed downscale. After performing an unscheduled shutdown and securing the reactor at 1610 hours, it was noted that the point had been reading downscale for the last 7-8 minutes of a full power run completed at 1430 hours but had not been noticed due to the downscale nature of the failed indication. Under MLP #92-24, the recorder was checked out and continuity of cables was confirmed back to the equipment pit. After UFTR staff and RSRS evaluations and NRC agreement that no tech spec violation was involved and with NRC approval, several short irradiations were approved and completed on July 30-31, 1992. While the reactor was on administrative shutdown awaiting sufficient cooling time to begin unstacking shielding to perform the fuel inspection originally planned for mid-August, additional thermocouple wire and replacement thermocouples were ordered. Since repair of the thermocouple system required the core shielding to be unstacked, both the fuel inspection (B-2 Surveillance) and work under MLP #92-24 were completed during one unstacking of the core shielding which was accomplished on August 11, 1992. After the fuel inspection (B-2 Surveillance) was completed on August 12, 1992 under RWP 92-1-I, work under MLP #92-24 and RWP-92-2-I was undertaken to isolate the temperature monitoring system failure to the wiring and connection to thermocouple number 2. After several unsuccessful attempts to reterminate the connection with existing wiring including stripping additional small quantities of excess wiring, the decision was made to replace the wiring and reterminate the connections to all three (3) thermocouples (#1, #2 and #3) on the south side of the reactor core. Under 10 CFR 50.59 Evaluation Number #92-06, a terminal barrier strip was installed in the equipment pit made of the same material as the thermocouples and the three south fuel box thermocouple readouts on the control room temperature recorder were connected to the barrier strip in the pit and new wire was run to the core where all three thermocouples were reconnected to restore proper operations of thermocouple #2 on the south center fuel box outlet as well as on thermocouples #1 and #3 on August 19, 1992. Quick disconnect leads were not used since the existing thermocouples were left in place. Subsequently, all shielding was replaced along with superstructure on August 20 with the confirmatory radiation surveys performed during the stepped approach to full power on August 21 along with the completion of the detailed restricted area radiation survey (Q-5 Surveillance) and verification of proper thermocouple response during full power operation with no further problems noted. Plans are eventually to terminate the remaining three (3) north core area thermocouple leads in the pit area, to replace all six (6) core area thermocouples with quick disconnect leads and then install quick disconnect leads on all six lines to minimize future dose commitment for repairs to this temperature monitoring system in the core area. In addition, it is planned to add an additional quick disconnect to the line below the core to limit the flux exposure that embrittles the wire and allow for rapid, low personnel exposure replacement of the embrittled core area thermocouple wiring. Current plans are to implement the remainder of these modifications under 10 CFR 50.59 Evaluation No. 92-06 when the core is unloaded for the HEU to LEU conversion unless other failures necessitate earlier implementation.

Controlling Documents: Maintenance Log Page #92-24 (Closed: 21 August 1992)
Radiation Work Permit #92-1-I
Radiation Work Permit #92-2-I
10 CFR 50.59 Evaluation No. 92-06

Figure 1.

Safety Channel #2
Calibration Schematic



R4B SERVES TO KEEP R4 FROM RUNNING INTO END ZONE

R4 SETS CALIBRATE CURRENT, COARSE

R4A SETS CALIBRATE CURRENT, FINE

① Replaced with identical component, only a sealed canister type.

② Replaced with a sealed canister type 250Ω replacement (adjustable).

$250 - 200 = 50\,\Omega$

% change in sensitivity

$= 50/(10k+5K+.2K) \times 100\%$

$= \frac{50}{15.2K} \times 100\% = 5/1520 \times 100\% = \frac{1}{320} \times 100\%$

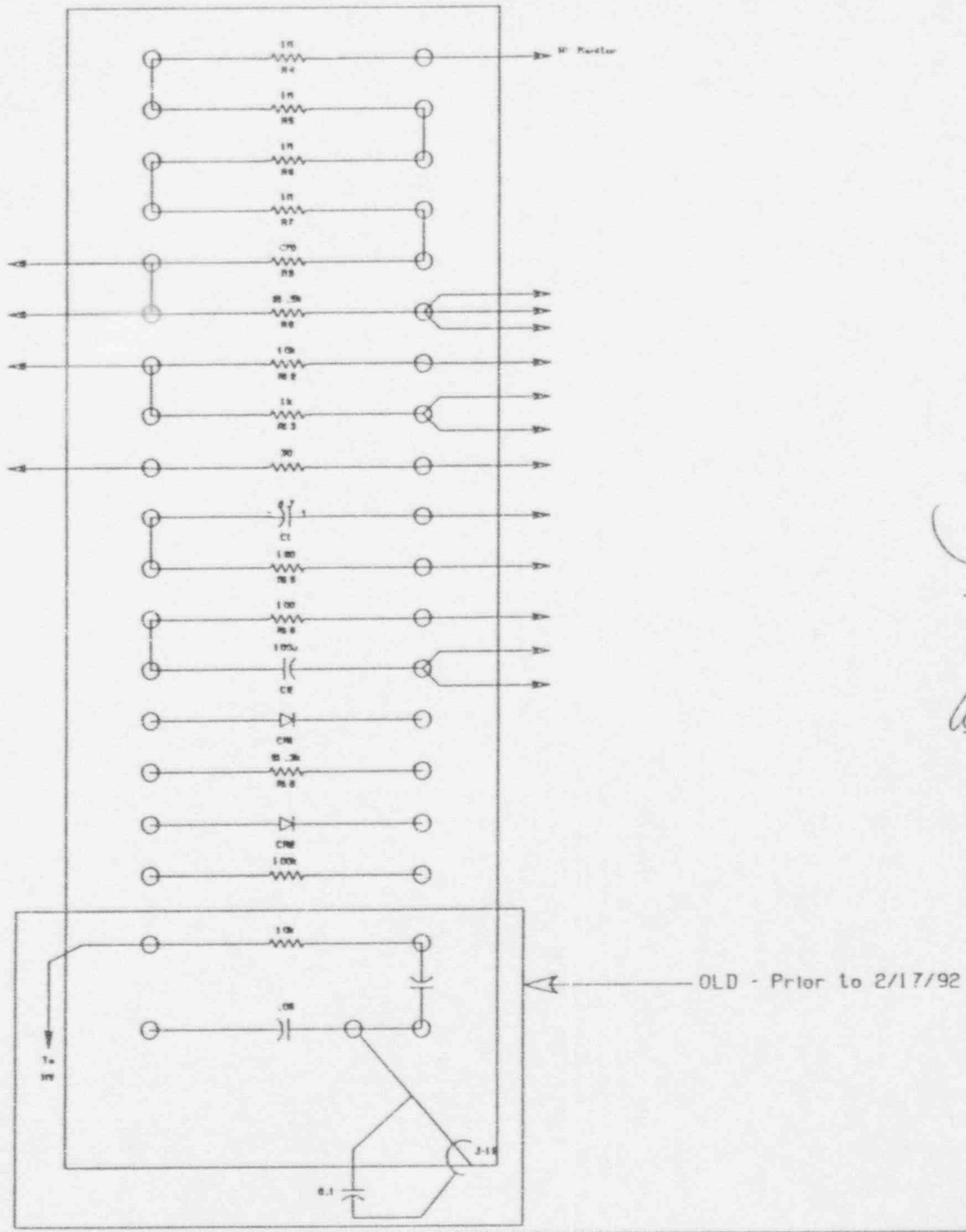
$\approx 0.33\%$

Figure 2A.

Physical Change in

Location of WR HV

Power Supply Connections



[signature] 2/17/92

Daniel Cronin Date

[signature] 2/17/92

William Vernetson Date

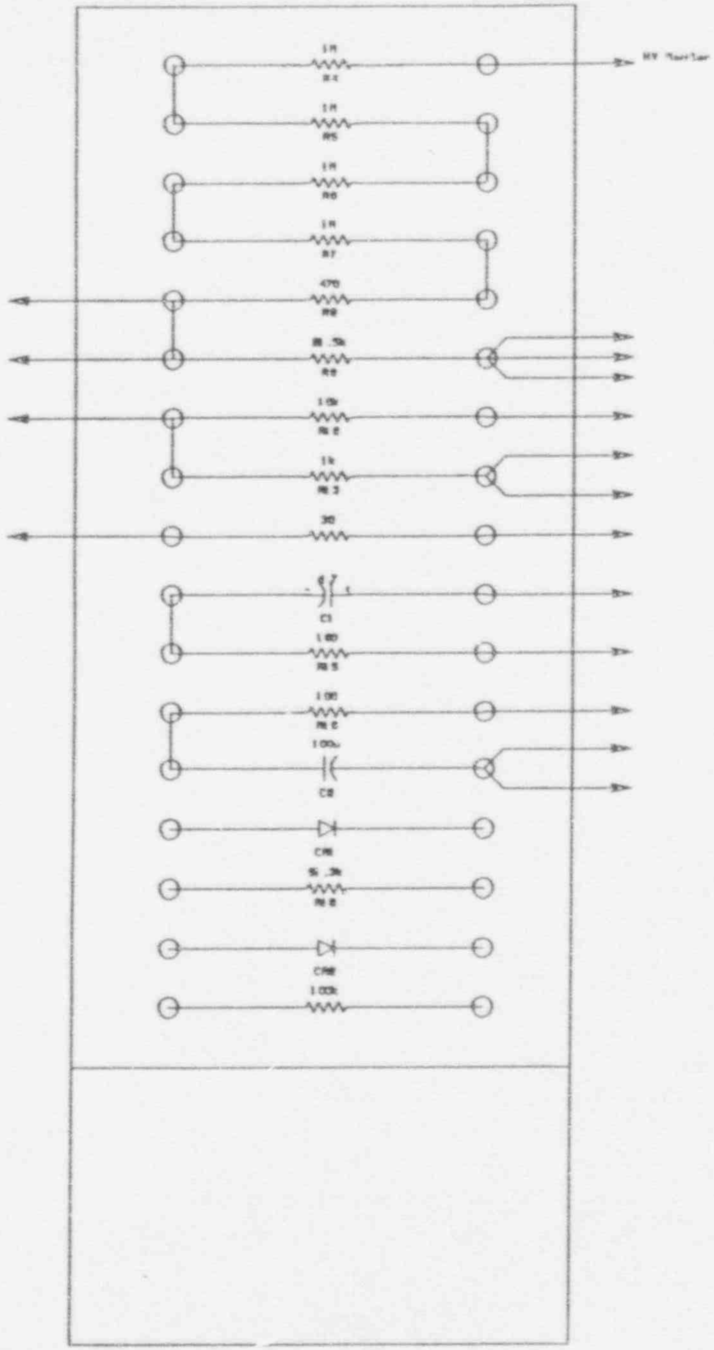
Rewashed on 7/30/93 [illegible]

Figure 2B.

Physical Change in

Location of WR HV

Power Supply Connections



Daniel Cronin — 2/17/92 — Date

William Vernetson — 2/17/92 — Date

reworked on 7/30/93 WGV

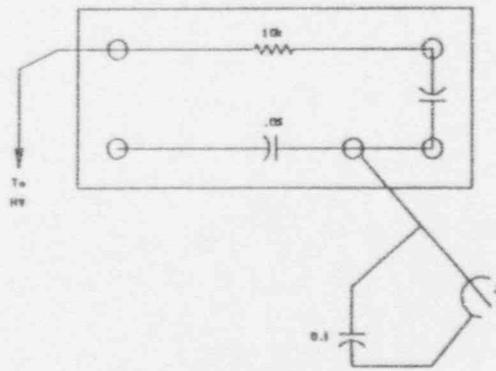


Figure 3A. Control Blade Position Indicating Circuit

CCW increases readout span and decrease bottom, compensat
CW decreases readout span and increase bottom, compensat
Back door pot to adj bottom
Drive unit pot to adj top

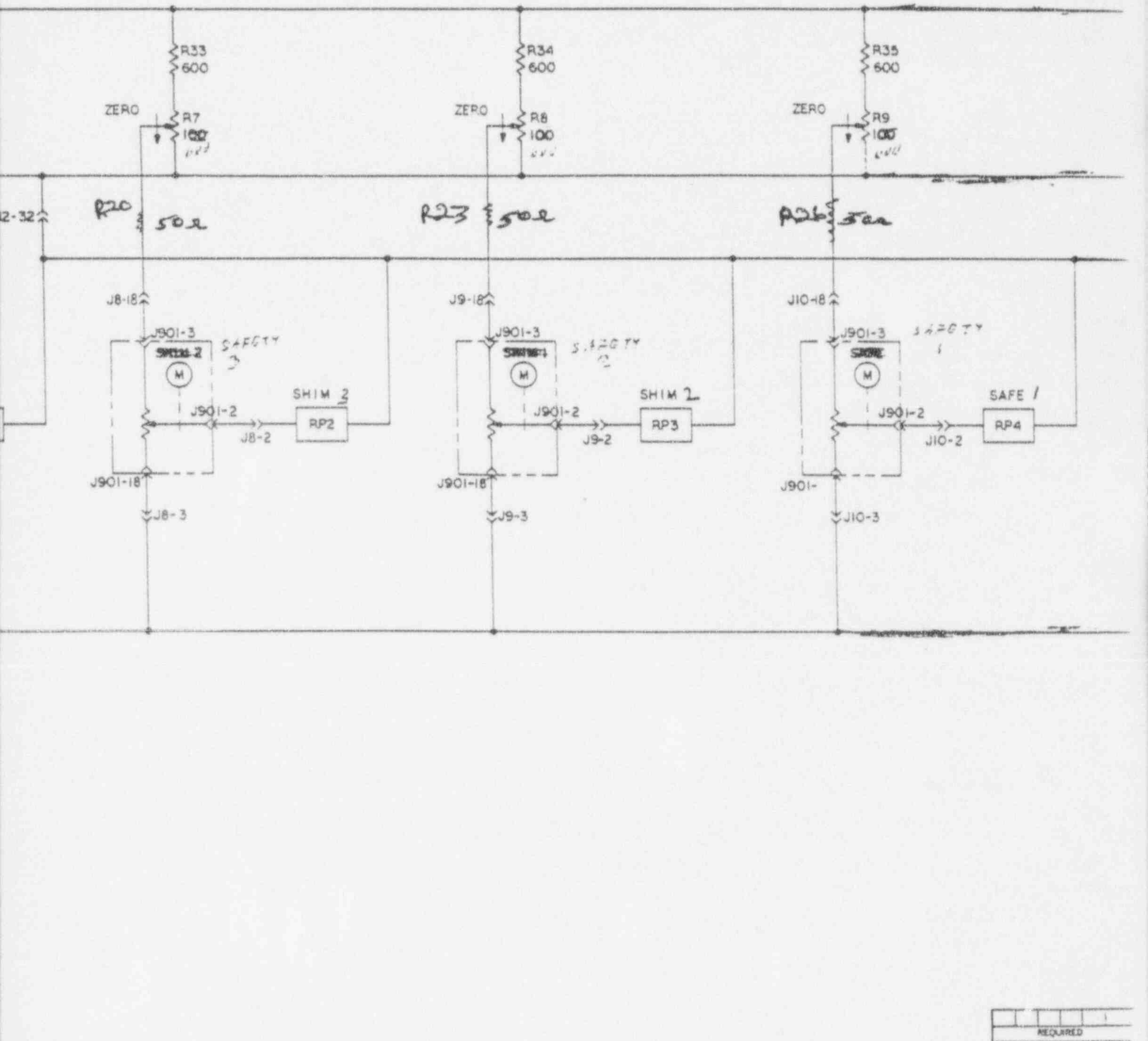


Figure 3B.1. Control Blade Position Indicating Circuit

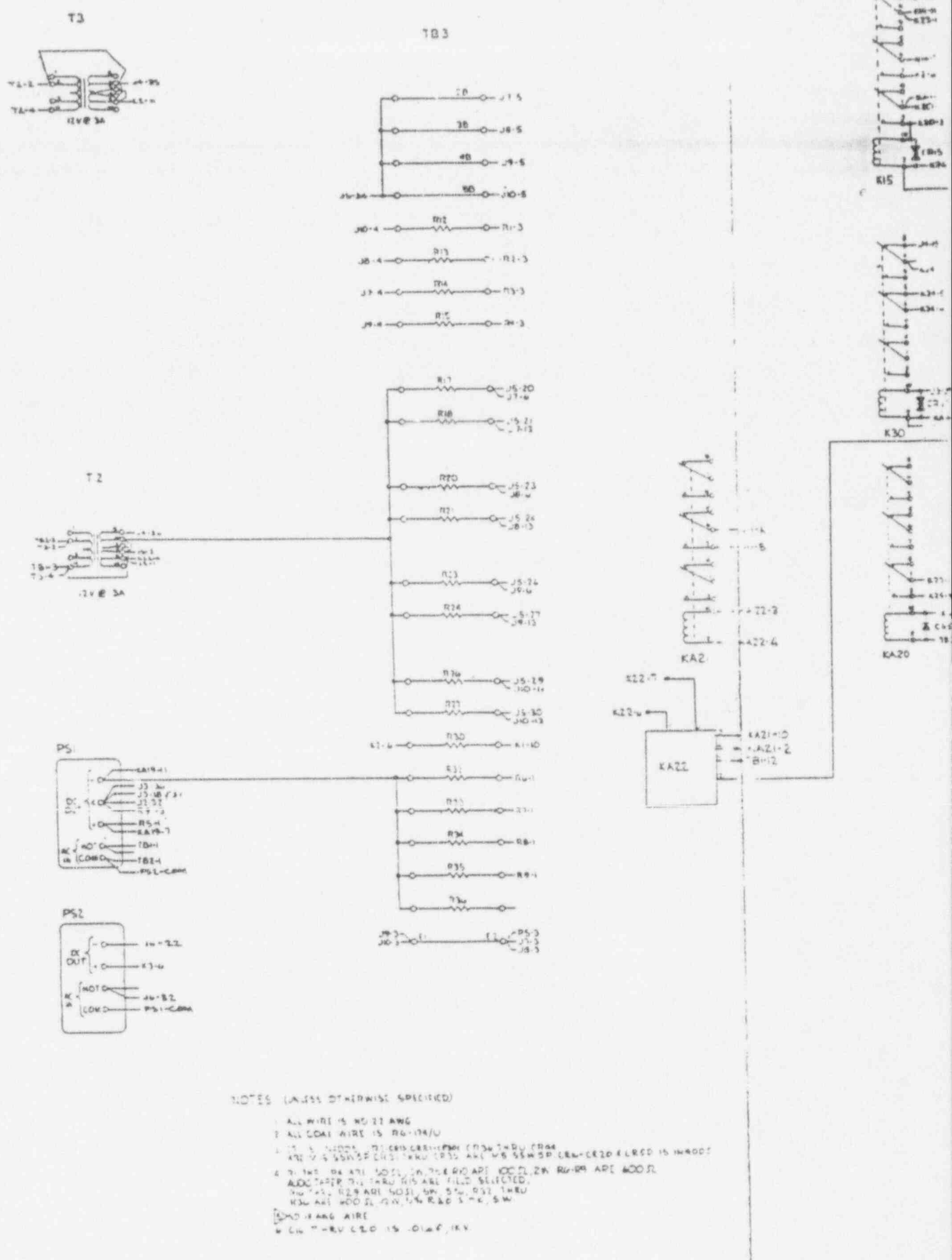


Figure 3B.2. Control Blade Position Indicating Circuit

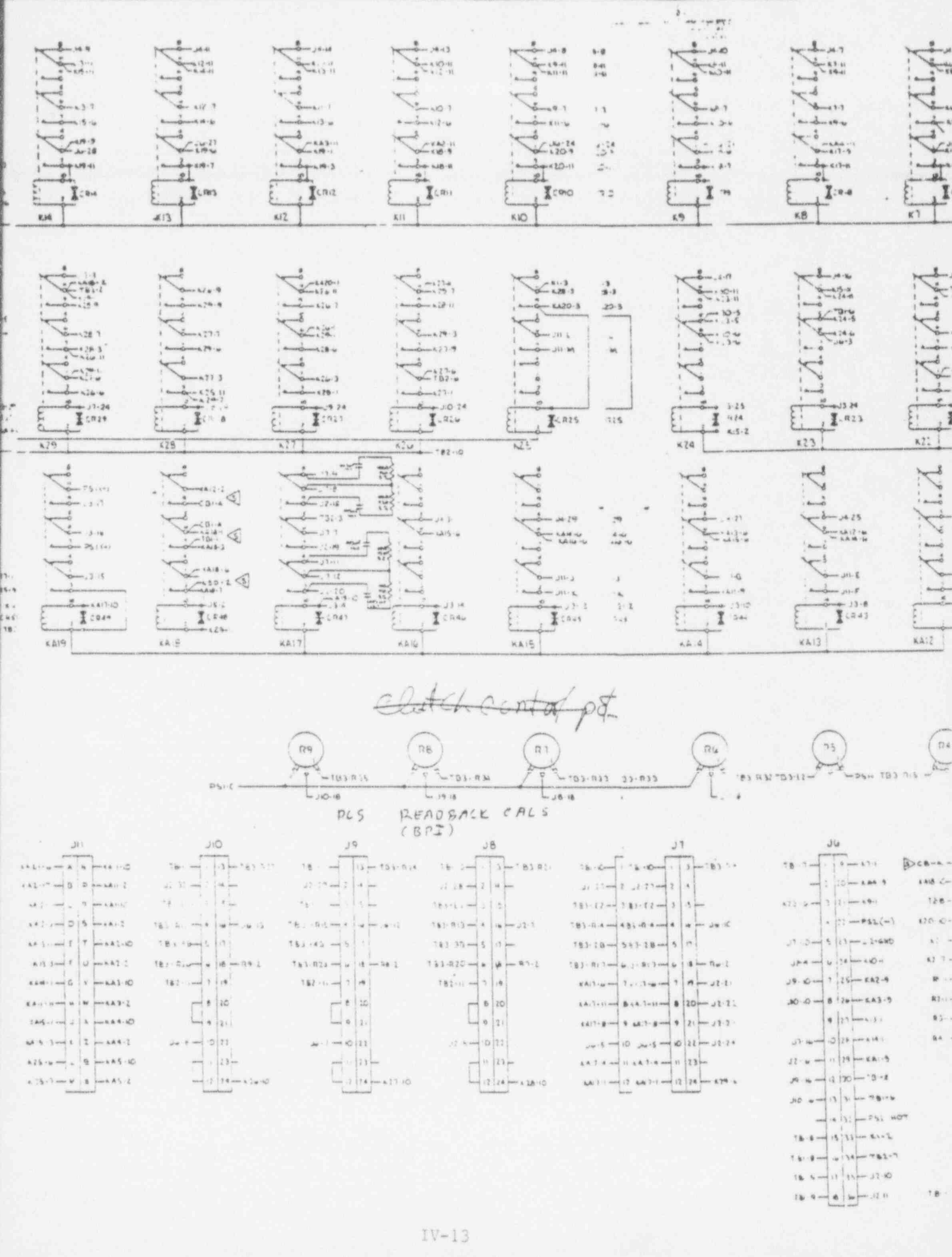
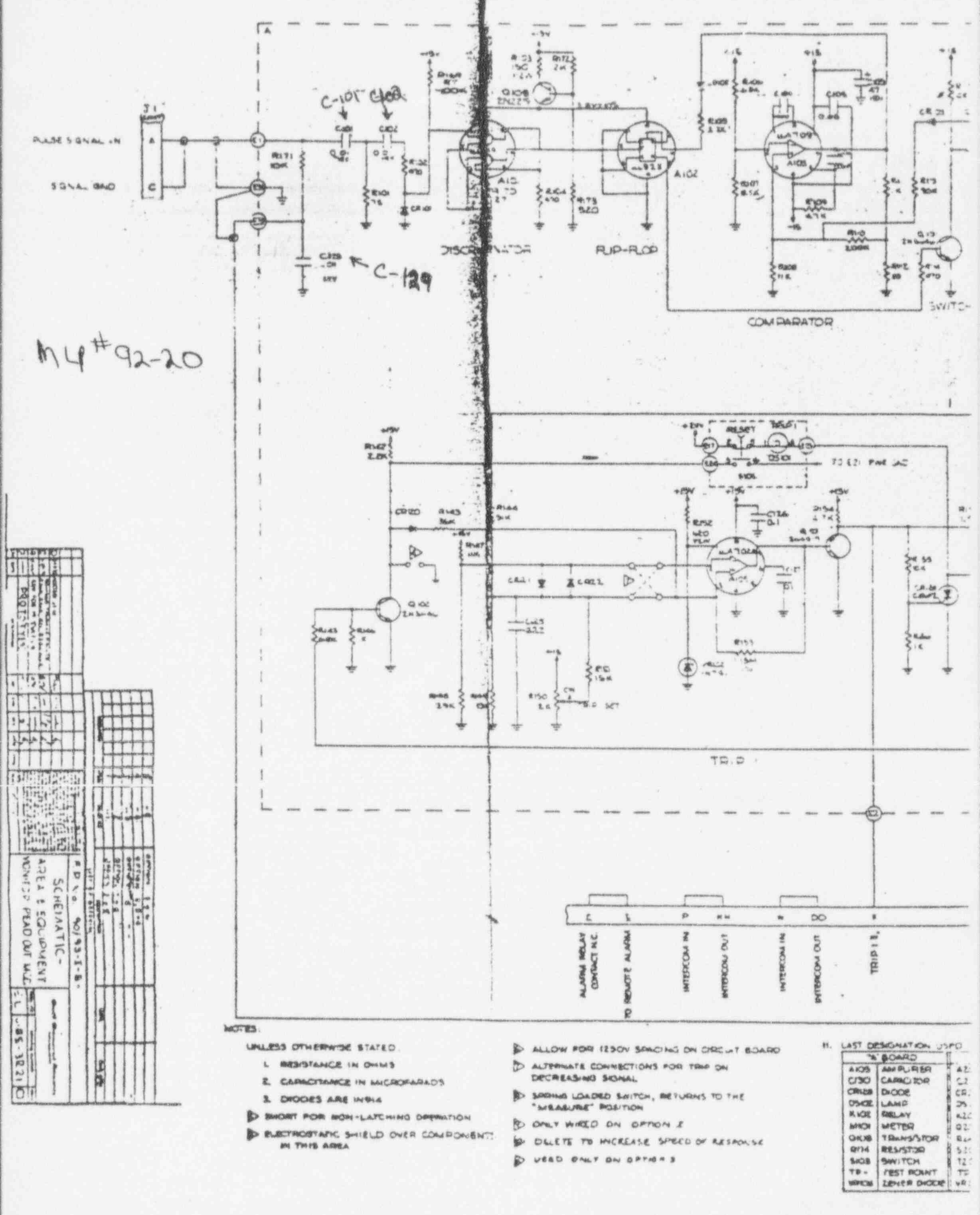


Figure 4A. Area Radiation Monitor



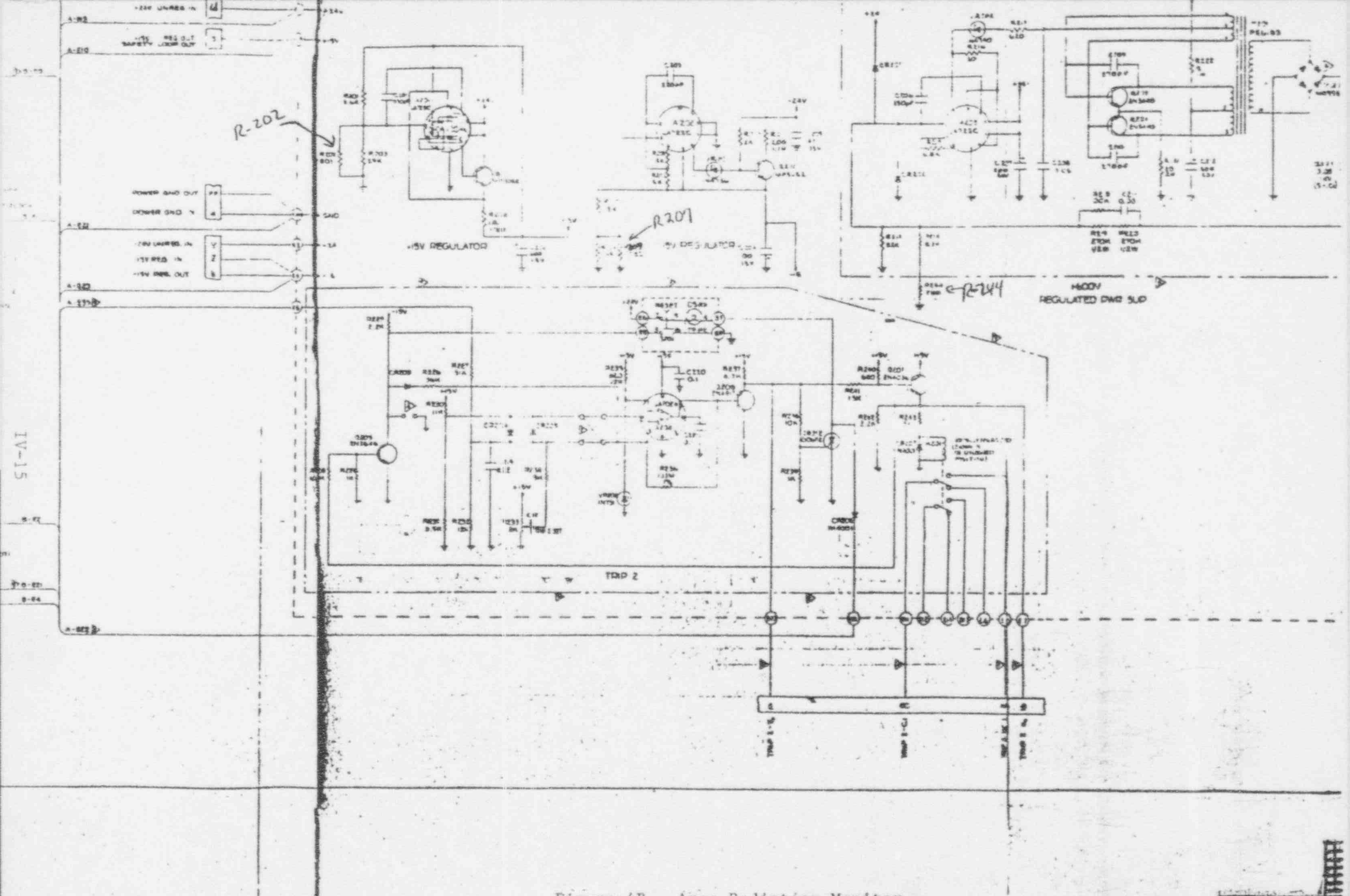


Figure 4B. Area Radiat on Monitor

MLP #92-20

V. SIGNIFICANT MAINTENANCE, TESTS AND SURVEILLANCES OF UFTR REACTOR SYSTEMS AND FACILITIES

A review of records for the 1984-1985 reporting year shows extensive corrective and preventive maintenance was performed on all four control blade drive systems external to the biological shield. Similarly maintenance work during the 1985-1986 reporting year was even more extensive as the problem of a sticking safety blade (S-3) recurred on September 3, 1985. The recurrence necessarily demanded a detailed and complete check of all control blade drive systems to determine finally and correct the cause of the sticking blade internal to the biological shield with the 1986-1987 reporting year involving relatively little maintenance and no large maintenance projects.

For the 1987-1988 reporting year, there were two dominant though manageable maintenance projects. The first large scale maintenance project during the 1987-1988 reporting year involved an extensive effort to clean the control blade drive motor gear assemblies to free them of hardened grease and replace worn bearings. Though only Safety-2 had failed to withdraw on demand, all gear assemblies had grease in various stages of hardening which was cleaned out and then replaced with fresh grease and new bearings, to restore free withdrawal of S-2 and assure free motion of all control blades. The second large scale project was involved with the evaluation, corrective action, testing and monitoring of the two safety channels due to two occurrences of the downscale failure of the Safety Channel 1 meter indication (and probably the function). The extensive checks, maintenance efforts to clean connections, change connections and replace parts and special test development and implementation as well as the monitoring involved for the two occurrences easily make this the largest maintenance effort since the control blade drive system maintenance performed internal to the biological shield in the 1985-1986 reporting year.

Other significant maintenance efforts in 1987-1988 were devoted to the diluting fan motor and RPM indicating system, the two-pen recorder response and the blade position indicators for all control blades. Although corrective maintenance in 1987-1988 was considerably increased over the previous reporting year, it was expected that much of the corrective and preventive maintenance performed in that year would assure a return to high availability in the 1988-1989 reporting year, and this is exactly what occurred. Indeed, the 79.2% availability for the 1987-1988 year indicates more or less routine maintenance and surveillance checks and tests throughout the year except for the two large projects cited above; for 1988-1989, the availability was back to near 90% at 87.67%. Of the 45 equivalent full days of unavailability, only 28.25 days were actually due to forced unavailability primarily due to corrective maintenance for repairs. In contrast to previous years, there was no single project dominating unavailability, though multiple maintenance tasks on the two-pen recorder and on the Radiation Monitoring System clearly dominated the maintenance efforts for the reporting year and warranted consideration of replacing these items when funds could be made available.

Maintenance efforts in the 1989-90 reporting year increased again so that total availability for the year was only 68.84%. Especially significant efforts were devoted to checks, repairs, surveillances and other maintenance activities connected with the biennial fuel inspection resulting in a two-month outage, part of which was due to the final failure and subsequent replacement of the 2-pen log/linear recorder. Though no other single maintenance effort was really large, there was considerable effort devoted to Safety Channel and other control and reactor protection system-related repairs during the year both for repairs following trips or other failures and for preventive maintenance. Without the two month outage (63 days) for fuel inspection, the remaining unavailability for the year was fairly normal as there were only 50 3/4 additional days of unavailability in the 1989-1990 reporting year with 24 of those days in the planned/preventive maintenance category as well as several days unavailability for administrative shutdown. Certainly, the 113.75 total days unavailability (31.16% unavailability) was one of the poorer records in the last ten years. Nevertheless, it was expected that all the corrective and preventive maintenance would allow the UFTR to return to a high availability in the next reporting year.

Although availability in the 1990-1991 reporting year was not as high as hoped, it was greatly improved as there were 93 days forced unavailability, 1-1/4 days planned unavailability and 23-1/4 days of administrative shutdown. The 94-1/4 days total unavailability (25.82% unavailability) for maintenance is about average for the past ten years. This value was somewhat elevated by the lack of a full time Reactor Manager as some maintenance efforts involved extra days awaiting time for facility personnel to become available to address larger maintenance efforts. Of course, delays due to lack of replacement part inventory and the need to order repair parts also expands forced unavailability. Finally, the additional administrative shutdown time of 23-1/4 days for the 1990-1991 year is much higher than normal but again, this was due to a shortage of licensed personnel especially senior reactor operators over the last six months of the year and no full time Reactor Manager after October 5, 1990. This situation was expected to be much improved with the licensing of two new senior reactor operators early in the 1991-1992 year, plus the expected hiring of a full-time Reactor Manager.

Although no permanent reactor manager was able to be hired in the 1991-1992 reporting year, two new part-time student senior reactor operators (SROs) were licensed and certified on October 17, 1992. Although availability in the 1991-1992 reporting year was not as high as had been hoped, availability was again improved significantly as there were only 72.25 days forced unavailability, 4.25 days planned unavailability and 23.50 days of administrative shutdown. The 76½ days total unavailability (20.90% unavailability) for maintenance is approximately average for the past decade. Again, this value for maintenance-related unavailability is considerably elevated by the lack of a full-time Reactor Manager as some maintenance efforts, especially early in the reporting year before certification of the two new SROs, involved extra days awaiting time for facility personnel to become available to address necessary maintenance efforts. Of course, delays due to lack of replacement part inventory and the need to order repair parts again expanded forced unavailability, though less than previously, especially due to availability of the electronics repair kit acquired through Department of Energy Reactor Instrumentation Upgrade Program. Nevertheless, the additional administrative shutdown time of 23½ days for the 1991-1992 year is again higher than normal, primarily due to the shortage of senior reactor operators early in the year and no full-time Reactor Manager for the entire year. With the appointment of SRO D. Simpkins as part-time Acting Reactor Manager on August 11, 1992, this situation is expected to improve in the next reporting year, especially if a full-time Reactor Manager can be hired to complement the hiring of a new ex-Navy reactor operator trainee in August, 1992.

As indicated in the last annual report, the replacement of seals and connectors on the PC system and the maintenance performed to complete the nuclear instrumentation calibration in the 1990-1991 reporting year was expected to assure these areas would not be significant causes of outages in the 1991-1992 reporting year; this expectation was met demonstrating the efficacy of maintenance in these areas. Although there were no large maintenance projects for the year, several projects are noted to contribute to major portions of forced unavailability.

First, and most significantly, two failures of the thermocouple connections to the south center fuel box were responsible for over 31 days of forced unavailability with the first outage in September, 1991 lasting 7¾ days and the second outage in July/August, 1992 lasting 23¾ days as more extensive wiring corrections were implemented along with making preparations for installing quick disconnects to minimize future dose commitments and performing the biennial fuel inspection (B-2 Surveillance). Similarly, various failures related to the nuclear instrumentation system, including Safety Channel 2 trip indication, Safety Channel 2 meter circuit, Safety Channel 1 +15 volt and high voltage power supplies and the control blade position indicating circuits were responsible for about 25 days forced unavailability. Finally, maintenance related to replacement of bearings and pillow blocks for the stack diluting fan was responsible for 4¾ days forced unavailability as was the maintenance to replace the failed motor on the secondary cooling system deep well pump. As is indicated, these four areas account for most of the forced unavailability for the 1991-1992 reporting year with the failed thermocouple connections and the safety channels meriting the most concern for preventive maintenance. Maintenance in these areas during the current reporting year should assure that these areas will not be sources of significant forced unavailability in the next reporting year (1992-1993).

In the tables that follow, all significant maintenance, tests and surveillances of UFTR reactor systems and facilities are tabulated and briefly described in chronological order; these tabulations also include administrative checks. Table V-1 contains all regularly scheduled surveillances, tests or other checks and maintenance required by the Technical Specifications, NRC commitments, UFTR Standard Operating Procedures, or other administrative controls; these items are normally delineated with a prefix letter and a number for tracking purposes. The number of these surveillances increases each year as the UFTR Quality Assurance Program matures and requirements become more restrictive.

A listing of all the maintenance projects required to repair a failed system or component or to prevent a failure of a degraded system or component is presented in Table V-2. These maintenance efforts are frequently not scheduled though they can be when a problem is noted to be developing and preventive actions are implemented. In addition, they frequently are associated with reactor unavailability. Finally, these maintenance items can be associated with surveillances, checks or test items listed in Table V-1 since some of these scheduled surveillances are also required to be performed on a system after the system undergoes maintenance. For example, when the area monitor check sources or detectors are the subject of preventive or corrective maintenance as listed in Table V-2, the Q-2 calibration check of the area monitors must be completed as listed in Table V-1 before the reactor is considered operable. Similarly, when maintenance is performed on the control system, various surveillances such as drive time and drop time measurements must be performed satisfactorily before the reactor can return to normal operations.

In Table V-2 the first date for each entry is the date when the Maintenance Log Page (MLP) was opened; in a few cases, this date may be one or more days after the original problem was noted as with the entry in Table V-2 for Maintenance Log Page #91-64 on December 9, 1991. The date for work completion and the MLP number are included at the end of the maintenance description. As a result, in some years the first items listed in Table V-2 can have a starting date prior to the beginning of the current reporting year as the maintenance could be completed in a subsequent reporting year. This is the case for the first entry in Table V-2 which involved maintenance in progress at the end of the 1990-1991 reporting year and was not closed out in the current 1991-1992 reporting year as the cell preservation activities continued periodically throughout the year.

Similarly, six (6) maintenance log pages remain open at the end of the current reporting year - MLP #91-43 opened on August 7, 1991 to control cell appearance preservation activities, MLP #91-52 opened on September 17, 1992 to control repairs on the shield tank recirculation system, and MLP #92-22 opened on June 29, 1992 to control installation of an optical tachometer for the stack dilute fan rpm indication will remain open for some time as efforts continue to improve reactor cell appearance and preserve service life, as efforts continue to correct the noise in the shield tank recirculation system and as efforts continue to install an optical tachometer to eliminate reliance solely on a mechanical tach-generator as a limiting condition for operation. The other three (3) maintenance log pages will be closed out early in the next reporting year.

TABLE V-1

CHRONOLOGICAL TABULATION AND DESCRIPTION OF SCHEDULED UFTR SURVEILLANCES, CHECKS AND TESTS

Date		Surveillance/Check/Test Description
9 September 91	Q-1	Quarterly Check of Scram Functions
12 September 91	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 3 - Upstairs Offices and Laboratories)
12-20 September 91	B-3	Biennial Evaluation of UFTR Standard Operating Procedures Manuals for Completeness (Review Standard Completed and Issued With Evaluation of Controlled Copies Completed)
22 September 91	S-10	Emergency Call List Check
22 September 91	Q-6	Quarterly Check of Posting Requirements
2 October 91	Q-8	Quarterly Report of Safeguards Events
2-7 October 91	S-6	UFTR Semi-annual Security Plan Key Inventory
7 October 91	S-3	Semi-annual Inventory of Special Nuclear Material
15 October 91	Q-3	Quarterly Radiological Emergency Evacuation Drill
24 October 91	Q-2	Quarterly Calibration Check of Area and Stack Radiation Monitors
29 October 91	S-1	Measurement of Control Blade Drop Times
29 October 91	S-5	Measurement of Control Blade Controlled Insertion Times
29 October 91	S-11	Semi-annual Replacement of Control Blade Clutch Current Light Bulbs
31 October 91	Q-6	Quarterly Check of Posting Requirements (Partial - Posting New NRC Form 3 Only)
5 November 91	Q-10	Quarterly Check of Air Handler Condensate Drain for Contamination
13 November 91	Q-6	Quarterly Check of Posting Requirements (Complete)
26-27 November 91	A-3	Annual Measurement of UFTR Temperature Coefficient of Reactivity
26 November 91	Q-9	Quarterly Calibration Check of Air Particulate Detector
27 November 91	Q-4	Quarterly Radiological Survey of Unrestricted Areas
27 November 91	Q-5	Quarterly Radiological Survey of Restricted Areas
27 November 91	S-7	Semi-annual Check (Replacement) of Security System Batteries
4-18 December 91	S-10	Emergency Call List Check
13 December 91	Q-3	Quarterly Radiological Emergency Evacuation Drill
18 December 91	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 4 - Reactor Building Annex)
18 December 91	Q-6	Quarterly Check of Posting Requirements (Complete)
1 January 92	Q-1	Quarterly Check of Scram Functions
2 January 92	S-4	Measurement of Argon-41 Stack Concentration (Includes Measurement of Dilution Air Flow-Rate - Previously A-1 Surveillance)

TABLE V-1

CHRONOLOGICAL TABULATION AND DESCRIPTION OF SCHEDULED UFTR SURVEILLANCES, CHECKS AND TESTS

Date		Surveillance/Check/Test Description
27/30 January 92	S-10	Emergency Call List Check
21 January 92	S-9	Semi-Annual Replacement of Well Pump Fuses
23 January 92	Q-2	Calibration Check of Area and Stack Radiation Monitors
1 February 92	S-10	Emergency Call List Check (Update of Several Changed Numbers)
18 February 92	Q-4	Quarterly Radiological Survey of Unrestricted Areas
19 February 92	Q-5	Quarterly Radiological Survey of Restricted Areas
21-28 February 92	B-3	Biennial Evaluation of UFTR Standard Operating Procedures Manuals for Completeness (Recheck of Controlled Manuals, Check of Information Copies Including Two RSRS Manuals)
26 February 92	Q-10	Quarterly Check of Air Handler Condensate Drain For Contamination
26 February 92	Q-9	Quarterly Calibration Check of Air Particulate Detector
9-12 March 92	A-2	UFTR Nuclear Instrumentation Calibration Check and Calorimetric Heat Balance
13 March 92	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 1 - Reactor Cell and Control Room)
26 March 92	Q-1	Quarterly Check of Scram Functions
6 April 92	S-3	Semi-annual Inventory of Special Nuclear Material
6 April 92	Q-8	Quarterly Report of Safeguards Events
6/8 April 92	S-6	Semiannual Security Plan Key Inventory for UFTR and UFSA
8 April 92	Q-6	Quarterly Check of Posting Requirements
13 April 92	Q-3	Quarterly Radiological Emergency Evacuation Drill
14 April 92	S-8	Semiannual Leak Check of PuBe and SbBe Neutron Sources
21 April 92	Q-2	Quarterly Check of Area and Stack Radiation Monitors
30 April 92	S-1	Measurement of Control Blade Drop Times (Partial)
30 April 92	S-5	Measurement of Control Blade Controlled Insertion Times (Partial)
30 April 92	S-11	Semiannual Replacement of Control Blade Clutch Current Light Bulbs (Partial)
4 May 92	S-1	Measurement of Control Blade Drop Times (Complete)
4 May 92	S-5	Measurement of Control Blade Controlled Insertion Times (Complete)
4 May 92	S-11	Semi-annual Replacement of Control Blade Clutch Current Light Bulbs (Complete)
11-29 May 92	Q-10	Quarterly Check of Air Handler Condensate for Contamination
26 May 92	Q-9	Quarterly Calibration Check of Air Particulate Detector
27 May 92	Q-4	Quarterly Radiological Survey of Unrestricted Areas

TABLE V-1

CHRONOLOGICAL TABULATION AND DESCRIPTION OF SCHEDULED UFTR SURVEILLANCES, CHECKS AND TESTS

Date		Surveillance/Check/Test Description
27 May 92	Q-5	Quarterly Radiological Survey of Restricted Areas
1 June 92	S-7	Semi-annual Check (Replacement) of Security System Batteries
12 June 92	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 2 - Downstairs Laboratories and Offices)
19-20 June 92	S-4	Measurement of Argon-41 Stack Concentration (Includes Measurement of Dilution Air Flow-Rate - Previously A-1 Surveillance)
18/23 June 92	S-10	Emergency Call List Check
2 July 92	Q-1	Quarterly Check of Scram Functions
7 July 92	Q-8	Quarterly Report of Safeguards Events
7 July 92	S-10	Emergency Call List Check
7 July 92	Q-6	Quarterly Check of Posting Requirements
23 July 92	S-9	Semi-Annual Replacement of Well Pump Fuses
31 July 92	Q-3	Quarterly Radiological Emergency Evacuation Drill
7 August 92	Q-2	Quarterly Calibration Check of Area and Stack Radiation Monitors
12 August 92	B-2	Biennial Inspection of Incore Reactor Fuel Elements (Two Elements Inspected)
18 August 92	Q-10	Quarterly Check of Air Handler Condensate for Contamination
21 August 92	Q-5	Quarterly Radiological Survey of Restricted Areas
23 August 92	Q-6	Quarterly Check of Posting Requirements
25-31 August 92	S-2	Annual Reactivity Measurements (Worth of Control Blades, Total Excess Reactivity, Reactivity Insertion Rate and Shutdown Margin)

Note: An asterisk on the surveillance tracking designation is used to indicate surveillance was not completed within the allowable interval resulting in reactor unavailability for normal operations; none occurred in the current reporting year.

All required UFTR surveillances, checks and tests are up-to-date at the end of the reporting year. Though the following two(2) surveillances were due in August, 1992 and are carried over to the new year, they are both within the allowable interval and were subsequently completed within that interval:

Q-4 - Quarterly Radiological Survey of Unrestricted Areas (Due 27 August 1992).
Q-9 - Quarterly Calibration Check of Air Particulate Detector (Due 26 August 1992).

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
7 August 1991	Following discussions and evaluations of how best to improve reactor cell appearance and preserve service, MLP #91-43 was utilized to control and document various cell preservation activities to include cleaning, scraping, servicing and painting the equipment pit and various other reactor structure, shielding and floor surfaces. Work in the equipment pit and on the pit shield blocks was completed in August, 1991, with various other efforts started. During September, the reactor shield structure and various floor surfaces were prepared and painted with additional coatings to be applied. During October, additional shield structure and floor surfaces were painted. During November, 1991 this work was continued to include painting the control blade drive pedestals. During May, 1992 this work was continued in the northwest corner and along the west wall of the reactor cell with scraping and painting of the floor along the wall. During June, July and August 1992, there was no additional work performed (MLP #91-43 remains open).
3 September 1991	During a partial outage of chilled water to the reactor building air handling systems, the reactor cell environment was noted to be extremely humid. Under MLP #91-50, the reactor cell air handling system was repaired and restored to full operational capability by Physical Plant Division technician Tim Tenbrock. While awaiting full actuation of the chilled water system, the cell atmosphere was restored to near normal conditions on partial chiller operation with no further problems noted (3 Sep 91, MLP #91-50).
6 September 1991	During the daily checkout, the Safety Channel 2 meter trip indication was noted to be above 125 kW at approximately 128 kW. Under MLP #91-51, the trip indication was evaluated and determined to require only an adjustment with no effect on the annual calorimetric calibration provided applicable voltages were unchanged as expected. Under MLP #91-51 the trip indication was then adjusted and verified to be correct on 9 September 1991 for several checkouts. The adjustment was verified not to impact the previously performed calibration for which voltages were confirmed per documentation on the MLP #91-51. Subsequently, after another successful daily checkout on 10 September 1991, the reactor was returned to normal operation with no further problems noted (9 Sep 91, MLP #91-51).
17 September 1991	During the weekly checkout the shield tank demineralizer system pump was noted to be excessively noisy, probably due to a blade hitting the

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	housing, though it was operating properly. Under MLP #91-52, a spare identical pump was taken from storage and transported to Gainesville Electric Motor Repair, Inc. for overhaul and repair to include replacement of seals. The pump repair was unsuccessful as the first set of seals delivered were incorrect. Since it may not be possible to get replacement seals, alternatives such as obtaining a new pump/motor assembly are being investigated. In addition the problem was noted not to have gotten worse during the year. During January, 1992, some used seals were located and taken to Gainesville Electric Motor Repair and were installed in this pump. After repair and overhaul this spare pump was returned to inventory in January, 1992 for possible installation in the shield tank system, if flow checks are successful; work was begun on setting up a rig to perform the flow checks in April but no work has been performed since April, 1992 (MLP #91-52 remains open).
18 September 1991	Following a startup to full power, the stack high level alarm actuated after 1 hour 14 minutes at full power. The operator on duty noted the indication on the stack monitor was the normal value of about 2000 cps, not the 4000 cps at which the alarm is set with all other indications also normal. The operator performed an unscheduled shutdown and noted the stack alarm would not reset until the stack count rate was well below 2000 cps at about 1500 cps. Per the unscheduled shutdown evaluation and MLP #91-53, the stack monitor detector was checked out with the alarm indication found to have drifted down to about 2100 cps (conservative). After recalibration and a check on 18 September 1991, a calibration check was performed again on 20 September 1991 to confirm the problem was not recurring. Subsequently the UFTR was returned to normal operation on 20 September, 1991 but with no further operation until radiation levels were checked at stepped power levels of 1, 10 and 100 kW following restacking for the unrelated thermocouple repair project (See MLP #91-54) on 30 September 1991 with no further problems noted (20 Sep 91, MLP #91-53).
24 September 1991	During the weekly checkout on 24 September, 1991, point number 2 (south center fuel box outlet line) on the temperature recorder was noted to drift upscale for an alarm. Under MLP #91-54 the recorder was checked out and continuity of cables was confirmed back to the equipment pit. Subsequently under RWP #91-07-I, the core shielding was unstacked, a connection on the thermocouple lead for point #2 was repaired, the

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	thermocouple was verified to be operational and the core shielding restacking was completed on September 30, 1991. Radiation surveys were performed around the restricted area at 1 kW, 10 kW and 100 kW to confirm proper shielding configuration on September 30, 1991. On October 1 several additional radiation surveys were completed and MLP #91-54 and RWP #91-07-I were closed out with all documentation complete and the reactor approved for normal operations on October 1, 1991. Subsequently on October 2, the reactor returned to normal operations with no further problems noted (1 Oct 91, MLP #91-54).
3 October 1991	During the exit interview on 2 October 1991, NRC License Examiner Patrick Isaac indicated a possible generic training program weakness in that neither candidate was aware of the Tech Spec requirement for a reactor trip signal on loss-of-power to the secondary coolant deep well pump. After checking to see that this trip was not specifically delineated in scram checks or elsewhere, work conducted under MLP #91-55 verified the trip occurred with a delay on a loss of power to the deep well pump above 1 kW as required on 3 October 1991. However, this check did not delineate whether this trip derived from low flow or loss of pump power. Under #91-55 also on 3 October 1991, examination of Reactor Protection System diagrams showed the loss of pump power alone should cause the requisite trip independent of loss of secondary flow. Subsequently on 7 October 1991, this trip on loss of secondary cooling pump power alone was verified by turning on city water at ~75 gpm, adjusting the wide range drawer test signal above 1 kW and then securing the deep well pump while still on deep well cooling logic and with no loss of flow. Since the trip occurred as required by loss of deep well pump power alone, the UFTR was considered to meet the surveillance requirement in Table 3.2 of the Tech Spec when subjected to the most restrictive interpretation of Tech Specs requirements. This check of the trip on loss of secondary coolant pump power alone was committed to be incorporated into the Q-1 Surveillance (Quarterly Scram Checks) prior to next performing the Q-1 checks. This change was incorporated in the Surveillance Data Sheet in time for the Q-1 surveilllance conducted on 1 January 1992. Following approval of the RSRS Executive Committee on 7 October 1991 the UFTR was returned to normal operation on 8 October 1991 with the final report to NRC submitted as a letter dated 16 October 1991 (See Appendix B to this report) with no further problems noted (7 Oct 91, MLP #91-55).

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
14 October 1991	Following a decrease in cell lighting level due to burned out overhead lamps, a maintenance work request was called in to Physical Plant Division (PPD). Under MLP #91-56, PPD technicians replaced all burned out overhead lamps in the reactor cell under supervision of RO G.W. Fogle and SRO trainee D. Cronin to restore proper full lighting level with no further problems noted (14 Oct 91, MLP #91-56).
1 November 1991	During preparations to assure capability to perform transmission experiments at the south beam port, the timer/counter module in the nimbin was noted to be failed. Under MLP #91-57 the module was removed, repaired and verified to be operational in the nimbin with no further problems noted (7 Nov 91, MLP #91-57).
4 November 1991	Following a thorough check to verify operation of the main power breaker for the reactor facility per an inspection recommendation by American Nuclear Insurers, the console compensated ion chamber (CIC) was noted to be temporarily inoperable. Under MLP #91-58, the CIC was checked out and was subsequently verified to be operating properly with no further problems noted (4 Nov 91, MLP #91-58).
7 November 1991	During a daily checkout the Safety Channel 2 percent power meter was noted to be reading low (94% versus 100%) in calibrate. Under MLP #91-59, the contacts on the Safety Channel 2 calibrate switch were cleaned and checked to restore a proper reading in calibrate on the Safety Channel 2 percent power meter. Following successful completion of a daily checkout, the reactor was returned to service with no further problems noted (8 Nov 91, MLP #91-59).
15 November 1991	In preparation for performing measurements of the temperature coefficient of reactivity, operability of the city water mode of secondary cooling was to be checked and verified. Under MLP #91-60, the city water secondary flow trip logic was checked and verified and city water flow was throttled back in preparation for running at higher temperatures for the temperature coefficient measurements (18 Nov 91, MLP #91-60).
19 November 1991	Following 32 minutes operation at full power the Safety Channel 2 meter was noted to fail pegged downscale by the reactor operator and by an SRO sitting in the control room. Since loss of this meter constituted loss of the overpower trip for this channel, an unscheduled shutdown was performed.

purity of the sample matrix and the elements of interest (Cl, Ti, F) for this project make NAA ideally suited to determine the concentrations of chlorine, titanium and more recently fluorine remaining after various processing stages. The fluorine concentration determination is especially important since the facility has been able to perform this analysis with reliable results despite the short half-life (11 seconds) of the activated product (F-20). Funding for this service work is supplied through the Advanced Materials Research Center. Though no work was performed during this reporting year, this project is ongoing.

NAA Research - Trial Irradiation of Phosphate for Rare Earth Element and Other Element Characterization - Dr. P. Gielisse (FAMU/FSU, Dept. of Mechanical Engineering), Dr. R. Clark (FSU, Chemistry Dept.), Dr. W.G. Vernetson, R. Ratner*, T. Downing*, D. Farinha*, J. LaBelle*, Reactor Staff.

Various phosphate ore samples are being assessed using NAA to identify significant concentrations of rare earth elements for potential mining applications. Interest in this project is spurred by the large mined phosphate deposits in Florida as well as the recent advances in superconductors involving various composite materials containing rare earth elements. Analysis is in progress for short and long duration irradiations. Reactor time for this work has primarily been supported under the DOE Reactor Sharing Program along with one small external grant two years ago as data is being generated to support a proposal for more external funding with no irradiation work performed this year.

NAA Research - Biogeochemical Assessment of the Pollard, Alabama Oil Field - Dr. G. Cwick (SEMSU), Dr. M. Bishop (UWEC), K Hanrahan*, R. Ratner*, L. Vickers**, T. Downing*, D. Farinha*, J. LaBelle*, R. Strubinger (WHS)**, Reactor Staff.

The biogeochemical analysis of soil and vegetation samples is the first phase of a three-phase study to determine if hypothesized biogeochemical anomalies occur in the Pollard, Alabama oil field and can be correlated to tonal anomalies in satellite imaging that corresponds to hydrocarbon deposits. Potentially abnormal concentrations of selected elements characteristic of hydrocarbon seepage from underground deposits could produce identifiable stress-type conditions or growth reactions in the vegetation. These environmental characteristics may be correlated to satellite mapping of hydrocarbon production potential. Environmental vegetative anomalies detected by neutron activation analysis will be correlated to image anomalies. This work was initially supported under the DOE Reactor Sharing Program as data is being generated to support a proposal for external funding. Irradiation and analysis of Phase 1 samples was completed in November, 1989 with Phase 2 samples prepared for irradiation and considerable analysis performed in the 1989-1990 year. During the 1990-1991 year a small amount of external support for sample processing was received in this current reporting year to speed processing of samples. One student also obtained good results in a project where only the pine needle samples were selected for NAA during this last reporting year with this work continuing to the most recent reporting year.

NAA Research - Evaluation of Elemental Volatility In Standards - Dr. W.G. Vernetson, Dr. W.H. Ellis, R. Ratner**, T. Downing*, Reactor Staff

This project was undertaken to support NAA Laboratory activities. Various standards have been analyzed via NAA to determine whether handling or preparation of standards would affect results for volatile elements such as mercury. The results have been useful in evaluating laboratory procedures and identifying the proper means for preparing and handling samples, especially those containing mercury, depending upon whether in elemental or compound-specific state. This work is ongoing with plans to obtain a freeze dryer and moisture analyzer when funding is available to limit the loss of volatile sample constituents.

NAA Research - Evaluation of Silicon Carbide Fibers - Dr. W. Torecki (MSE Dept), Dr. W.G. Vernetson, R. Ratner*, Reactor Staff.

This project involved several sets of analyses on specially manufactured silicon carbide fibers to determine sample purity including identification of significant trace element content as well as an effort to determine whether different samples could be identified by the relative content of silicon in the different fibers. The trace element work was successful, showing no significant trace elements in these pure samples. The identification work, however, was not successful as silicon(and graphite) do not activate sufficiently to allow relative content of either to be used to identify samples. This work may be continued in the future if a prompt gamma analysis facility can be implemented to support his work or if plans to shield the fibers with cadmium to absorb the thermal neutrons and enhance sensitivity are successfully implemented.

Plasma Physics Studies - High Temperature Pulsed Ion Chamber Plasma Diagnostic Reactor Shield Tank Irradiation Facility Design - Dr. W.H. Ellis, Dr. W.G. Vernetson, Dr. I. Maya, Dr. J. Appelbaum, Prof. G.J. Schoessow, D. Simpkins, W.Y. Choi*, A. Ferrari*, C. He**, Reactor Staff.

In support of the design of a high temperature irradiation facility for pulsed ion chamber diagnostic experiments to be performed in the shield tank of the UFTR, flux mapping was carried out to determine the general radiation flux profile in the shield tank, both gamma and neutron, and locate the highest usable flux field therein, a determining factor for placement of the irradiation facility. Gold foils and thermoluminescent dosimeters were used for neutron and gamma field flux mapping with additional measurements in progress to better define the flux distribution. When completed, the shield tank facility will provide a more flexible pulsed ion chamber plasma diagnostic experimental arrangement to facilitate loading and unloading of experimental chambers to allow non-disruptive temporary storage without complete removal between experiments. This arrangement will promote multiple simultaneous usages of the UFTR and reduce personnel exposure. The design and operation of the facility is in support of plasma diagnostic studies associated with establishing the engineering design parameters for gaseous core reactor/MHD converter space power systems currently under study by the Innovative Nuclear Space Power Institute (INSPI) and remains in the design stage subject to availability of funding.

Plasma Physics Studies - Multiprobe PIC Diagnostic Studies of Nuclear Enhanced MHD Plasmas - Dr. W.H. Ellis, Dr. I. Maya, Dr. N.J. Diaz, Dr. W.G. Vernetson, R. Ratner*, W.Y. Choi**, A. Ferrari**, C. He**.

The objective of this research is to investigate those characteristics of nuclear generated plasmas that are related to critical engineering design parameters for gas-core reactor/MHD converter systems. The work will be directed toward the development of an experimental system to measure the various design parameters as functions of temperature and pressure for nuclear generated plasmas to include the nuclear ionization source rate, plasma loss coefficients, and electrical conductivity. Ionization chambers filled with candidate reactor fuel gas/MHD working fluids will be placed into the UFTR equipped with a high temperature heater system, with gas purge, plasma diagnostics, power, control and environmental monitoring systems. Measurements will be performed over a range of temperature and pressure conditions and for a range of reactor power levels (and nuclear ionization source intensities) and gas compositions in support of the University of Florida INSPI space power research program and a doctoral dissertation. Preliminary measurements of experimental port sizes and determination of experiment usage of UFTR ports were completed in the previous reporting year with a detailed run request and proposal developed but not approved pending completion of experimental apparatus. During this past reporting year the run request and analysis for non-fueled experiments was approved and a series of non-fueled experiments was conducted using this specially-designed PIC detector system to conclude much of the experimental work in support of a doctoral dissertation. This student's work was concluded early in the reporting year with several publications produced as well. Subsequently, additional work will be performed on fueled systems subject to availability of student support as well as support for making instrument repairs and modifications on this very sophisticated PIC detector system as there is sufficient research work here for several additional master's theses and doctoral dissertations.

UFTR Core Redesign (LEU Program) - Neutronics Analysis for UFTR Core Redesign - Dr. W.G. Vernetson, Dr. E.T. Dugan, R. Piciullo, R. DeMartino**.

As part of the DOE Low Enriched Uranium Conversion Program, investigations have been performed on the UFTR to determine the feasibility and desirability of replacing the 93% enriched MTR plate type fuel with 4.8% enriched, cylindrical SPERT fuel pins. For this redesign, the only permanent structural modification had been hoped to be the insertion of new grid assemblies into existing fuel boxes. Acceptable neutronic criteria (possible k_{eff} range, maximum flux and degree of undermoderation) have been determined using industry-accepted, 4-group cross sections in one, two and three-dimensional diffusion theory calculations of k_{eff}, flux profiles, power peaking factors and coefficients of reactivity. First order perturbation calculations have been used to determine key kinetic parameters. Neutronic results to date indicate that the UFTR/SPERT core redesign can be accommodated to meet requisite neutronic criteria with an actual increase in peak thermal flux levels which would be very useful. The UFTR received a DOE grant to support this analysis in December, 1987 to begin with a decision on whether to go with SPERT or plate-type fuel. After the necessary nondestructive examination of the pins, other mechanical factors as well as required large core structural changes influenced the design. Therefore, during this year the decision has been made to use plate fuel based on other considerations, especially core physical loading and minimization of core changes. Neutronics analysis to date on this project has involved obtaining and setting up the code methodology to be utilized in producing the licensing package for submission to USNRC. Modeling of the existing core begun last year was completed by mid year with the neutronics analysis of the proposed LEU completed as part of a masters project this year. This project examined several possible core fuel bundle designs and by the beginning of the reporting year the decision had been made to select the 14 fuel plates per fuel bundle design with thermal hydraulics analysis begun and nearly completed during the reporting year. At year's end, the thermal hydraulics analysis is nearly completed.

<u>UFTR Operator Training and Requalification</u> - Dr. W.G. Vernetson, D.L. Munroe, D. Simpkins, R. Ratner*, T. Downing*, Reactor Staff.

Lectures and hands-on operations on the reactor are necessary to license operators for the UFTR. The requalification and recertification training program establishes a required number of startups, weekly checks, daily checks, drills, practical exercises, lectures and examinations for each operator. Operator participation is mandatory in order to maintain assurance of proficiency levels and to be able to demonstrate the requisite operator skills. Operational proficiency is assured by written and oral examinations as well as by observations in practical exercises. The same program in an accelerated mode is used to train UFTR reactor operator license candidates. Current 10 CFR Part 55 (Operator Licenses) requirements have been considered in continuing the UFTR Operator Requalification and Recertification Training Program. Two senior operators were licensed in October, 1991 and another began license training in August, 1992. In addition, the individual who was serving as the Acting Reactor Manager on a consultant basis ceased this association in August, 1992 as a fully certified SRO assumed this position. Finally, after submission of the UFTR Requalification and Recertification Training Program for its usual two year renewal in May, 1991, the facility received a letter in November, 1991 with eleven questions concerning the Program and how it meets the requirements of 10 CFR 55. As a result, the Training Program was completely rewritten documenting the Program as implemented and submitted to the NRC in December, 1991, with approval received in February, 1992. Therefore, from licensing new operators, redoing the training program, and conducting the normal training programming, this was a busy area during the reporting year.

<u>Gaseous Release Determinations</u> - Argon-41 Stack Measurements - Dr. W.G. Vernetson, Dr. W.E. Bolch, D. Simpkins, D.L. Munroe, R. Ratner*, J. LaBelle**, Reactor Staff.

A Cobalt-60 resin-cast Standard Sample matrix had been applied in standardized controlled measurements of radioactivity (Ar-41) in stack effluent using a detailed standard operating procedure (UFTR SOP-E.6: Argon-41 Concentration measurement) developed and approved as the best practicable method of evaluation of Ar-41 releases from the UFTR facility as required by UFTR Technical Specifications on Effluents Surveillance in Section 4.2.4,Paragraph (2). During the previous year a low density simulated gas geometry source was incorporated to replace the Cobalt-60 standard. Application of this SOP has continued to obtain a statistically significant number of data points and plans are eventually to investigate the effect of variable core vent flow on total Ar-41 releases. Other commitments during the previous reporting year limited progress on this project; nevertheless, a source well was installed in the stack to facilitate better calibration of the stack monitor detector at levels up to the 4000 cps limit of the monitor. As part of a student's senior design project, a variable position calibration control device was designed, constructed and installed in the UFTR stack effluent access port to improve the methodology used to perform the quarterly stack radiation monitor calibration checks. This device allows easy positioning of the calibrator source to assure readings at the high (4000 cps) and low (100 cps) end on the stack radiation monitor. After testing to assure proper functioning this device has been permanently mounted in the stack access port to facilitate all future stack radiation monitor calibration checks since its installation and checkout in March, 1990, to facilitate performance of the quarterly stack monitor calibration and assure the reliability of its results. With the expectation of eventually raising power levels plus the decreased Ar-41 release limit in the proposed 10 CFR 20 revision, this work to characterize the variable affecting stack release concentrations will be moved to a higher priority in the next reporting year if a student can be found to work on it. During this year the existing limits as well as the new 10 CFR Part 20 limits on Argon-41 release concentrations have both been incorporated unofficially into the semi-annual measurements (S-4 Surveillance).

NAA Research - Neutron Activation Analysis for Characterization of Various NBS and USGS Standards with Inhouse Certification of Trace Elements - Dr. W.G. Vernetson, Dr. W.H. Ellis, R. Ratner*, L. Vickers**, T. Downing*, Reactor Staff.

Various NBS (now NIST) standard reference source samples in various dilutions are being irradiated for neutron activation analysis to determine the NAA lower limit of detection for the various standards and to identify and benchmark secondary standards based on NBS noncertified concentration values and USGS (US Geological Survey) standards obtained from USGS. This work formed the basis for training a high school student in research methods under the 1986 and again under the 1988 Florida Foundation of Future Scientists Summer High School Student Research Program under the DOE Reactor Sharing Program as well as for a student senior project during the previous year. Limited results were obtained. Although good reports in limited areas have been prepared by the students in each case, the work has continued to progress slowly as various reliable secondary standards are to be developed to facilitate NAA on samples where multiple trace element concentrations are to be determined. This ongoing project provides data on which to base generating irradiation and decay schemes targeted to measure concentrations of specific elements in NIST (NBS) Standards to assure certified comparisons with unknown samples are available. Work to date is progressing well, but considerable additional effort is required to benchmark uncertified contents of standards. During the previous two years (1989-1991), as part of a students' senior design project, the contents of various NIST/NBS and USGS standards are being cross correlated and spread sheets being developed. This project is intended to allow for potential NAA Laboratory user to consult a matrix to determine which standards should be used for trace element determinations, depending on the makeup of the sample matrix. Considerable work has been devoted to this project as the students project has been concluded, however, more work is planned as the NAA Laboratory matures and attempts to develop its own standards for special or even routine applications. During the previous 1990-1991 year another useful student project was completed involving the compilation and verification of standard reference materials (SRAs) table files to promote and facilitate rapid computer access to information on various standards that are available so that individual project libraries can be rapidly and optimally developed to support neutron activation analysis projects. Limited progress was made on this project in the 1991-1992 reporting year.

NAA Research - Implementation of Upgraded NAA Laboratory Facilities - Dr. W.G. Vernetson, Dr. W.H. Ellis, Dr. G.J. Schoessow, R. Ratner*, M. Wachtel**, J. LaBelle*, D. Farinha*, C. Leipner**, D. Simpkins

The implementation of the two PC-based ORTEC analyzers with spectrum analysis software in the 1986-1987 reporting year caused the decision to be made not to upgrade an ND66 MCA since the NAA Lab now has state-of-the-art analytical capabilities for performing spectrum analysis and subsequent neutron activation analysis. The new larger standardized size sample holder is for the rabbit system has also worked well to facilitate ease and speed of handling samples for NAA. During the 1988-1989 year, manual cell isolation valves were installed to provide a backup means to assure samples could not be inserted until allowed by the reactor operator. Earlier in the year a post-accident core vent sampling connection was also installed in the rabbit system lines to provide for sampling of cell air radioactivity levels prior to venting during abnormal or emergency operating conditions per UFTR Tech Spec Amendment No. 17. Two years ago improvements included the full implementation of sample drying and standards controlled environment facilities along with a slide presentation on instrumental neutron activation analysis including the theory of neutron activation analysis, preparation of samples before and after irradiation, control of contamination, use of the rabbit facility and vertical ports for sample activation, and use of the PC-based analyzers and ORTEC software package to count samples and perform the analysis for trace element determinations. The most important facility innovation during the 1989-1990 year was completion of work on the design of an automatic sample changer for one detector system in the NAA Laboratory. As part of a student's senior design project, the automatic sample changer was installed in the NAA Laboratory in mid-1990. The system was mechanically complete and operable for one sample at a time but needed electronics work to sequence its switching circuits properly and interface it with the computer-based analyzer. This work had been progressing very slowly awaiting a student project and the hiring of a replacement electronics engineers. During this year, considerable progress was made in redesigning the switching circuit and in developing a software package for the necessary interfacing with the computer systems. When fully implemented, this device will allow NAA Laboratory workers to count samples and store the spectra for a dozen or more samples without returning to the laboratory which will greatly increase the potential throughout for the laboratory. Other laboratory improvements this year included installing a new monitor for one computer, implementation of a[illegible]al computer storage capacity and implementation of an upgraded gamma spectro[illegible]y system including a multichannel buffer for multiple detector operation. In addition, an integral shield was obtained for one HPGe detector system and an upgraded desiccator system with additional storage capacity was obtained for storage of standards and samples prior to irradiation.

Neutron Radiography Facility Development - Determination of Beam Characteristics and Optimization of Facility - Dr. W.G. Vernetson, Dr. A.M. Jacobs, Dr. S. Nagler, Dr. H. Van Rinsvelt, R. Ratner**, L. Morales, J. Thompson**(CHS), UFTR Staff.

Thermal column and East-West throughport facilities were evaluated for radiation beam characteristics with the thermal column being determined optimal as a neutron radiography facility. A precollimator/collimator and drift tube assembly have been completed, a film cassette and developing facility have been implemented. The beam configuration modifications have neared completion with certifiable Class I (ANSI Standard E545) neutron radiographs nearly possible. Following final beam configuration development, a shield and shutter assembly will be developed. Checks to determine possibility of producing real time radiographs in several configurations were unsuccessful in the 1986-1987 reporting year. One funded and several other repeated applications were performed in the 1987-1987 reporting year. During the 1987-1988 year extensive work to optimize and characterize the facility parameters was also accomplished along with completion of darkroom facilities for radiograph development including the loan of an autoprocessor which has not been much used. However, this developmental project is ongoing and a major enterprise for utilizing staff time and design efforts in the past reporting year as we attempt to obtain a reliable and easily implemented system. During the present year, an improved semi-permanent shielding cavity, as well as a movable table to position objects to be radiographed along with movable shield block, have been implemented to facilitate use of the neutron radiography facility with reduced installation time and reliable results for service usages as well as laboratory projects. One service usage clearly demonstrated and documented the sensitivity of the system using graded thicknesses of boraflex material. Several papers have also been presented on this facility and a thesis was also completed at the end of 1989-1990 reporting year. During the 1989-1990 year another project was undertaken to improve and characterize beam characteristics and design permanent shielding to allow reduction of time to take radiographs with work still in progress as the effort is hoped to eventually allow reaching characteristics necessary for real time radiography. During the 1990-1991 year, in addition to staff efforts to improve radiography facility capabilities, one student under the Florida Foundation of Future Scientists Summer High School Student Research Program performed some special studies on the facility and generated a report of his work which was the subject of a science fair exhibit during this past year. Other activity during this reporting year was simply to train new personnel to assure continued capability to set up the experimental facility and produce quality radiographs which is continuing at year's end.

LEU Conversion - Special SNM-1050 SPERT Low Enriched Fuel Conversion Efforts - Dr. W.G. Vernetson, D. Simpkins, D.L. Munroe, Reactor Staff.

Extensive efforts were conducted to consider qualifying the SPERT fuel for use in the UFTR. Prior work on the SPERT fuel licensed under SNM-1050 has included extensive decontamination work, radiation and contamination surveys, property surveys, SNM-1050 facility modifications, fire alarm system maintenance/upgrade, LEU SPERT fuel movement to a newly decontaminated room, security system modification and NRC Radiation Safety Inspection. Subsequently complete pin by pin identification number verification for fuel inventory and visual inspection was completed along with x-ray radiography of sufficient pins to fuel the UFTR for LEU conversion and allow refueling. Efforts in this area prior to this year have also included relicensing the SNM-1050 facility for "storage only" and concluded with a determination not to use the SPERT fuel for conversion. After the decision in the previous reporting year not to utilize the SPERT fuel for UFTR HEU-to LEU conversion, the decision was made to ship the SPERT fuel from the University of Florida campus. During the 1989-1990 year, 1200 fuel pins were finally loaded into 6M containers and transferred to Martin-Marietta for shipment to Oak Ridge National Laboratory on May 18, 1990 to support blanket experiments associated with a restarted reach. This transfer was accomplished under QA Program Approval 0578 (see Appendix H of the 1990-1991 Annual Report). Later in the year a change in the license was generated, submitted and approved by NRC allowing the remaining 4400 SPERT fuel pins to be stored in Room 6 at the Nuclear Research Building. Following Room 6 upgrades, the remaining SPERT fuel was moved from Room 5 to Room 6 in July, 1990. One student report on the radiography effort to analyze the LEU pins was completed during the 1990-1991 reporting year. At the end of the 1989-1990 year and throughout the last two years, efforts have continued to ship the SPERT fuel either to a secure DOE facility or to Rensselaer Polytechnic Institute for use in their zero power facility. These efforts were without success during the current reporting year though the return shipment of 1200 fuel pins from ORNL was not authorized after conclusion of the ORNL experiments since Room 6 has insufficient room to store the remaining 1200 pins. Otherwise, this situation remains unchanged.

Facility Characterization - Determination of UFTR Beam Ports/Thermal Column Neutron Spectra - Dr. W.G. Vernetson, Dr. W.H. Ellis, R. Ratner*, C. Leipner**, UFTR Staff.

The neutron spectra at the thermal column, South beam port and South-West beam port are being determined to provide information for irradiation services. When the irradiation and analysis protocol is established, variation in beam parameters will be attempted to determine the viability of beam variations. This project was initiated by a participant in the 1987 Summer Student Research Program and was continued in the next reporting year to provide the basis for a science fair entry. The work to date is progressing well as several laboratory exercises have contributed to the data base for this project as has the preliminary work on designing a prompt gamma analysis facility performed on the 1988-1989 reporting year. For the 1990-1991 reporting year, as part of a student's senior design project, various threshold detector foils were activated in the south and southwest beam ports to characterize the energy-dependence of the neutron field with special emphasis on the neutron field above 1 MeV. Though one student project has been completed with some useful spectral measurements produced, little progress was made on this work during the 1991-1992 reporting year.

Facilities Development - Characterization of UFTR Beam Port Neutron Flux for Implementation of a Prompt Gamma Analysis Facility - Dr. W.G. Vernetson, R. Ratner*, UFTR Staff.

The potential for installation of a prompt gamma analysis facility at the UFTR has been under consideration. The irradiation characteristics are being determined for selected beam ports, initially determining the neutron spectrum for the south beam port as part of a special project for a student participating in the Florida Foundation for Future Scientists summer program in 1988. This project also included a preliminary design for the prompt gamma analysis system emphasizing its complementary features when used with NAA for trace element analysis of samples. Work on this project to design and implement a prompt gamma analysis system to complement the existing Neutron Activation Analysis (Delayed Gamma) facility and capabilities has been in abeyance for the last two years but general considerations and requests for DOE support in this area continue to be evaluated since there have been several inquiries for elemental analysis that would require such a facility.

<u>CHS-5510/5510L</u> - Dr. K. Williams, Dr. M.L. Muga, Dr. W.G. Vernetson, D. Simpkins, R. Ratner*

Radiochemistry laboratory project exercises of half-life determination, neutron activation analysis of silver and aluminum in metal samples and on identification of chlorine in chemical samples have been performed using both an NaI scaler system and a HPGe spectrum analysis system. Data from this set of class exercises has been used to develop a standardized UFTR exercise. Extensive work last year via a project in the CHS-5510L Laboratory to identify the trace element concentrations in powdered milk provided the basis for a yearly repeatable laboratory experiment; as a result, trace element analysis of milk samples using the UFTR and NAA Laboratory constitutes a regular part of the radiochemistry course curriculum. In the 1989-1990 reporting year, a special comparative exercise to investigate food packaging and contents using neutron and x-ray radiography was incorporated as well.

<u>NAA Research</u> - Rare Earth and Trace Element Geochemistry of Sedimentary Mineral Deposits - Dr. A. Dabous (FSU), Dr. A. Odom (FSU), Dr. W.G. Vernetson, R. Ratner*, T. Downing**, D. Farinha*, Reactor Staff.

Egyptian beach sands and other sedimentary deposits are being evaluated for their rare earth element as well as other trace element content. The purpose of this research is to evaluate the potential for commercial extraction of rare earth elements for possible use in advanced superconductor materials. Related objectives are to determine the origin of the sedimentary deposits under study and then evaluate the geochemical environment based upon the processes that would lead to the deposition of specific elements. This project is partially supported by the DOE Reactor Sharing Grant with a proposal for further support expected to be generated in the upcoming year based on extensive but preliminary results of analysis on some samples provided during the last three reporting years with one student special project in progress during the year also supporting the research work.

<u>NAA Research</u> - Oyster Shell Characterization At The Atomic Level - Dr. D.E. Hintenlang, R. Ratner*, W. Coughlin**, Reactor Staff.

In this masters degree project various oyster shells are being irradiated to determine and evaluate the trace element composition. The oyster shells have been selected from various locations on both the east and west coasts of Florida. The objective is to determine how and if the trace element content of the shells varies in an orderly fashion according to the location of the oyster bed from which the sample was taken. This project began last year and continued periodically throughout the reporting year.

NAA Research - Trace Element Analysis of Fertilizers - R. Allen (UCHS), Dr. B. Abbott, Dr. W.G. Vernetson, R. Wade** (UCHS), D. Cronin**, R. Ratner*, Reactor Staff.

This work formed the basis for training a high school student in research methods under the 1991 Florida Foundation for Future Scientists Summer High School Student Research Program under the DOE Reactor Sharing Program. In this project various commercial fertilizers are being analyzed for trace element, especially heavy metal, content in an effort to evaluate the implications for buildup of such elements upon repeated application to farm and/or pasture land as well as home gardens. One project report was prepared with work continued in the reporting year to support a high school science fair project and a special project for a nuclear engineering sciences student.

NAA Research - Citrus Product Trace Element Analysis for Source Identification - Dr. W.G. Vernetson, R. Hanrahan*, R. Ratner*, Mark Wood** (BRCHS).

The existence of various combinations and concentrations of trace elements has been proposed as a potential means of identifying the source of citrus products. Specifically, trace element analysis using NAA has been applied to several frozen orange juice products for which the citrus was grown in different locations, some in South America, some in California and some in Florida. Qualitative results to date, as part of a high school science fair project, are encouraging but inconclusive primarily because of sample preparation problems and unavailability of optimal standards. Therefore, more work is needed to develop a consistent sample preparation methodology as well as NAA protocol to allow generation of reliable quantitative results for possible identification of citrus sources; nonetheless, one high school science fair project has been produced and the area remains one for which a student researcher is sought in an effort to gain funding support.

NAA Research - Trace Element Analysis of Hair Samples - R. Allen (UCHS), Dr. W.G. Vernetson, R. Wade** (UCHS), R. Ratner*, D. Farinha*, T. Downing*, Reactor Staff.

As part of a high school science research project, various hair samples have been collected from nursing home patients suffering from Alzheimer's syndrome. The objective here is to perform elemental analysis to quantify aluminum content of hair samples to determine whether the aluminum present in brain tissue of Alzheimer's patients is also present in hair tissue and how the two are related. The results of this mini project have been inconclusive to date. It is expected that this project will be able to be expanded as part of future student research projects.

NAA Research - Neutron Activation Analysis of Filtered Heart-Lung Pump Particles - Dr. Edward Staples, Dr. W.G. Vernetson, R. Ratner*, M. Patton*, Reactor Staff.

After learning about the capabilities of neutron activation analysis, a student supplied a standard sample from the filter of a heart-lung infusion pump as a baseline sample to identify chlorine content. The objective here was to attempt to identify the source of the particles, which clog the filter, as either from the pump and its moving parts or from the connective tubing. Because of the inability to control the samples prior to delivery, background chlorine levels masked the source of chlorine yielding inconclusive results for this study.

NAA Research - Neutron Activation Analysis of Experiment Holding Devices - Dr. W.G. Vernetson, R. Ratner*, T. Downing*, Reactor Staff.

Various types of experiment holding materials (cords) were analyzed using neutron activation analysis to identify the best choice for holding experiments inserted in the reactor vertical ports and to identify the trace element content of the materials. This work resulted in selection of experiment holding materials that yield low residual radioactivity to assure that radiation fields and resultant doses for those removing and handling samples prior to transfer from the reactor are maintained as low as reasonably achievable (ALARA).

NAA Research - Neutron Activation Analysis of Aqueous Corrosion Products - Dr. E.D. Verink (MCI), Dr. W.G. Vernetson, R. Hanrahan, Reactor Staff.

Various aqueous corrosion products were analyzed using neutron activation analysis to determine the trace element content of iron and chromium in these products. This work was performed as a funded service project for Materials Consultants, Incorporated to support investigative work into the cause of materials problems with good results obtained.

NAA Research - Neutron Activation Analysis of Laboratory Rat Tissues for Mercury Content - Dr. B. Oguntebi/Dr. K. Soderholm (Endodontics Department), Dr. W.G. Vernetson, M. DeGrood**, D. Simpkins, R. Ratner*, T. Downing*, Reactor Staff.

Mercury amalgam material like that used to fill cavities in teeth was implanted into the bones of a large population of laboratory rats with some rats receiving no amalgam implants. Subsequently, the brains and kidneys of the laboratory rats were excised, freeze dried and delivered to the NAA Laboratory. After much sample processing, including further freeze drying, these samples were analyzed using neutron activation analysis to determine the trace mercury content in these samples. This work was performed as a funded research project with the samples delivered unlabeled as to whether in amalgam-implanted rats or not. The results of this work to date show wide but consistent variation in the mercury content of the rat brain and kidney tissues. It is expected that these results may have significant implications for the mercury uptake in critical organs in humans having such amalgams in their teeth.

Irradiation Effects Research - High Fluence Irradiation of Polycrystalline Superconductor Material - Dr. P. Gielisse (FSU/FAMU), Dr. H. Niculescu (FSU), Dr. W.G. Vernetson, J. Weaver**, D. Simpkins, Reactor Staff.

A small toroidal-shaped piece of high temperature polycrystalline superconductor material (YBaCuO - 1:2:3:7) is being irradiated to moderately high fluences of high energy neutrons. These irradiations are intended to demonstrate increased critical current density for the material after being subjected to high fast neutron fluence. Increased critical current density will then allow for reduction in shielding requirements on superconducting magnets such as for use on fusion reactors. At year's end this irradiation has just begun and is expected to continue for a good number of months with periodic checks of the material.

NAA Research - Evaluation of Storage of Carbonated Beverages on Aluminum Content - A. Arica (PHS), Dr. W.G. Vernetson, Dr. B. Abbott, F. Ayoung-Chee** (PHS), R. Ratner*, T. Downing*, D. Farinha*, Reactor Staff.

Various carbonated beverages under different storage conditions including length of time following unsealing of the container are being analyzed for aluminum content using neutron activation analysis. Since aluminum is so readily taken up by the body, it is hoped some conclusions relative to aluminum uptake can be reached as to implications of allowing carbonated beverages to set after opening before consumption. One high school student project in this area was completed as part of the FFFS Summer Science Student Research Training Program at the end of the reporting year showing significant differences in initial aluminum content of carbonated beverages as well as large increases with delayed consumption following opening. Work is continuing to present a science fair project on this work in the next reporting year.

NAA Research - Evaluation of Canned Tuna for Mercury Content - J. Griggs (MHS), C.H. Coldwell (MHS), E. Leonard (MHS), Dr. W.G. Vernetson, Dr. B. Abbott, B. Morehouse** (MHS), R. Ratner*, T. Downing*, D. Farinha*, Reactor Staff.

Various brands of canned tuna fish are being evaluated for mercury content using Neutron Activation Analysis. Here it is hoped to identify certain brands or types of tuna that may be higher in mercury content and therefore make recommendations to shoppers as to proper choices to minimize mercury uptake via food consumption. One high school student project in this area was completed as part of the FFFS Summer Science Student Research Training Program at the end of the reporting year. Results to date are inconclusive though some detectable mercury levels have been identified. Work is continuing to present the results of this project at a science fair in the next reporting year.

Health Physics Research - Nuclear Quadrupole Resonance Spectroscopy Using Neutron Doses on Nitrogenous Compounds - Dr. David E. Hintenlang, Khalid Jamil**, Reactor Staff.

The effects of neutron radiation doses on various nitrogenous compounds are being studied by observing the changes in static and dynamic molecular structure occurring in the vicinity of Nitrogen-14 nuclei using the technique of Nuclear Quadrupole Resonance (NQR) spectroscopy. Experiments have been performed using compounds such as urea, thiourea, and sodium nitrite to observe the changes in NQR parameters produced by nuclear radiations. The initial results show that there are significant changes in NQR parameters with variable neutron doses. Further work to correlate the dose and NQR spectroscopic response is in progress to develop a reliable and predictable dosimetric indicator with external funding provided for some of the work which is progressing well.

Isotope Production - Activation of Pure Copper - Dr. John Kuperus, Reactor Staff.

Pure copper samples have been irradiated for use by researchers in the J. Hillis Miller Health Center Radiologic Pharmacy Department to be used in calibrating a research scanner utilized for positron emission tomography (PET). A number of samples were supplied this year; those supplied have been well used in the calibration procedure with future usage expected to occur more frequently in the upcoming year.

TRTR Newsletter - Publication of Newsletter for Nonpower Reactor Community - Dr. W.G. Vernetson, T. Rousan*, D. Simpkins*, R. Ratner*, D. Cronin*.

Limited financial support was made available beginning February, 1989 to support a newsletter to be published quarterly or more often as the need arises to provide better continuing communications among TRTR members and between the regulators and TRTR members. The newsletter will also provide a forum for discussing key issues affecting the membership of the National Organization of Test, Research and Training Reactors (TRTR). All NRC regional offices and the main NRC offices in Bethesda are supplying results of inspection reports and other documents for newsletter input to assure better communications between the regulators and the TRTR membership. In addition to the renewal proposal for 1992 and appointment of a new assistant editor, four newsletters totalling over 70 pages were published during the reporting year with the system working well and expected to continue to produce quarterly issues during the upcoming year.

Facility Special Services - Special Individual and Group Lectures, Tours and Demonstrations - Dr. W.G. Vernetson, D. Simpkins, R. Piciullo, R. Ratner*, R. Rafford*, J. LaBelle*, C. Leipner*, Reactor Staff.

Various lectures, tours and demonstrations of reactor, NAA Laboratory and other facilities were conducted for hundreds of visitors to include campus and off-campus educational groups, university service personnel, potential and interested facility users, personnel requiring Radiation Workers Instructions or Second Person Qualification, foreign visitors and reporters. Other special visitors this year included WESH-TV reporters from Orlando, a group of Northeast Regional Data Center employees, a group of visitors from Pakistan, a Senior Administrative Assistant and the University Finance and Accounting Office Associate Controller, a university professor and a visiting Bulgarian scientist, two groups of students visiting from Brazil, various groups from the Physical Plant Division and Ingley, Campbell and Moses, Inc., the University of Florida Architect Engineer and representatives from the Engineer's office, a visiting professor from Clemson University, the Editor of the Florida Review and his staff, a photographer representing the Chronicle of Higher Education, various University Police and Gainesville Fire Department personnel, several groups of 1992 Engineer's Fair visitors, a group of NASA visitors, several groups of outstanding high school students sponsored by Tau Beta Pi Honor Society, various NRC, ANI and DOE visitors and inspectors plus many other groups and individuals too numerous to list including NES personnel for Emergency Response as well as Right-to-Know Training.

Facilities Support - Facility Upgrade/Improvement Activities - Dr. W.G. Vernetson, R. Piciullo, D. Simpkins, R. Ratner*, Reactor Staff, Physical Plant Division Staff.

Various activities have been undertaken to upgrade facilities and assure continued facility usage and usefulness. Included among those activities this year are the initiation of the project to install terminal strips and quick disconnect fittings for all the core thermocouple connections. Various cell preservation activities including scraping and painting various floor and reactor structure surfaces was also continued. A great deal of effort was also devoted to upgrading various information notices, radiation-related signs and other right-to-know signs required to be posted throughout the facility to meet various federal, state and university requirements. There was also a significant effort to have the metal doors to the diluting fan room replaced with better doors for safety/security purposes and to have a service disconnect installed on Breaker #9 to reroute the diesel generator sensing line to prevent inadvertent repowering of the console should Breaker #9 ever be opened to secure the console. Of course, various NAA Laboratory activities to prepare better libraries and to obtain and implement improved analysis programs were also instrumental in improving facilities operations as every effort continues to be made to assure smooth and effective facility operations in all areas.

Surveillance Activities - Checks, Tests and Surveillances To Meet License Conditions - Dr. W.G. Vernetson, D.L. Munroe, R. Piciullo, D. Simpkins, UFTR Staff, Radiation Control Staff.

A series of quarterly, semiannual, annual and other checks, tests, calibrations and other surveillances have been completed to assure meeting the license conditions in the UFTR Technical Specifications and to assure continued operability of the UFTR. Additional checks and other surveillances are included to assure proper facility operations.

Maintenance Activity - Activities to Correct Failures and Restore the UFTR to Operable Status - Dr. W.G. Vernetson, D.L. Munroe, R. Piciullo, D. Simpkins, UFTR Staff, Radiation Control Staff.

Routine corrective maintenance on UFTR systems and facilities again occupied a considerable amount of time during the reporting period. During the year, there was one large maintenance project requiring significant effort; this was for the second occurrence of the failure of thermocouple #2 in the outlet of the core south center fuel box coolant line near the end of the reporting year as a recurrence of a failure early in the year. The outage for this second occurrence was over three weeks in length as new wire was connected to all three thermocouples on the core south side with a terminal strip and quick disconnect fittings installed in the equipment pit area for these three lines. This work was performed as a modification approved under 10 CFR 50.59 Evaluation Number 92-06. Future plans are to make the same connections to a terminal strip for the three north side lines and to install quick disconnect fittings for all six core area thermocouple lines to reduce dose commitments (ALARA) for future core area thermocouple repair work. Nevertheless, there were several failures and significant contributions to forced unavailability during this period for corrective and preventive maintenance performed on the nuclear instrumentation system circuits and for a momentary failure of the Safety Channel 2 meter trip plus other maintenance work on the blade position indicating system, the area radiation monitoring system and the stack radiation monitoring system. Other than the fact that there were two failures of thermocouple point #2 and several minor failures in the radiation monitoring system, there were fewer multiple failure occurrences in this year than in most previous years. During the upcoming year an effort is planned to obtain funds and replace the radiation monitoring system to prevent lost usage opportunities. Overall, it is hoped the facility will be well served by maintenance performed during the year (especially maintenance on the circuits of the nuclear instrumentation system and on the thermocouple connections) to attain an even higher availability for the 1992-1993 reporting year.

IX. THESES, PUBLICATIONS, REPORTS AND ORAL PRESENTATIONS OF WORK RELATED TO THE USE AND OPERATIONS OF THE UFTR

1. "A Report on the Analysis for Trace Elements in Oil Field Samples from Pollard, Alabama," Lisa Vickers, ENU-4905 Senior Research Project Report, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 2, 1991 (Omitted from 1990-1991 Report).

2. "Fall Semester Reactor Operations Laboratory Manual for ENU-5176L," W.G. Vernetson, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, September, 1991.

3. "Facilities Information and Description Plus Basic Radiation Worker Instructions," W.G. Vernetson, Graduate Seminar Presentation in ENU-6935, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, September 9, 1991.

4. "Update on Results of Trace Element Analysis Using NAA for Biochemical Assessment of Samples from Pollard, Alabama Oil Field (Phase 2)," W.G. Vernetson, NAA Laboratory Progress Report to G. Cwick (SEMSU) and M. Bishop (UWEC), Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, September 12, 1991.

5. "Physical Security Plan, Revision 10," W.G. Vernetson, Submission to the U.S. Nuclear Regulatory Commission, September 18, 1991.

6. "Research-Related Project Topics at the University of Florida Training Reactor," W.G. Vernetson, Graduate Seminar Presentation in ENU-6935, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, September 23, 1991.

7. "Gatorade Funding to Enable Proof-of-Principle Experiments and Preparation of a Patent Disclosure for the Gamma Compensated PIC Wide Range Neutron Flux Monitor and Reactor Power Measurement System," W.H. Ellis, Special Proposal Submitted to University of Florida Division of Sponsored Research, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, September 25, 1991 (Funded).

8. "Report on Log of Security Events," W.G. Vernetson, Official Report Submittal to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, October 2, 1991.

9. "Comments on Operator Licensing Examination," W.G. Vernetson, Official Facility Report to USNRC on Operator Licensing Examination Administered to Two SRO Candidates, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, October 8, 1991.

10. "Radionuclide Usage and Emissions Survey Form," W.G. Vernetson et al., Official Survey Submitted to the U.S. Environmental Protection Agency, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, October 11, 1991.

11. "Failure to Perform Required Surveillance of LSSS on Loss of Secondary Coolant Pump Power," W.G. Vernetson, Final Report Submitted to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, October 16, 1991.

12. "Development and Application of a PIC Based Multiprobe Plasma Diagnostic System," W.Y. Choi, Draft Doctoral Dissertation, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, October 20, 1991.

13. "University of Florida Training Reactor: Facilities Information and Description," D. Simpkins, Presentation to Science Students at Heritage Christian School, Gainesville, FL, October 21, 1991.

14. "Results of Fuel Conversion Analysis for the University of Florida Training Reactor," W.G. Vernetson, Presentation on October 25, 1991 in Session I on Operational Issues at the 1991 Annual Meeting of the National Organization of Test, Research and Training Reactors Held in Cambridge, MA, October 23-25, 1991.

15. "Funding Renewal Request for Production of the TRTR Community Newsletter," W.G. Vernetson, Proposal Submitted to EG&G Idaho, Inc., Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, November 5, 1991 (Funded effective July 1, 1992).

16. "Development and Application of a PIC Based Multiprobe Plasma Diagnostic System," W.Y. Choi, Doctoral Dissertation Presentation, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, November 6, 1991.

17. "Integrating Research Reactors and Other Nuclear Facilities Into the Nuclear Engineering Curriculum," W.G. Vernetson, Presentation at the Nuclear Engineering Undergraduate Curriculum Workshop: Nuclear Engineering Education, Its Role and Curriculum As We Enter the Twenty-First Century, Jointly Sponsored by the ANS Education and Training Division, the Nuclear Engineering Department Heads Organization and the Nuclear Engineering Division of the American Society for Engineering Education and Held in San Francisco, November 9, 1991.

18. "Innovative Computer-Based Nuclear Radiation Detection/Instrumentation Teaching Laboratory System," W.Y. Choi, Paper Presentation on November 11, 1991 in a Session Entitled Innovation in Nuclear Engineering Education and Training at the Winter International Meeting of the American Nuclear Society Held in San Francisco, CA, November 10-14, 1991.

19. "A Midsize Reactor Facility - A Regional Resource for Research and Education," W.G. Vernetson, Paper Presentation on November 14, 1991 in a Session Entitled Update on Research Reactors, at the Winter International Meeting of the American Nuclear Society Held in San Francisco, CA, November 10-14, 1991.

20. "Unscheduled Reactor Trip on Loss of Secondary Flow," Final Report Submitted to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, November 27, 1991.

21. "Innovative Computer-Based Nuclear Radiation Detection/Instrumentation Teaching Laboratory System," W.H. Ellis, W.Y. Choi, Q. He, Trans. Amer. Nucl. Soc., 64, p. 32, November, 1991.

22. "A Midsize Reactor Facility - A Regional Resource for Research and Education," W.G. Vernetson, Trans. Amer. Nucl. Soc., 64, p. 245, November, 1991.

23. "TRTR - National Organization of Test, Research and Training Reactors Newsletter," Volume 3, No. 4, W.G. Vernetson and T. Rousan, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, November, 1991.

24. "UFTR Safety Channel #2 Circuit Failure," W.G. Vernetson, Final Report Submitted to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, December 3, 1991.

25. "Final Report on the Fall Semester Reactor Operations Based Health Physics Cooperative Work Training Program," conducted for Radiation Protection Technology Program Students at Central Florida Community College, W.G. Vernetson, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, December 13, 1991.

26. "Emergency Plan for the University of Florida Training Reactor - Revision 7," W.G. Vernetson, Official Submittal to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, December 17, 1991.

27. "Development and Application of a Pulsed Ionization Chamber Based Multiprobe Plasma Diagnostic System," W.Y. Choi, Doctoral Dissertation, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, December 17, 1991.

28. "Instrumental Neutron Activation Analysis Using the Proposed k_o-Factor Method at the University of Florida Training Reactor," R.T. Ratner, Internal Progress Report on Initial Stages of Masters' Degree Research, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, December 18, 1991.

29. "UFTR Reactor Operator Requalification and Recertification Training Program for July, 1991 Through June, 1993," Revised Official Updated Program Submittal to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, December 29, 1991.

30. "University of Florida Training Reactor: Facilities Information and Description," D. Simpkins, Presentation to P.K. Yonge High School Government Class, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, January 10, 1992.

31. "Laboratory Safety, Chemical Hazards and Right-to-Know Requirements," R.T. Ratner, Special Presentation to Meet Training Requirements for Facility Users, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, January 23, 1992.

32. "NAA of Synthetic Agricultural Fertilizers for Determination of Trace Metal Content," R. Wade, Union County High School, Union County Science Fair Presentation (First Place, Chemistry Division), Lake Butler, FL, January, 1992.

33. "A Study of Magnitude and Spectral Measurements of Neutron Flux to Support Neutron Radiography," J. Thompson, Charlotte High School, Charlotte High School Science Fair Presentation, Punta Gorda, FL, January, 1992.

34. "Information and Description of the University of Florida Training Reactor Facility," W.G. Vernetson, Presentation on February 3, 1992 for Participants in the 29th Annual Junior Science, Engineering and Humanities Symposium Held at the University of Florida, Gainesville, FL, February 2-4, 1992.

35. "NAA of Synthetic Agricultural Fertilizers for Determination of Trace Metal Content," R. Wade, Union County High School, Suwannee Valley Region Science Fair Presentation (First Place - Chemistry Division), Lake Butler, FL, February 25-26, 1992.

36. "Progress Report on Thermal Hydraulic Analysis for UFTR HEU to LEU Fuel Conversion," G.E. Welch, Internal Report of Progress on Thermal Hydraulics Analysis for HEU to LEU Conversion, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, February 27, 1992.

37. "TRTR - National Organization of Test, Research and Training Reactors Newsletter," Volume 4, No. 1, W.G. Vernetson and T. Rousan, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, February, 1992.

38. "Input to Proposal for EGN-1002 Experiment Course Using the UFTR," W.G. Vernetson, Nuclear Engineering Sciences Department Section of SUCCEED Proposal to NSF Consortium on Freshman Laboratory Program, March 2, 1992.

39. "Calculation of Rupture Modulus," G. LaTorre, Advanced Materials Research Center, University of Florida, Gainesville, FL, March 3, 1992.

40. "Report on Results of Radiographic Evaluation and Rupture Modulus Testing on Grand Gulf Nuclear Unit Boraflex Absorber Coupons," W.G. Vernetson and D. Simpkins, Report to NUSURTEC, Incorporated in Palm Harbor, Florida, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, March 5, 1992.

41. "NRC Inspection Report No. 50-83/92-01," D.M. Collins, E. McAlpine and C. Bassett, USNRC Record of Inspection Conducted on February 24-28, 1992 at the UFTR Facility, Atlanta, GA, March 18, 1992.

42. "Proposal Submitted to the Nuclear Regulatory Commission to Meet 10 CFR 50.64 Requirements for Scheduling UFTR Conversion from HEU to LEU Fuel," W.G. Vernetson, Updated Scheduling Proposal Submitted to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, March 26, 1992.

43. "Annual Progress Report of the University of Florida Training Reactor for September 1, 1990 - August 31, 1991 Reporting Year," W.G. Vernetson, November, 1991 (Delayed to March, 1992).

44. "NAA of Synthetic Agricultural Fertilizers for Determination of Trace Metal Content," R. Wade, Union County High School, State of Florida Science Fair Presentation, Miami, FL, March, 1992.

45. "UFTR Safety Analysis Report - Revision 7," W.G. Vernetson, Official Submittal to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, April 3, 1992.

46. "Report on Log of Security Events," W.G. Vernetson, Official Report Submittal to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, April 6, 1992.

47. "Gamma Compensated Pulsed Ionization Chamber Full Range Neutron Flux/Reactor Power Measurement and Control System," W.H. Ellis, Proposal Submitted to the Department of Energy/Energy Research Office, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, April 20, 1992.

48. "Status Report on UFTR Safety Analysis Report Update for HEU to LEU Conversion," A. Randmere, Internal Report on HEU to LEU Conversion Work, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, April 22, 1992.

49. "Radiation Tool Might Boost Safety," Associated Press Article on NQR Dosimetry Based on UFTR Irradiated Samples, Published in Florida Today, April 27, 1992.

50. UFTR SOP-D.5, UFTR Reactor Waste Shipments: Preparations and Transfer," Revision 1, W.G. Vernetson et al., Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, April, 1992.

51. "Final Report on Funding for the University of Florida Training Reactor Through the U.S. Department of Energy University Reactor Instrumentation Program," Grant No. DE-FG07-90ER12969, W.G. Vernetson, Submitted to Department of Energy, April, 1992.

52. "Update on Results of Trace Element Analysis Using NAA for Biochemical Assessment of Samples from Pollard, Alabama Oil Field (Phase 2)," W.G. Vernetson, NAA Laboratory Progress Report to G. Cwick (SEMSU) and M. Bishop (UWEC), Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, May 1, 1992.

53. "Status Report of Trace Element Analysis of Sedimentary Mineral Deposits," R.T. Ratner and W.G. Vernetson, NAA Laboratory Progress Report to A.A. Dabous (FSU), Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, May 1, 1992.

54. "Biologically-Equivalent Dosimetry from Nitrogen-14 Nuclear Quadrupole Resonance," D.E. Hintenlang, L.H. Iselin and K. Jamil, Worldwide Achievement in Public and Occupational Health Protection Against Radiation: Proceedings of the Eighth International Congress of the International Radiation Protection Association, p. 3411, Held in Montreal, Canada, May 15-22, 1992.

55. "NQR Spectroscopy Studies," D.E. Hintenlang, L.H. Iselin and K. Jamil, Paper Presentation in Poster Session at the International Radiation Protection Association 8th Congress Held in Montreal, Canada, May 17-22, 1992.

56. "Elemental Analysis of Aqueous Corrosion Products," W.G. Vernetson and R.T. Ratner, NAA Laboratory Report Sent to Materials Consultants, Inc., Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, May 22, 1992.

57. "Final Report on the University of Florida U.S. Department of Energy 1990-1991 Reactor Sharing Program," Grant No. DE-FG07-85ER75103, W.G. Vernetson, submitted to Department of Energy, May, 1992.

58. "University of Florida Reactor Sharing Program," W.G. Vernetson, Proposal Submitted to Department of Energy, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, May, 1992 (Partially Funded).

59. "Proposal for Funding for the UFTR Through the U.S. Department of Energy University Reactor Instrumentation Program: Special Research Grant Program Notice No. 92-11," W.G. Vernetson, Proposal Submitted to Department of Energy, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, May, 1992 (Partially Funded).

TABLE VI-2 (CONTINUED)

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(August 31, 1992)

D. RADIATION CONTROL PROCEDURES

- D.1 UFTR Radiation Protection and Control (REV 4, 7/91)
- D.2 Radiation Work Permit (REV 10, 3/87)
- D.3 Primary Equipment Pit Entry (REV 2, 5/85)
- D.4 Removing Irradiated Samples From UFTR Experimental Ports (REV 5, 10/89)
- D.5 UFTR Reactor Waste Shipments: Preparations and Transfer (REV 1, 4/92)
- D.6 Control of UFTR Radioactive Material Transfers (REV 0, 12/88)

E. MAINTENANCE PROCEDURES

- E.1 Changing Primary Purification Demineralizer Resins (REV 3, 6/85)
- E.2 Alterations to Reactor Shielding and Graphite Configuration (REV 3, 5/87)
- E.3 Shield Tank and Shield Tank Recirculation System Maintenance (REV 2, 4/83)
- E.4 UFTR Nuclear Instrumentation Calibration Check (REV 1, 4/90)
- E.5 Superseded
- E.6 Argon-41 Concentration Measurement (REV 0, 1/84)
- E.7 Measurement of Temperature Coefficient of Reactivity (REV 0, 5/85)
- E.8 Verification of UFTR Negative Void Coefficient of Reactivity (REV 0, 12/85)

F. SECURITY PLAN RESPONSE PROCEDURES (Reactor Safeguards Material, Disposition Restricted)

- F.1 Physical Security Controls (Confidential, except for UFTR Form SOP-F.1A)
- F.2 Bomb Threat (Confidential, except for UFTR Form SOP-F.2A)
- F.3 Theft of (or Threat of the Theft of) Special Nuclear Material (Confidential, except for UFTR Form SOP-F.3A)
- F.4 Civil Disorder (Confidential)
- F.5 Fire or Explosion (Confidential)
- F.6 Industrial Sabotage (Confidential)
- F.7 Security Procedure Controls (REV 2, 10/89)
- F.8 UFTR Safeguards Reporting Requirements (REV 0, 9/87)

TABLE VI-3

TABULATION OF UFTR STANDARD OPERATING PROCEDURES TEMPORARY CHANGE NOTICES ISSUED FOR 1991-1992 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
0.1	12/91	16	Information Copies of SOP Manuals assigned to new SROs D. Simpkins and D. Cronin by name.
0.5	10/91	Q-4 (pp 1-3), Q-5 (p 1)	Updates the unrestricted area (Q-4) and restricted area (Q-5) Surveillance Data Sheets to reflect additional points measured in unrestricted areas of Building #557 and to document better the review of the Q-4 and Q-5 Surveillances by having separate review and acknowledgement blocks for the Radiation Control Officer and the Facility Director on both Q-4 and Q-5 Surveillance Data Sheets.
	12/91	28, 29, Q-1 (p 5), Q-10 (p 1)(new)	Adds the Quarterly Check of Air Handler Condensate (Q-10 Surveillance) to document ANI requested checks of air handler condensate, adds check of trip for loss of secondary well cooling pump power (per evaluations initiated as a result of questions raised by the NRC license examiner) to Quarterly Scram Checks (Q-1 Surveillance) which is now 5 pages, updates list of surveillances on Page 28 to include Q-10 and updates listing of latest changes to surveillance data sheets on Page 29.
	12/91	Q-6	Updates list of items to be checked to be posted in control room and outside control room to include latest issue of NRC Form-3 (Rev 7/91 or later) and adds Call List #1 to be posted outside control room.

TABLE VI-3 (CONTINUED)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES ISSUED
FOR 1991-1992 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
	3/92	28	Updates list of surveillances to include correcting title for S-8 Surveillance and adds S-9 Surveillance which had been omitted.
	5/92	28, 29, Q-1 (pp 1-6)	Updates Q-1 Surveillance Data Sheets to six pages to correct minor typographical errors and add clarifications as well as require initials for all entries per an RSRS audit recommendation; also updates list of surveillances on Page 28 to correct title of PuBe/SbBe Source Leak Checks (Q-8 Surveillance) and updates listing of latest changes to surveillance data sheets on Page 29.
	7/92	Q-1 (pp 1-6)	Updates Q-1 Surveillance Data Sheets to correct several typographical errors and clarify several procedural steps.
A.1	6/92	26	Updates procedure to change reference to "purple pen" to read "green pen" per previous replacement of two-pen recorder and use of green pen.
A.4	6/92	3	Updates procedure to change note in procedure to delete lifting of red pen by itself since new two-pen recorder does not allow lifting red pen alone and there is no need to do so, makes driving all control blades down simultaneously for a shutdown recommended as opposed to required as has always been understood and also corrects several grammatical errors.

TABLE VI-3 (CONTINUED)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES ISSUED
FOR 1991-1992 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
E.7	11/91	5	Updates procedure to allow using deep well cooling mode for the heatup required to perform the measurement of the temperature coefficient of reactivity (A-3 Surveillance) and to allow power reduction explicitly but not require complete shutdown following heatup.
F.1	7/91	13	Updates NRC requirements for reporting major security events.

TABLE VI-4

TABLE II
(Revision 1)

UNIVERSITY OF FLORIDA TRAINING REACTOR

TENTATIVE MILESTONE SCHEDULE

FOR HEU TO LEU FUEL CONVERSION

I.	Date of Receipt of Funding (expected)	September 30, 1987
II.	Date of Full Submittal to NRC of Application to Convert (including all necessary documents)	October, 1989
III.	Date of NRC Order to Convert	February, 1990
	A. Date of Completion of All Plans to Convert	September, 1990
	B. Date of Receipt of LEU Fuel	November, 1990
	C. Date of Completion of Any Final Tests With HEU Fuel	January, 1991
	D. Date of Removal of HEU Fuel	March, 1991
	E. Date of Shipment of HEU Fuel	June, 1991
	F. Date of Loading of LEU Fuel	August, 1991
	G. Date of Completion of Determination of Initial Operational Parameters With LEU (Startup and Power Operations Testing)	October, 1991
	H. Date of Submittal of Report to NRC/DOE Summarizing New Operational Characteristics and Comparing With Predictions of Safety Analysis	January, 1992

3/87

TABLE VI-5

TABLE II
(Revision 2)

UNIVERSITY OF FLORIDA TRAINING REACTOR

TENTATIVEMILESTONE SCHEDULE

FOR HEU TO LEU FUEL CONVERSION

I.	Effective Date of Receipt of Funding	November, 1987
II.	Date of Full Submittal to NRC of Application to Convert (including all necessary documents)	December, 1989
III.	Date of NRC Order to Convert	April, 1990
	A. Date of Completion of All Plans to Convert	November, 1990
	B. Date of Receipt of LEU Fuel	January, 1991
	C. Date of Completion of Any Final Tests With HEU Fuel	March, 1991
	D. Date of Removal of HEU Fuel	May, 1991
	E. Date of Shipment of HEU Fuel	August, 1991
	F. Date of Loading of LEU Fuel	October, 1991
	G. Date of Completion of Determination of Initial Operational Parameters With LEU (Startup and Power Operations Testing)	December, 1991
	H. Date of Submittal of Report to NRC/DOE Summarizing New Operational Characteristics and Comparing With Predictions of Safety Analysis	March, 1992

3/88

TABLE VI-6

TABLE II
(Revision 3)

UNIVERSITY OF FLORIDA TRAINING REACTOR

TENTATIVEMILESTONE SCHEDULE

FOR HEU TO LEU FUEL CONVERSION

I.	Effective Date of Receipt of Funding	November, 1987
II.	Date of Full Submittal to NRC of Application to Convert (including all necessary documents)	June, 1990
III.	Date of NRC Order to Convert	October, 1990
	A. Date of Completion of All Plans to Convert	May, 1991
	B. Date of Receipt of LEU Fuel	July, 1991
	C. Date of Completion of Any Final Tests With HEU Fuel	September, 1991
	D. Date of Removal of HEU Fuel	November, 1991
	E. Date of Shipment of HEU Fuel	February, 1992
	F. Date of Loading of LEU Fuel	April, 1992
	G. Date of Completion of Determination of Initial Operational Parameters With LEU (Startup and Power Operations Testing)	June, 1992
	H. Date of Submittal of Report to NRC/DOE Summarizing New Operational Characteristics and Comparing With Predictions of Safety Analysis	September, 1992

3/89

TABLE VI-7

TABLE II
(Revision 4)

UNIVERSITY OF FLORIDA TRAINING REACTOR

TENTATIVE MILESTONE SCHEDULE

FOR HEU TO LEU FUEL CONVERSION

I.	Effective Date of Receipt of Funding	November, 1987
II.	Date of Full Submittal to NRC of Application to Convert (including all necessary documents)	April, 1991
III.	Date of NRC Order to Convert	August, 1991
	A. Date of Completion of All Plans to Convert	March, 1992
	B. Date of Receipt of LEU Fuel	May, 1992
	C. Date of Completion of Any Final Tests With HEU Fuel	July, 1992
	D. Date of Removal of HEU Fuel	September, 1992
	E. Date of Shipment of HEU Fuel	December, 1992
	F. Date of Loading of LEU Fuel	February, 1993
	G. Date of Completion of Determination of Initial Operational Parameters With LEU (Startup and Power Operations Testing)	April, 1993
	H. Date of Submittal of Report to NRC/DOE Summarizing New Operational Characteristics and Comparing With Predictions of Safety Analysis	August, 1993

3/90

TABLE VI-8

TABLE II
(Revision 5)

UNIVERSITY OF FLORIDA TRAINING REACTOR

TENTATIVE MILESTONE SCHEDULE

FOR HEU TO LEU FUEL CONVERSION

I.	Effective Date of Receipt of Funding	November, 1987
II.	Date of Full Submittal to NRC of Application to Convert (including all necessary documents)	January, 1992
III.	Date of NRC Order to Convert	May, 1992
	A. Date of Completion of All Plans to Convert	December, 1992
	B. Date of Receipt of LEU Fuel	February, 1993
	C. Date of Completion of Any Final Tests With HEU Fuel	May, 1993
	D. Date of Removal of HEU Fuel	July, 1993
	E. Date of Shipment of HEU Fuel	October, 1993
	F. Date of Loading of LEU Fuel	December, 1993
	G. Date of Completion of Determination of Initial Operational Parameters With LEU (Startup and Power Operations Testing)	March, 1994
	H. Date of Submittal of Report to NRC/DOE Summarizing New Operational Characteristics and Comparing With Predictions of Safety Analysis	May, 1994

TABLE VI-9

TABLE II
(Revision 6)

UNIVERSITY OF FLORIDA TRAINING REACTOR

TENTATIVEMILESTONE SCHEDULE

FOR HEU TO LEU FUEL CONVERSION

I.	Effective Date of Receipt of Funding	November, 1987
II.	Date of Full Submittal to NRC of Application to Convert (including all necessary documents)	August, 1992
III.	Date of NRC Order to Convert	November, 1992
	A. Date of Completion of All Plans to Convert	July, 1993
	B. Date of Receipt of LEU Fuel	September, 1993
	C. Date of Completion of Any Final Tests With HEU Fuel	December, 1993
	D. Date of Removal of HEU Fuel	February, 1994
	E. Date of Shipment of HEU Fuel	May, 1994
	F. Date of Loading of LEU Fuel	July, 1994
	G. Date of Completion of Determination of Initial Operational Parameters With LEU (Startup and Power Operations Testing)	October, 1994
	H. Date of Submittal of Report to NRC/DOE Summarizing New Operational Characteristics and Comparing With Predictions of Safety Analysis	December, 1994

3/92

VII. RADIOACTIVE RELEASES AND ENVIRONMENTAL SURVEILLANCE

This chapter summarizes the gaseous, liquid and solid radioactive releases from the UFTR facility for this reporting year. Argon-41 is the primary gaseous release while there was one low level liquid release and no solid releases at all. Finally, this chapter includes a summary of personnel exposures at the UFTR facility.

A. Gaseous (Argon-41)

The gaseous releases from the UFTR Facility for this reporting year are summarized in Table VII-1. The basis for the gaseous activity release values is indicated in Table VII-2. These values are obtained by periodic measurements of stack concentrations as required by Technical Specifications following UFTR SOP-E.6, "Argon-41 Concentration Measurement".

TABLE VII-1

UFTR GASEOUS RELEASE SUMMARY

Month	Release	Monthly Average Concentration
September, 1991	4.6122×10^6 μCi/Month	1.6406×10^{-9} μCi/ml
October, 1991	4.1023×10^6 μCi/Month	1.4592×10^{-9} μCi/ml
November, 1991	4.3595×10^6 μCi/Month	1.5507×10^{-9} μCi/ml
December, 1991	1.8722×10^6 μCi/Month	0.6659×10^{-9} μCi/ml
January, 1992	6.8143×10^6 μCi/Month	1.8129×10^{-9} μCi/ml
February, 1992	6.2036×10^6 μCi/Month	1.7298×10^{-9} μCi/ml
March, 1992	8.0095×10^6 μCi/Month	2.2333×10^{-9} μCi/ml
April, 1992	9.5872×10^6 μCi/Month	2.6732×10^{-9} μCi/ml
May, 1992	18.0722×10^6 μCi/Month	5.0391×10^{-9} μCi/ml
June, 1992	8.5741×10^6 μCi/Month	2.5088×10^{-9} μCi/ml
July, 1992	10.7584×10^6 μCi/Month	3.1479×10^{-9} μCi/ml
August, 1992	0.1802×10^6 μCi/Month	0.0573×10^{-9} μCi/ml

TOTAL ARGON-41 Releases for the Reporting Year: **83.1457 Ci**

YEARLY AVERAGE ARGON-41 Release Concentration: **2.043×10^{-9} μCi/ml**

UFTR Technical Specifications require average Argon-41 release concentration averaged over a month to be less than 4.0×10^{-8} μCi/ml. All such monthly values are well below this limiting release concentration and the average monthly release concentration of 2.043×10^{-9} μCi/ml is more than an order of magnitude below the limiting value. Even with the new 10CFRPart20 values reducing the Argon-41 release concentration limit to 1.0×10^{-8} μCi/ml, there is no problem expected as the highest monthly value listed in Table VII-1 is less than 51% of the allowable limit.

Total releases and average monthly concentrations are based upon periodic Argon-41 release concentration measurements made at equilibrium full power (100 kW) conditions. The results for these experimental measurements used in calculating the gaseous Ar-41 release data are summarized in Table VII-2. Entries in Table VII-2 represent the average results of analyses of a minimum of three (3) samples per UFTR SOP-E.6 using a new gas standard obtained in response to NRC Inspection Report No. 88-01.

TABLE VII-2

UFTR GASEOUS RELEASE DATA BASE

Month	Releases Per Unit Energy Generation	Instantaneous Argon-41 Concentration at Full Power[1]
Sept. 1991 - Dec. 1991	3404.59 μCi/kW-hr	8.720×10^{-8} μCi/ml
Jan. 1992 - May 1992	4228.53 μCi/kW-hr	8.100×10^{-8} μCi/ml
Jun. 1992 - Aug. 1992	3541.06 μCi/kW-hr	7.460×10^{-8} μCi/ml

1. Values used to assure average release concentration meets 10 CFR 20 limits.

B. Liquid Waste From the UFTR/Nuclear Sciences Complex

There were approximately 84,400 liters discharged from the liquid waste holdup tanks to the campus sanitary sewage system during this reporting period. For this period there was only one discharge as summarized in Table VII-3.

The effluent discharged into the holding tanks comes from twenty laboratories within the Nuclear Sciences Center, the University Radiation Control Office as well as the UFTR complex. The UFTR normally releases approximately 1 liter of primary coolant per week to the holdup tanks as waste from primary coolant sampling. A total of 53 weekly samples were taken during this reporting year; the average activity for these coolant samples was 2.07×10^{-7} μCi/ml (β-γ) and 4.06×10^{-8} μCi/ml (α) for this 1991-1992 reporting period.

There were no other primary coolant releases to the holding tanks during the reporting year.

TABLE VII-3A

LIQUID WASTE RELEASES FROM HOLDUP TANKS

		Gross Beta	
Date	Volume (liters)	Concentration (μCi/ml)	Total Release Activity (μCi)
1. July 18, 1992	84,400	<LLD(1.6×10^{-9})	0.135[1]

1. The activity was determined for this entry using the LLD. Actual activity released in such cases is less than this value.

TABLE VII-3B

LIQUID WASTE RELEASES FROM HOLDUP TANKS

		Tritium	
Date	Volume (liters)	Concentration (μCi/ml)	Total Release Activity (μCi)
1. July 18, 1992	84,400	1.4×10^{-6}	118.16

TABLE VII-3C

LIQUID WASTE RELEASES FROM HOLDUP TANKS

		Carbon-14	
Date	Volume (liters)	Concentration (μCi/ml)	Total Release Activity (μCi)
1. July 18, 1992	84,400	<LLD(3.1×10^{-7})	21.164[1]

1. The activity was determined for this entry using the LLD. Actual activity released in such cases is less than this value.

C. Solid Waste Shipped Offsite

The UFTR facility made no shipments of solid waste during this reporting year. The last shipment was made on December 10, 1985 through ADCO Services, Inc. and consisted on one 55 gallon drum containing radioactive scrap metal parts as well as paper, plastic and other reactor-related waste materials associated primarily with the work to restore proper functioning of the UFTR control blade drive systems. The activity of the shipment was approximately 3.125 curies with the activity primarily attributed to Cobalt-60. Though a similar shipment of two drums was planned for the last two reporting years and again this reporting year to remove all the products resulting from the control blade restoration and maintenance project of 1985-1986, this shipment has not occurred to date. No date has been set for this next shipment though it is expected to occur sometime during the next reporting year as waste from several other small maintenance projects is consolidated for shipment to clear space for waste expected to be generated during the UFTR conversion from HEU-to-LEU fuel expected within 2 years. The new Standard Operating Procedure UFTR SOP-D.5, "UFTR Reactor Waste Shipments: Preparations and Transfer" originally generated in the 1986-1987 reporting year and revised in April 1992 during this reporting year, will be used to assure proper control of the waste for shipment as will guidance provided in several NRC Information Notices published in the last several years.

D. Environmental Monitoring

The UFTR maintains continuous film badge as well as thermoluminescent dosimeter monitoring (new for the 1982-1983 reporting period) in areas adjacent to and in the vicinity of the UFTR complex. The badge and TLD cumulative totals for this reporting period from September, 1991 through August, 1992 are summarized in Table VII-4. As can be noted, the values for the 12 months of the reporting period are either minimal or very low in all cases. Overall, the values in Table VII-4 show minimal environmental radiation dose from UFTR operations. The recorded TLD exposures are probably close to background in all cases while those recorded via film badges are also essentially background to within the accuracy of the monitoring instruments.

Film badge yearly exposures include contributions from September, October, and November 1991 and from July 1992. The accumulation of exposure recorded by month of exposure on the film badges is presented in Table VII-5. Film badges normally receive about 30 mrem during film badge handling and processing which makes readings of 10-30 mrem relatively uncertain and probably close to minimal in all cases. As a result the values recorded in Table VII-5 as well as all the minimal values are considered to support the conclusion of minimal environmental exposures from UFTR operation, especially since the months with exposure as recorded in Table VII-5 represent the full spectrum of monthly UFTR energy generation running from October, 1991 with 1204.92 kW-hrs generated at the low end (tenth for the year) to July, 1992 with 3038.18 kW-hrs generated on the high end (second for the year) with the eighth and ninth highest values of energy generation being recorded in September and November, 1991, respectively. Clearly the occasional exposures registered above minimal are not correlated with UFTR energy generation.

In July, 1992, all seven (7) environmental monitoring film badges are listed in Table VII-5 as having received above minimal dose. Although July, 1992 was a relatively high usage month (3038.176 kw-hrs generated), none of the more accurate TLD's (twelve) are listed as receiving above the minimal or nominal background dose. In addition, previous months at this and even higher energy generation levels have not yielded a correlated increase so energy generation is eliminated as a source of the elevated levels in the film badges, especially since no TLD read high for July, 1992.

One possible cause of the higher values might be thought to be unstacking the core shielding for the B-2 fuel surveillance and repair of the temperature monitoring system. However, this activity did not begin until 11 August 1992 so this activity could not be the cause of the elevated badge readings.

In summary, the more accurate TLD readings are likely to be the preferred readings and these values recorded on the film badges are evaluated to be acceptable and not caused by any facility problems but badge inaccuracies and/or faulty processing.

Based on Revision 3 of the UFTR Safety Analysis Report submitted to the NRC on May 29, 1987, plans are to eliminate some of the film badges currently used since the thermoluminescent dosimeters are preferred and were intended to replace the film badges previously referenced in the Safety Analysis Report. No action has been taken on this change to date; current plans to implement this change are on hold.

TABLE VII-4

CUMULATIVE RESULTS OF ENVIRONMENTAL MONITORING

FOR THE 1991-1992 REPORTING YEAR

Film Badge Designation	Total Yearly Exposure (mrem)[1]	TLDs[2]	Total Yearly Exposure (mrem)[3]	Months of Exposure
A1	90	1	60	10/91 and 6/92
A2	70	2	30	10/91
A3	10	3	30	10/91
A4	20	4	70	10/91 and 12/91
A5	40	5	30	10/91
A6	60	6	30	10/91
A7	50	7	30	10/91
		8	30	10/91
		9	30	10/91
		10	30	11/91
		11	30	11/91
		12	M	--

1. Film badge yearly exposures include contributions from September, October, and November 1991 as well as July 1992 as indicated in Table VII-5.

2. The first seven TLDs are attached adjacent to the corresponding numbered film badge monitors.

3. M denotes minimal (< 10 mrem) exposure; film badges normally receive about 30 mrem during film handling and processing.

TABLE VII-5

ENVIRONMENTAL BADGE EXPOSURE RECORD BY MONTH OF EXPOSURE

Film Badge Designation	Total Expos.	Sept. 1991 Expos.	Oct. 1991 Expos.	Nov. 1991 Expos.	July 1992 Expos.
A1	90	30	10	10	40
A2	70	30	M	M	40
A3	10	M	M	M	10
A4	20	M	M	M	20
A5	40	10	M	M	30
A6	60	20	M	20	20
A7	50	20	10	M	20

E. <u>Personal Radiation Exposure</u>

Maintenance and experimental work requiring significant exposure commitment was minimized as much as possible during this 1991-1992 reporting year as in the 1987-1991 reporting years following previous years when major maintenance in the core area involved relatively large dose commitments. This record is despite the outages for the incore fuel inspection and temperature monitoring system maintenance. UFTR-associated personnel exposures greater than minimum detectable during the reporting period are summarized in Table VII-6.

Table VII-6 lists the permanent whole body badge exposures recorded above background for the reporting year for personnel employed directly at the UFTR. These exposures are summarized for all badged UFTR personnel on an annual basis with no further breakdown because all exposures with two exceptions are well below 100 mrem with the highest at 240 mRem. In addition, the largest exposures are generally spread over several months primarily for support of experimental, research and educational projects as well as maintenance and surveillance projects. In this year, most of the exposure recorded in Table VII-6 was either to support neutron radiography experimentation, incore maintenance on the temperature monitoring system, or to support the biennial inspection of incore reactor fuel elements (B-2 Surveillance), with the later two being the largest sources of facility personnel exposure for the 1991-1992 reporting year.

TABLE VII-6

ANNUAL UFTR PERSONNEL EXPOSURE[1]

Name	Position	Permanent Film Badge Exposure (mrem)[2,3]
W.G. Vernetson	Director of Nuclear Facilities	10
D. Simpkins	Senior Reactor Operator	200
G.W. Fogle	Reactor Operator	40
D. Cronin	Senior Reactor Operator	240
T. Becker	Student Radiation Control/Facility Technician	M
T. Downing	Student Radiation Control/Facility Technician	60
J. Wolf	Senior Reactor Operator Trainee/Technician	M
R. Piciullo	Acting Reactor Manager/Consultant	M

1. Several individuals from the Radiation Control Office personnel periodically assigned to support UFTR-related activities and receiving a non-minimal dose for the year are listed in Table VII-7, VII-8, and VII-9.

2. M denotes minimal (<10 mrem) meaning background only.

3. All exposures reported here are for film badge readings for deep/whole body exposure.

Exposures for University of Florida personnel employed by the Radiation Control Office where the exposure is attributed to radiation control work associated with UFTR activities was minimal with no individual receiving a recorded exposure above background for normal work activities. One individual from the Radiation Control Office periodically assigned to support UFTR-related activities and special projects received a non-minimal dose for the year as listed in Table VII-7 tabulated from the self reading pocket dosimeter log. The exposure for this individual from the Radiation Control Office is due to involvement in supporting the biennial fuel inspection and temperature monitoring system maintenance but is at a very low dose level.

TABLE VII-7

EXPOSURE RECORDS FOR RADIATION CONTROL PERSONNEL
AS RECORDED ON PROMPT-READING DOSIMETERS

Personnel	Date	Exposure	Comments
M. LaFranzo	8/12/92	16 mR	Biennial Fuel Inspection and Temperature Monitoring System Thermocouple Repair.

Three individuals from the Radiation Control Office, periodically assigned to support UFTR related activities and special projects, received a non-minimal dose for the year as listed in Tables VII-8 for incore temperature monitoring system maintenance, and Table VII-9 for the biennial fuel inspection (B-2) surveillance/additional incore temperature monitoring system maintenance. The fuel inspection surveillance is typical of the type of project requiring additional radiation control support personnel, usually at widely-spaced intervals. During the 1991-1992 year, the fuel inspection surveillance and incore temperature monitoring system maintenance were the only large projects requiring the utilization of radiation control personnel not normally assigned to support special UFTR activities.

All personnel involved in the fuel surveillance project and incore temperature monitoring system maintenance were monitored by film badge dosimetry with personnel directly involved also monitored by local-use TLD dosimetry and self-reading pocket dosimeters. The activities included shielding removal, disconnecting and reconnecting incore thermocouples, fuel handling and inspection, followed by replacement of shielding. During these incore projects, eight (8) different personnel received measurable exposures, five (5) from the UFTR operations staff, and three (3) from the Radiation Control Office. All exposures listed in Tables VII-8 and VII-9 are for film badges, used as whole body monitors, unless otherwise indicated.

For visitors, students, or other non-permanent UFTR personnel, a few individuals had a non-zero prompt, self-reading dosimeter exposure measurement not above 0.5% of the allowable quarterly limit for the entire reporting period as indicated on Table VII-10. In most cases, the values of one (1) up to four (4) mrem exposures recorded for self-reading pocket dosimeters are attributed to uncertainty in reading the devices or having dropped the dosimeter. In most cases in Table VII-10, dosimeters monitoring other students participating in the same exercise or project indicated no exposure. Additionally, in all cases except for radiation control support activities, the projects including weekly and daily checkouts, tours, and operations demonstrations did not involve activities that would be expected to generate significant radiation exposure.

TABLE VII-8

RADIATION EXPOSURE ACQUIRED DURING RWP 91-07-I / MLP 91-54 TO REPAIR TEMPERATURE MONITORING SYSTEM WIRING SEPT./OCT. 1991

UFTR Personnel:	
D. Simpkins	90 mR (whole body) 270 mR (rt. wrist) 330 mR (rt. foot) 80 mR (head)
D. Cronin	20 mR (whole body) 20 mR (rt. wrist) 40 mR (rt. foot) 20 mR (head)
W.G. Vernetson	10 mR (whole body)
G. Fogle	40 mR (whole body)
Radiation Control Personnel:	
J. Keeley	20 mR (whole body)
D. Munroe	20 mR (whole body)

NOTES:

1. All exposures listed are for film badges by Landauer unless otherwise noted.
2. No exposure was recorded in this project for Radiation Control Personnel not normally assigned to assist in UFTR operations except for large projects.
3. Any and all other personnel involved received negligible dose.

TABLE VII-9

RADIATION EXPOSURE ACQUIRED DURING RWP 92-02-I TO REPAIR TEMPERATURE MONITORING SYSTEM WIRING AND THE UFTR BIENNIAL FUEL INSPECTION (B-2 SURVEILLANCE) JULY/AUG. 1992

UFTR Personnel:	
D. Simpkins	110 mR (whole body) 420 mR (rt. wrist) 80 mR (rt. foot) 220 mR (head)
D. Cronin	150 mR (whole body) 290 mR (rt. wrist) 140 mR (rt. foot) 90 mR (head)
T. Downing	40 mR (whole body) 30 mR (lt. wrist) 30 mR (lt. foot) 20 mR (head)
Radiation Control Personnel:	
D. Munroe	30 mR (whole body)
M. LaFranzo	70 mR (whole body)

NOTES:

1. All exposures listed are for film badges by Siemens unless otherwise noted.
2. No exposure was recorded in this project for Radiation Control Personnel not normally assigned to assist in UFTR operations except for large projects.
3. Any and all other personnel involved received negligible dose.

TABLE VII-10

EXPOSURE RECORDS FOR NON-PERMANENT UFTR PERSONNEL
AS RECORDED ON PROMPT-READING DOSIMETERS

Personnel[1]	Date	Exposure (mR)	Comments
J.Baron*	10/01/91	4	Evaluated as dose received during restricted and unrestricted area radiation survey exercise for Co-op student trainees from CFCC Radiation Technology Program.
P.Isaac	10/02/91	1	Evaluated as dose received during UFTR tour and administration of two SRO qualification exams by NRC examiner.
B.Bombassei*	10/08/91	1	Evaluated as dose received by two (2) CFCC Co-op students during a reactor shielding survey demonstration and hands-on practice.
J.Baron*	10/08/91	1	
J.Baron*	10/15/91	1	Evaluated as dose received by two (2) CFCC Co-op students during practice exercises.
B.Bombassei*	10/29/91	1	
C.Leipner	11/01/91	2	Evaluated as dose received by four (4) ENU-6516L students during Approach-to-Critical, and Thermal Diffusion Length exercises.
K.Al-Ahmady	11/01/91	2	
Q.He	11/01/91	1	
R.Hugenroth	11/01/91	4	
J.Baron*	11/05/91	3	Evaluated as dose received by one CFCC Co-op student during Rabbit system demonstration for student trainees.
A.Smith	11/13/91	2	Evaluated as dose received by two (2) Heritage Christian School students during UFTR tour and reactor operations demonstrations.
C.Tallent	11/13/91	3	
J.Baron*	11/19/91	1	Evaluated as dose received by one CFCC Co-op student during Rabbit system demonstration for student trainees.
A.Ferrari	12/12/91	1	Evaluated as dose received by one doctoral student while performing Gamma Compensated PIC Neutron Detector Experiments over two(2) day period.
	12/13/91	3	
Q.He	2/28/92	2	Evaluated as dose received by one graduate student while performing NES Experiment.

TABLE VII-10 (continued)

EXPOSURE RECORDS FOR NON-PERMANENT UFTR PERSONNEL AS RECORDED ON PROMPT-READING DOSIMETERS

Personnel[1]	Date	Exposure (mR)	Comments
S.Turner	3/19/92	1	Evaluated as dose received while performing NUSURTEC transmission experiments.
Y.Pan	3/30/92	2	Evaluated as dose received by one ENV-6215 student during a UFTR tour and reactor operations demonstration.
J.Winton	3/31/92	1	Evaluated as dose received by two (2) ENU-4905L/6937L students during Control Blade Worth Experiment.
H.Trosman	4/02/92	1	
D.Farinha	5/14/92	3	Evaluated as dose received by one NES student commencing an ENU-4905 project during UFTR tour, Rabbit system demonstration, and Second Person Qualifications.
	5/21/92	3	
R.Lower	7/13/92	1	Evaluated as dose received by one NES student commencing an ENU-4905 project during performance of the Weekly and Daily Checkouts.
C.Delgado	7/13/92	1	Evaluated as dose received by one EH&S worker while performing the monthly Fire Extinguisher Checks.
L.Simpkins	7/17/92	1	Evaluated as dose received by four (4) NERDC employees during UFTR tour and Cerenkov radiation demonstration.
M.Watson	7/17/92	1	
J.Spede	7/17/92	1	
J.Hulton	7/17/92	1	

1. The personnel labeled with asterisks were involved in cooperative work training exercises at the UFTR as part of their degree requirements for Central Florida Community College. All were issued film badges which indicated minimal exposure for their 3 month stay at the facility.

There was only one case of non-permanent UFTR personnel that received a non-zero reading on a film badge. Dan Ekdahl is an electronics engineer who works for the Nuclear Engineering Sciences Department and on occasion for the UFTR. It was noted for the month of September, 1991, when a dose of 10 mR was recorded, that several maintenance items were performed which required frequent visits to the UFTR cell. It is also noted that Ekdahl's film badge was stored in the rack outside the UFTR control room which could have further added to the indicated exposure.

It should be noted that tours of reactor facilities are strictly controlled and limited during periods when the reactor is running or ports are open or other opportunities for significant radiation fields are present. Therefore, the lack of significant visitor exposure is expected and in agreement with ALARA guidelines.

VIII. EDUCATION, RESEARCH AND TRAINING UTILIZATION

NOTE: The participating students are indicated with an asterisk (*). Other participants are faculty or staff members of the University of Florida, unless specifically designated otherwise. A double asterisk (**) indicates those students working on theses, projects or dissertations.

Radiation Protection Training - Reactor Operations Based Radiation Protection Health Physics Cooperative Work Training Program, Dr. W.G. Vernetson, R. Rawls (CFCC), S. MacKenzie (CFCC), D.L. Munroe, D. Simpkins, J. Keeley, M. LaFranzo, R. Ratner*, L. Vickers*, D. Farinha**, C. Leipner*, Reactor Staff.

A set of reactor operations based radiation protection health physics cooperative work training exercises have been developed to meet the cooperative work needs of Radiation Protection Technology students at Central Florida Community College (CFCC). Two (2) of these courses were conducted during this reporting year for a total of 11 students with great success. Students who take these courses are well suited to work as radiation control technicians and health physics assistants at nuclear power plants. The exercises are also extremely adaptable and some of them have been upgraded and used in the undergraduate and graduate health physics laboratory and other courses at the University of Florida. The development of this course and its subsequent presentation to CFCC students has been partially supported under the UFTR DOE Reactor Sharing Program and has been a valuable resource in the continuing effort to sustain and even increase reactor utilization. During this reporting year considerable staff effort was again devoted to improving the materials used for several of the exercises and to development of variations on several exercises.

UFTR Reactor Operations With NAA, Neutron Radiography, Shielding, Half-Life and Other Laboratory/Demonstration Exercises - Dr. W.G. Vernetson, Dr. B. Abbott, R. Piciullo, D. Simpkins, Dr. P. Simony/Dr. J. Pelphry (JU), Dr. C. L. Lee/Dr. O. Lee (FCCJ), R. Allen (UCHS), R. Rawls/S. MacKenzie (CFCC), Dr. M. Lombardi/C. Vernesse (HCC), S. Marchionno/R. Sturm/Dr. A. Ferrari/L. Iselin/Dr. B. Tucker (SFCC), A. Butler/S. Richardson (CRHS), S. Buell (SAHS), J. McMullen/A. Heller (EHS), T. Anderson/Dr. P. Becht/G. Jones/D. Dodge (PKYHS), S. Reeder (DHS), Dr. G. Featherston/B. Jones, J. DeLott (HCS), T. Jordan (CHS), E. Lunquist/J. Luepke (BHS), A. Arico/C. Schumaker (PHS), J. Griggs/C. H. Coldwell (MHS), D. Murray (FAIS), S. Turecki (RHS), R. Ratner*, T. Downing*, J. LaBelle*, C. Leipner*, S. R. Wade**, B. Morehouse**, F.A. Chee**, Reactor Staff.

Mini-courses (including lectures, tours, demonstrations, reactor operations, NAA of unknown and standard samples, demonstrations of neutron radiography, etc.) have been developed and presented as part of the UFTR DOE Reactor Sharing Program to provide practical reactor operations, radiation protection and health physics training as well as NAA laboratory experience and neutron radiography practice for groups of students from Central

Florida Community College Radiation Protection Technology Program, Santa Fe Community College Nuclear Medicine Technology/Radiologic Programs, Santa Fe Community College Science Department, the Hillsborough Community College Nuclear Medicine/Allied Health Technology programs, a group of physics and chemistry students from Jacksonville University. Other participants in all or part of such mini-courses this year include physics, chemistry, biology, science and/or government students from Bolles High School, Chamberlain High School, Crystal River High School, Citrus County High School, Dunnellon High School, Heritage Christian School, P.K. Yonge High School, Ridgewood High School, and St. Augustine High School as well as individual and groups of students from Union County High School, Piper High School, and Mainland High School as well as mixed groups of high school students from the Florida Accelerated Initiatives Seminar, Florida High School Scholars Program and others.

Reactor Operations Laboratory (ENU-5176L) - Dr. W.G. Vernetson, D. Simpkins, R. Piciullo, Reactor Staff.

Students in the reactor operations course spend about two and a half hours weekly at the controls of the UFTR performing reactor operations exercises under supervision of licensed reactor operators. The lab encompasses training in reactivity manipulations, reactor checkouts, operating procedures, standard and abnormal operations and applicable regulations. Specific exercises directed toward development of understanding of light water power reactor behavior are included as this laboratory course serves as basic preparation for students entering the utility industry in the test and startup area as well as plant operations. When this course is not interrupted by outages, students usually perform a series of exercises designed to assure them of conducting 10 meaningful startups and 10 shutdowns along with a broad usage of reactivity manipulations. A special effort is made to correlate UFTR exercises with various aspects of LWR operations. This stand alone lab course was offered one time during the current reporting year as a separately approved course. In addition, one student high honors special topics project (ENU-4930) was begun near the end of the year for a student to perform all the laboratory exercises and to rework them into a standard generic format storage on a computer disk. This student is also generating a complete set of questions with answers to be used as a check of understanding for each of the laboratory exercises.

Basic Physics Research - Development of Pulsed Ionization Chamber Plasma Kinetics Diagnostics Capabilities - Dr. W.H. Ellis, Dr. E.T. Dugan, Dr. N.J. Diaz, Dr. I. Maya, W.Y. Choi**, J.S. Parks*, J. Monroe*, A. Ferrari*, Q. He**.

Experimental measurements have been made with several pulsed ionization chamber designs to determine plasma kinetic properties including first and second order recombination coefficients as well as ion number densities in a fissioning plasma. Earlier work was confined to helium plasmas. During the current year work was extended to heated chambers containing higher pressures of UF_6-He mixtures and then with redesigned chambers containing only helium. During the upcoming year, a series of more advanced experiments are planned to support development of a multiprobe plasma diagnostic system which will allow the generation of plasmas in UF_6-He gas/MHD working fluids and facilitate measurement of various temperature-dependent design parameters as functions of gas pressure and temperature for nuclear-generated plasmas. This work is ongoing as part of the Innovative Nuclear Space Power Institute (INSPI) research efforts in the Strategic Defense Initiative for supporting the development of space nuclear power generation sources with work during the last reporting year utilizing Helium-3 filled detectors prior to using the UF_6-He mixtures while work this year involved various benchmark calibrations of gamma and fission chambers.

Service to Florida Foundation of Future Scientists - Lectures, Tours and Demonstrations of Reactor Operations - Dr. B. Abbott, Dr. W.G. Vernetson, Dr. G. R. Dalton, Prof. J. S. Tulenko, D. Simpkins, D. Paulin, R. Ratner*, T. Downing*, D. Farinha*, UFTR Staff.

A series of lectures, tours and demonstrations of reactor operations and nuclear facility capabilities are conducted for a large number of student and faculty participants in the annual Junior Science, Engineering and Humanities Symposium jointly sponsored each winter by the Florida Foundation of Future Scientists and the University of Florida for promising high school juniors and their teachers. This year the same service was again provided for participant groups of high school students in the FFFS Summer Research Program and was extended to include student participants in the FFFS-sponsored Summer Future Leaders Seminar.

Reactor Operations Demonstrations - Reactor Operations Instruction and Demonstrations for Various Courses Within the University of Florida - Dr. W.G. Vernetson, Reactor Staff.

The following courses are identified where one or in many cases as many as four or five classes or labs in a course would be conducted using the UFTR facility. All would begin with the lecture, tour and reactor operations and facility capabilities demonstration with later classes, where needed, devoted to more detailed lab instruction in one or more areas of UFTR facility operations such as instrumentation demonstrations, radiation surveys and effluent characterization irradiations for half-life measurements, neutron activation analysis using the rabbit system for short irradiations or the vertical ports for longer irradiations as well as neutron radiography applications and methodology evaluation. Courses include:

Course	Instructor(s)
ENU-4101	Dr. R. Pagano
ENV-4201	Dr. C.E. Roessler, Dr. W.G. Vernetson
ENU-4505L	Dr. W.H. Ellis/Dr. G.R. Dalton/Dr. W.G. Vernetson
ENU-4905	Dr. W.G. Vernetson, Dr. G.J. Schoessow
ENU-4930	Dr. W.G. Vernetson
ENU-4934	Prof. J.S Tulenko/Dr. W.G. Vernetson
ENU-5005	Dr. R. Pagano
ENU-6516L	Dr. R. Pagano, Dr. W.H. Ellis, Dr. W.G. Vernetson
ENV-6215	Dr. C.E. Roessler
ENV-6932	Dr. W.S. Properzio
ENU-6935	Prof. J.S. Tulenko/Dr. W.G. Vernetson
ENU-6936	Dr. W.G. Vernetson/Dr. E.T. Dugan/Dr.W.H. Ellis
ENU-6937	Dr. W.G. Vernetson
ENU-7979	Dr. D.E. Hintenlang/Dr. W.H. Ellis

Radiation Protection and Control Health Physics Practice (ENV-4201, ENV-4932/6932, ENV-6215) - Dr. W.E. Bolch, Dr. W.S. Properzio, Dr. C.E. Roessler, Dr. W.G. Vernetson, D.L. Munroe, J. Keeley, M. LaFranzo, R. Ratner*, T. Downing*, D. Farinha*, Reactor Staff.

These courses provide students in various disciplines within the Environmental Engineering Sciences curriculum with knowledge of reactor environments, analytical methods of analyzing radiation including NAA plus practical experience in radiation protection and control such as performing radiation surveys in and around the UFTR cell and environs, calibrating area radiation monitors, determining effluent levels, setting up emergency exercises, etc. These exercises also serve as training for potential radiation control technicians, most of whom are students in Nuclear or Environmental Engineering Sciences. Much activity occurred in this category during this reporting period as T. Downing was radiation control certified for the UFTR facility.

Nuclear Engineering Laboratory I (ENU-4505L) - Dr. W.H. Ellis, Dr. G.R. Dalton, Dr. W.G. Vernetson, D. Simpkins, Q. He*, R. Ratner*, Reactor Staff.

ENU-4505L is the nuclear engineering laboratory course for undergraduate senior level students in Nuclear Engineering Sciences. The UFTR is used for a variety of exercises and experiments, including NAA exercises, radiation dose measurements, measurement of induced radioactivity, foil irradiations, flux mapping, evaluation of hot channel factors, calorimetry, blade worth reactivity calibration, determination of diffusion length in graphite and 1/M approach-to-critical as well as a variety of other reactor physics parameter determinations and operational measurements.

Radiation Worker Training - 10 CFR 19 Radiation Worker Instructions - Dr. W.G. Vernetson, D.L. Munroe, T. Downing*, D. Farinha*, J. LaBelle*, Reactor Staff.

In response to previous NRC inspections, a standardized set of training materials has been developed and is being well used to meet the requirements for training as radiation workers for users of the reactor facility including many students and other frequent visitors for surveillances on fire extinguishers, air handlers, cell light replacement, etc. This material was further expanded and updated during the reporting year. All such training is carefully documented to assure meeting regulatory requirements.

Nuclear Engineering Laboratory II (ENU-6516L) - Dr. W.G. Vernetson, Dr. W.H. Ellis, Dr. G.R. Dalton, Dr. R. Pagano, D. Simpkins, Q. He*, R. Ratner*, Reactor Staff.

ENU-6516L is the nuclear engineering laboratory course for graduate students in Nuclear Engineering Sciences. The UFTR is used for a variety of exercises and experiments including foil irradiations for coincidence counting, 1/M approach-to-critical, neutron/gamma flux and energy mapping, neutron activation analysis, inverse reactor kinetics measurements, control blade reactivity worth measurements and demonstration of the neutron radiography methodology and comparison with x-ray radiography methodology for comparison of capabilities and neutron activation analysis for trace element identification as well as evaluation and generation of in-house standards used for NAA. This course was offered twice during the reporting year.

NAA Research - Neutron Activation Analysis of Archeological Seashells - Dr. T. Stocker (UWF), Dr. W.G. Vernetson, R. Hanrahan*, UFTR Staff.

Under the Reactor Sharing Program, neutron activation analysis is being evaluated to be applied to various archeological seashell specimens ranging up to nearly 1800 years old. Since shells were used as trade items by the American Indians in the Eastern half of the United States, the research is directed toward identifying enough trace element constituents in these seashells to develop a method for determining Indian trade routes in the Eastern United States. This research is in its early stages on a time available basis with no work performed during the current reporting year. Some information on this type of work may be available from a European reactor facility which has been requested to supply reprints of their work with no response to date. This project has been much delayed but it is hoped to begin processing samples in the next reporting year.

NAA Research - Trace Element Evaluation of Various Age Seashells - Dr. Guy Prentice, Dr. G.S. Roessler, R. Ratner*, D. Farinha**, T. Downing*, UFTR Staff.

Neutron activation analysis is being applied to identify the trace element composition of environmental seashells from various locations in Florida of various ages. The purpose of this research is to determine whether a set of key trace elements (nuclides) can be identified as signatures for shells from various locations and age. The work continues as its purpose is being reevaluated and the work progresses on a time available basis with one student project begun this year to perform a comparative evaluation of the trace element content of four different age seashells using neutron activation analysis.

NAA Research - Neutron Activation Analysis of Estuary Sediments - Dr. R. Byrne (USF-St. Petersburg), Dr. G. Smith (USF-St. Petersburg), Dr. W.G. Vernetson, R. Ratner*, UFTR Staff.

Under the DOE Reactor Sharing Grant, Instrumental Neutron Activation Analysis (INAA) has been applied to estuary sediments from the Tampa Bay region of Florida to determine and quantify the spatial distributing of various rare earth metals. Work to date has included preparatory work to map the spatial variation of the flux in the UFTR vertical ports and another exercise to determine accurate values for the cadmium ratios for ports to be used in the activations for this research in a special graphite sample holder manufactured for this project. These are key parameters because of the resonance absorption characteristics of many rare earth metals. Virgin teflon tube sample holders were demonstrated to withstand extended reactor runs and were analyzed for impurity content using NAA. Initial irradiation and analysis of all samples in this project first was concluded during the 1988-1989 reporting year with a proposal to obtain external support to follow. During the last reporting year, one extended irradiation and analysis was performed with several relatively short irradiations performed to confirm previous results with no work performed this year. We are hopeful that external funds will eventually be supplied to support this work as the principal investigator remains active in the area and expects to have more samples at some point.

Investigation of Properties of Fuel Storage Pit Liners - Dr. S. Turner (NUSURTEC), Dr. W.G. Vernetson, J. Wallis (NUSURTEC), R. Piciullo, D. Simpkins, G. LaTorre, R. Robinson*, D. Cronin*, R. Ratner*, UFTR Staff.

Power reactor high density spent fuel racks typically are separated by sheet metal-enclosed boron silicide or other boron-containing material. This project is intended to define parameters that may be used to gauge radiation damage and incipient failure (including significant absorber loss via teaching as well as mechanical failure) in boraflex. Specific procedures applied to date involve relative density measurements, modulus of rupture tests, neutron transmission coefficient measurements and neutron radiography of used as well as unused liner sample coupons from utility spent fuel pools with consistent results obtained to date. Sensitivity analyses conducted on graded-thickness boraflex samples have demonstrated clearly that the radiographic analysis of these samples is both generally consistent and sufficiently sensitive to support additional long-term utilization of the UFTR radiography facility for this work. With the loss of Mr. Piciullo during this reporting year, considerable time was spent training additional personnel to produce neutron radiographs to include setting up the experimental port.

Optical Physics Research - Analysis of Radiation Induced Lattice Disturbances in Dielectric Materials - Dr. H. Plendl (FSU), Dr. P. Gielisse (FSU/FAMU), D. Simpkins, R. Ratner*, Reactor Staff.

Under the DOE Reactor Sharing Program, various types and cuts of dielectric materials, primarily topaz, have been subjected to various thermal and fast neutron fluences in the UFTR as well as gamma ray fluences in the UFTR shield tank facility using a specially designed container. Similar irradiations with 3 MeV electrons are being performed at Florida State University. The objective of this work is to analyze the response of the material lattice to the disturbances caused by the various components of the radiation field to include thermal neutrons, fast neutrons and gamma rays. Comparisons are being made with previous results of irradiations with X-rays and electrons and with thermal neutrons, all in isolation. The purpose of the work is to gain a comprehensive understanding of how certain dielectrics such as $Al_2(SO_4)(OH)$ and similar lattices response to different types of radiation in the generation and destruction of color sites. During the 1988-1989 reporting year the work involved extensive large sample and small sample irradiations in a cadmium-covered experimental facility developed and characterized specifically for insertion in the UFTR shield tank. Subsequently, there have been further small sample irradiations in the shield tank as well as extensive fast-neutron irradiation of cadmium-covered samples in the UFTR vertical ports after removal from the shield tank facility. This work has continued during the 1991-1992 year with irradiation of other types of dielectrics including beryl for which extensive irradiations have been performed on a second set of samples during the year.

UFTR Core Redesign (LEU Program) - Thermal-hydraulic Analysis for Core Redesign - Dr. W.G. Vernetson, Dr. E.T. Dugan, Professor G.J. Schoessow, E. Yokuda (DOE EG&G Inc.), R. Piciullo, D. Simpkins, G.E. Welch, Reactor Staff.

As part of the DOE LEU Conversion Program, thermal-hydraulic analysis related to redesign of the UFTR core using SPERT fuel rods has been performed. Computer analysis has been undertaken to evaluate the UFTR/SPERT design for steady-state conditions as well as transients arising in response to a step insertion of reactivity, a loss of coolant flow, and a loss-of-coolant accident. Results to date indicate required safety margins and transient response conditions can be maintained with the UFTR/SPERT core design. Subsequently, using support provided by DOE to analyze conversion alternatives, the decision has been made not to go with SPERT fuel because of load considerations with thermal-hydraulic related conversion analysis expected to be much simpler. Analysis in this area of thermal hydraulics on the basic 14-plate core fuel bundle configuration had begun at the end of the 1990-1991 reporting year and was continued through most of this reporting year to provide input to support the license amendment for the HEU-to-LEU conversion since neutronics analysis has now been completed to set the core configuration. The thermal-hydraulics analysis was nearly completed during the 1991-1992 reporting year with only a few calculations remaining. The initial review of fuel drawings was also made during this year with Eileen Yokuda of EG&G Idaho visiting the facility and spending two days reviewing the unique UFTR core design which may necessitate manufacturing a complete dummy core to assure proper fit of the fuel in the fuel boxes.

UFTR Risk Assessment - Dr. W.G. Vernetson.

A preliminary probabilistic risk assessment of the University of Florida Training Reactor has been conducted. This project has determined an estimate of the probability of occurrence of a set of postulated maximum credible UFTR accidents. The results will be used to show that the UFTR poses no significant risk to the general population and environment around the UFTR and has demonstrated proficiency in PRA analyses as additional PRA projects are undertaken. Specifically, research is continuing to obtain better data for the maximum credible accidents and extend the methodology to examine risk associated with less serious but higher probability UFTR-related accidents or failures of key systems such as safety channels. This project is relatively inactive at present awaiting further student interest; it should be noted that NRC has shown some interest in this area as they have had a study completed by Science Applications International Corporation which appears to place UFTR risk level with some of the higher powered reactor facilities. This interest may lead to reactivation of this project, particularly for modifications to the reactor safety and control systems.

NAA Research - Determination of Chlorine, Titanium and Fluorine Concentrations in Quartz - Dr. G.P. LaTorre (GelTech), Dr. C. Balaban (Advanced Materials Research Company), Dr. W.G. Vernetson, R. Ratner*, Reactor Staff.

Different manufacturing techniques and parameters are used to reduce the concentration of chlorine, titanium and fluorine in quartz glass (silica) produced for optical uses. Compositional characterization of the glass is based on the titanium/silicon ratio. The high

Subsequently the licensee changed the surveillance data sheet for the Q-1 Quarterly Scram Checks to delineate using the city water to bypass the LOW FLOW secondary trip (or if city water does not exceed the trip point, the LOW FLOW trip will be bypassed by electrical shunt) to test the trip on loss of secondary pump power.

Following a review of this event, the inspector determined that this was a violation of the TS 3.2.2 requirement for performing required surveillances. However, this violation will not cited because the criteria specified in Section V.A. of the Enforcement Policy were satisfied (NCV 50-83/92-01-02).

c. Unscheduled Reactor Trip on Loss of Secondary Cooling Flow

Following a reactor startup at 12:10 p.m. on November 18, 1991, an unscheduled reactor trip occurred at about 12:30 p.m. due to the secondary cooling water flow dropping below the 8 gallons per minute (gpm) minimum as required by the LSSS. Previously the secondary city water had been valved back to assure higher temperatures to allow the UFTR staff to conduct a required safety surveillance. A daily checkout had been completed with both the UFTR well water and the city water supplying the secondary cooling. The secondary cooling water logic had been placed in the city water mode of operation and had been tested satisfactorily, signifying that city water flow was above 8 gpm. When reactor power was brought above one Kw (the point where the secondary water LSSS protective function begins to function), the reactor tripped automatically. After conferring with the UFTR staff and the RSRS, the licensee notified the NRC.

The licensee conducted an evaluation of the event and determined that the cause of the trip was that the city water flow rate dropped below the 8 gpm setpoint and caused a trip on low flow. In normal city water secondary cooling operation, the only indications of flow were the 60 gpm light and the SEC PRESS scram light on the reactor console. When city water flow was between 8 and 60 gpm, there was no indication of the correct flow, only yes or no on 8 gpm. A fluctuation in the city water pressure caused the flow rate to drop below the 8 gpm setpoint.

After reviewing this event, the inspector determined that it was not a violation of TS requirements.

d. Safety Channel No. 2 Circuit Failure

After the second startup of the day was begun at 1:40 p.m. on November 25, 1991, and after 32 minutes of operation at full power, the Safety Channel No. 2 meter was noted to have ceased functioning and to have pegged downscale. Because the operators in the control room determined that this event represented loss of Safety Channel No. 2 trip capabilities, an unscheduled reactor shutdown was initiated at 2:32 p.m. During the shutdown, with the reactor power at about 10 kW (some 20 seconds after commencing the shutdown), the Safety Channel No. 2 meter was noted to return to a normal reading.

The licensee performed an evaluation of the event and removed the Safety Channel No. 2 meter circuit from service. Because of the pegged downscale nature of the channel failure, the fault was isolated to the Safety Channel No. 2 meter circuit which contains two amplifiers. It was initially thought that one of the amplifiers had failed and had possibly caused the event. During extended bench testing and checks of the meter circuit assembly, an intermittent fault in the fine adjust potentiometer of the circuit was isolated. Although it was not the cause of the problem, the licensee decided to replace both the coarse and the fine gain potentiometers. Sealed potentiometers were used to provide better resistance to environmentally-drive degradation. (The change was made after a 10 CFR 50.59 evaluation was made.)

Extensive additional analysis and checks were performed on the meter and related circuits. Subsequently, the Safety Channel No. 2 amplifier card was reseated and further checks were performed. Since oxidation/corrosion on contacts had occasionally been a problem with the instrumentation in the reactor console and since the meter circuit intermittent-type failure could have been caused by such oxidation of contacts, the licensee determined that the cleaning of the contacts by reseating the Safety Channel No. 2 amplifier card had corrected the fault. No further repair or maintenance was deemed necessary.

On November 25, 1991, the RSRS Executive Committee met to review the occurrence and the corrective actions that had been taken in response. Based on the extensive circuit checks, the nature of the failure indicating the probable cause to be failure in the meter circuit, and the corrective actions taken in cleaning the meter circuit, the committee agreed that the UFTR staff could resume reactor operations. The reactor was restarted with an extra operator in the control room observing the safety channel for a period following reaching power.

After reviewing this event, the inspector determined that it was not a violation of TS requirements.

10. Followup on Information Notices (92717)

The inspector determined that the licensee was receiving all of the NRC Information Notices (INs) and that they were being reviewed for applicability and distributed to the appropriate personnel.

11. Exit Interview (30703)

The inspection scope and findings were summarized on February 28, 1992, with those persons indicated in Paragraph 1. The inspector discussed and detailed the findings for each area reviewed. Dissenting comments were not received from the licensee.

The licensee's staffing and current organizational structure met TS requirements and were adequate to implement the licensee's radiation protection and operational programs. The radiation protection and operational programs were adequate to ensure the safety of the facility personnel as well as that of the general public. The training program appeared to be current. The licensee had not made any shipments of radioactive material since the last inspection but had revised the procedure used to make such shipments.

Strengths in the radiation protection program were noted in the areas of management involvement in facility operations, low facility radioactive contamination levels, and low radiation dose received by personnel. Strengths in the operational area included thorough and complete documentation of activities in operations and maintenance log books, and in test, experiment, and surveillance records. Analysis and evaluation of the measurements and results of required surveillance tests met or exceeded regulatory requirements.

Two NCVs were identified.

Item Number	Description and Reference
50-83/92-01-01	NCV - Failure to follow procedures for checking control blade

	interlocks prior to the reactor restart when the daily checkout is omitted as allowed in TS 4.2.2(7) (Paragraph 9.a).
50-83/92-01-02	NCV - Failure to adhere to TS surveillance requirements to check whether a loss of pump power on secondary deep well cooling would cause a reactor trip (Paragraph 9.b)

APPENDIX B

FINAL REPORT TO NRC ON FAILURE TO PERFORM REQUIRED SURVEILLANCE OF LSSS ON LOSS OF SECONDARY COOLANT PUMP POWER

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

W.G. Vernetson, Director
NUCLEAR REACTOR BUILDING
Gainesville, Florida 32611
Phone (904) 392-1429 - Telex 56330

October 16, 1991

Failure To Perform Required Surveillance of LSSS on Loss of Secondary Coolant Pump Power - Final 14-Day Report

Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, Georgia 30323

Attention: Regional Administrator, Region II

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Gentlemen:

Pursuant to the reporting requirements of paragraph 6.6.2(g) of the UFTR Technical Specifications, a description of a potential violation of the Technical Specifications was reported by telephone/telecopy (Attachment I) on 3 October 1991 and a final 14-day written report is submitted with this letter to include occurrence scenario, NRC notification, evaluation of consequences, corrective action and current status. The potentially promptly reportable occurrence involved the failure to perform required surveillance of the Limiting Safety System Setting on loss of secondary coolant pump power.

Scenario

Following SRO Licensing Examinations administered on Tuesday afternoon(written) and all day Wednesday(Practical and Walkthrough) on 1-2 October 1991, Examiner Patrick Isaac raised a question about whether a loss of pump power on secondary deep well cooling would cause a trip as required by Tech Specs - primarily because both SRO candidates seemed unknowledgeable on this point. This question caused us to evaluate whether the requisite surveillance in Table 3.2 of the Tech Specs had been being performed properly; that is, whether loss of secondary coolant well pump power causes a trip and whether it has been the subject of operability tests at the required quarterly intervals. A check on October 3, 1991 did verify that a loss of power will implement the usual secondary coolant trip on a 10 second delay but whether this was derived from low flow or loss of pump power remained to be determined by further investigation.

It was decided to report this event to NRC Region II as a potential Tech Spec violation although the feeling of UFTR Staff was that it is not a violation since the intent of the Tech Specs to check both trips was considered to be met by the check of the secondary coolant low flow trip on the daily checkout. Nevertheless, reactor management agreed that the exact operation of the trip should be verified and checked with an update of the Quarterly Scram Checks Q-1 Surveillance implemented as necessary.

Until this point the daily checkout was the only check on the secondary cooling trip where the loss of flow/loss of pump power were checked as one check; this check still seems valid since a loss of pump power necessarily gives a loss of flow also. Nevertheless, the trip checks on the primary coolant system do involve separate LOW FLOW and Loss of Primary Coolant Pump Power checks on the Q-1 Quarterly Scram Checks so the decision was made to implement separate checks on the secondary flow/pump power simply to insure the most restrictive interpretation of the Tech Spec surveillance requirements are met.

NRC Notification

NRC Region II was informed of the status of the investigation at this point per a telephone conversation on 3 October 1991 with Mr. Bill Klein and Mr. Doug Collins relative to test for operability on the loss of secondary coolant well pump power. The situation was confirmed in a following telecopy (Attachment I).They were told of the question as to whether we have been meeting the Tech Spec surveillance requirements on loss of secondary coolant well pump power per Section 3.2.2(2) and that this point was raised as a result of questions from NRC License Examiner Patrick Isaac on 2 October 1991.

Mr. Klein and Mr. Collins were told our current feeling is that the existing surveillance has been adequate. Nevertheless, we were scheduling a meeting of our Reactor Safety Review Subcommittee Executive Committee prior to operation of the reactor and planned to report on the status of our determinations within the requisite two weeks for violations of the Tech Specs per Section 6.6.2(3)(g). Since we are now considered to meet surveillance requirements, per the test on 3 October 1991, they agreed we could restart upon RSRS Executive Committee approval. The situation was discussed with Mr. Craig Bassett of Region II in a separate phone call on 4 October 1991 and he agreed with how it was being addressed.

Evaluation/Effective Action

Late on 3 October 1991, examinations of RPS diagrams showed that loss of pump power alone should cause the requisite trip independent of loss of secondary flow. On the morning of 7 October 1991, this trip on loss of secondary cooling pump power alone was verified by turning on city water ~ 75 gpm, adjusting the wide range drawer test signal above 1 kW and then turning off the deep well pump while still on deep well cooling trip logic and no loss of flow. Since the trip occurred as required by loss of secondary pump power alone, the

UFTR is now demonstrated to meet fully the surveillance requirements in Table 3.2 of the UFTR Technical Specifications when subjected to the most restrictive interpretation. This check of the trip on loss of secondary coolant pump power alone will be incorporated into the surveillance data sheet for the Q-1 Quarterly Scram Checks prior to next performing the Q-1 scram checks. It will be delineated to allow using city water to bypass the LOW FLOW secondary trip or, if city water does not exceed the 60 gpm trip point, then the LOW FLOW trip will be bypassed by electrical shunt as with the primary coolant pump to test the trip on loss of secondary pump power.

Current Status/Consequences

The Reactor Safety Review Subcommittee (RSRS) Executive Committee met late on October 7, 1991 to review this event (Attachment II). The Committee essentially agreed with actions to date and with the staff evaluation that the intent of the Technical Specifications was probably being met by the existing trip check performed as part of the Daily Checkout. The Executive Committee also agreed that the separate trip check on loss of secondary coolant pump power should be incorporated into the Q-1 Quarterly Scram Checks as planned, agreed that the UFTR is now in full compliance with the Technical Specifications and approved the return of the UFTR to normal operations. Reactor Management and the RSRS Executive Committee agreed there has been no compromise to reactor safety in the occurrence, nor to the health and safety of the public. Other than revising the Q-1 Scram Check form and considering the event in the next regular RSRS meeting, this occurrence is now considered closed.

If further information is needed, please advise.

Sincerely,

William G. Vernetson
Director, Nuclear Facilities

Notary Public 10/16/91
Date

cc: R. Piciullo
Reactor Safety Review Subcommittee
Document Control Desk
Attachments (I & II)

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

W.G. Vernetson, Director
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Potential Tech Spec Violation -
Section 3.2.2

October 3, 1991

U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, GA 30323

Attention: Stewart Ebneter
Regional Administrator

Re: University of Florida Training Reactor
Facility License: R-56
Docket No. 50-83

As per telephone conversation on 3 October 1991 with Mr. Bill Klein and Mr. Doug Collins relative to tests for operability on the loss of secondary coolant well pump power, there is some question as to whether we have been meeting the Tech Spec surveillance requirements on loss of secondary coolant well pump power per Section 3.2.2(2). This point was raised as a result of questions by an NRC license examiner on 2 October 1991. We have performed one test to confirm the loss of power does cause a trip as required and are investigating whether only the loss of power will cause the trip. Our current feeling is that the existing surveillance has been adequate. Nevertheless, we are scheduling a meeting of our Reactor Safety Review Subcommittee Executive Committee prior to operation of the reactor and will report on the status of our determinations within the requisite two weeks. Since we are now considered to meet surveillance requirements, per test today, we will restart upon RSRS Executive Committee approval. Individual members of the RSRS have recommended NRC notification as per Section 6.6.2 of the UFTR Tech Specs which is the reason for this submission.

William G. Vernetson
Director, Nuclear Facilities
3 October 1991

WGV/p
cc: R. Piciullo
RSRS

Equal Opportunity/Affirmative Action Employer

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

W.G. Vernetson, Director
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Gainesville, Florida 32611
Phone (904) 392-1429 - Telex 56330

October 8, 1991

MEMORANDUM

TO: M.J. Ohanian, Chairman, Reactor Safety Review Subcommittee

FROM: W.G. Vernetson

SUBJECT: Executive Committee Meeting Minutes

The meeting occurred on October 7, 1991, from 4:20 p.m. to 4:55 p.m. with Dr. Ohanian and Mr. Munroe both briefed on the potential Tech Spec violation discovered by Mr. Patrick Isaac, the NRC license examiner as communicated in his exit interview. (See Attachment I). The communications with Region II as documented in the prompt notification letter(Attachment II) and in a telephone conversation on October 4 with Craig Bassett were also reviewed. Finally, the checks completed on October 7, 1991 were presented including the fact that, removing power to the secondary pump with secondary flow maintained above 60 gpm with the wide range drawer set above 1 kW does cause a trip with 10 second delay Tech Spec per the requirements in Section 3.2.2(2) Table 3.2 just as the low flow causes a trip. After review of the applicable Tech Specs Pages 4,5,7,8and 9(Attachment III), the Executive Committee agreed the intent of the Tech Specs seems to have been met but the additional check of the trip on loss of well pump power alone should be incorporated separately into the usual quarterly scram checks just as the loss of pump power trip is checked separately on the primary coolant pump. The members also agreed that the check of the trip using city water flow should be the preferred method with a temporary bypass of the low flow trip allowed, if the city water flow is less than 60 gpm. All members agreed the UFTR was approved to resume normal operations.

Equal Opportunity/Affirmative Action Employer

APPENDIX C

FINAL REPORT TO NRC ON UNSCHEDULED REACTOR TRIP ON LOSS OF SECONDARY FLOW

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

Vernetson, Director
LEAR REACTOR BUILDING
eville, Florida 32611
e (904) 392-1429 - Telex 56330

November 27, 1991

Unscheduled Reactor Trip
on Loss of Secondary Flow
Final 14 - Day Report

Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, Georgia 30323

Attention: Mr. Stewart Ebneter
Regional Administrator Region II

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Gentlemen:

Pursuant to the reporting requirements of paragraph 6.6.2(g) of the UFTR Technical Specifications, a description of an unscheduled reactor trip was reported by telephone/ telecopy(Attachment I) on 18/19 November 1991 and a final 14-day written report is submitted with this letter to include occurrence scenario, NRC notification, evaluation of consequences, corrective action and current status. This event was evaluated as not being a reportable occurrence; nevertheless, the commitment was made internally to make a prompt report on the occurrence.

Scenario

After a startup begun at 1210 hours intended to measure the temperature coefficient of reactivity(A-1, Surveillance), an unscheduled reactor trip occurred at 1234 hours due to the secondary cooling water flow dropping below the 8 gpm minimum as required by the Limiting Safety System Setting(LSSS). Previously the secondary city water had been valved back to assure higher temperatures for the A-1 surveillance. A daily checkout had been completed with both the well water and the city water supplying the secondary cooling water. The secondary cooling water logic had been placed in the city water mode of operation and had been tested satisfactorily, signifying city water flow was about 8 gpm. The well water warning light and the flow scram light were on as normal in city water mode operation. When reactor power was brought above one kilowatt (where the secondary water LSSS protective function implements), the reactor tripped automatically. The cause was evaluated to be that the city water flow rate had dropped below the 8 gpm setpoint and had caused a trip on low flow.

It was decided to report his event to NRC Region II in the same way as for a potential Tech Spec violation although the evaluation of the UFTR Staff and Reactor Safety Review Subcommittee Executive Committee was that it is not an occurrence requiring prompt notification.

NRC Notification

NRC Region II was notified of this event per a telephone conversation on 18 November 1991 with Mr. Joe Troup. The occurrence was confirmed in a following telecopy on 19 November 1991 (Attachment I). After being briefed, Mr. Troup agreed with our evaluation and the decision to make a prompt report on the occurrences. On this basis and since the RSRS Executive Committee had evaluated the event as not promptly reportable and with no violation involved, the requisite preoperational checks were performed and the UFTR was approved for restart on 18 November 1991.

Evaluation/Corrective Action

In normal city water secondary cooling operation, the only indications of flow are the 60 gpm light(well water FLOW SCRAM) and the SEC PRESS scram light. When flow is 8-60 gpm, there is currently no indication of the correct flow - only yes or no on 8 gpm. The actual flow could have been slightly above the trip setpoint and subsequently fell below with a slight variation in city water pressure.

All safety and control systems functioned properly and all procedures were followed prior to this event. The trip review and evaluation indicates there are no safety or radiological problems associated with this event. The cause of the trip lies in the lack of good variable flow determination in the city water system as well as expected fluctuations in water pressure from the local utilities.

In order to avoid this trip occurrence in the future, two recommendations have been made and approved by the RSRS Executive Committee. The first is to install a flow meter on the city water line on the secondary piping system. This device would allow for an accurate determination and indication of actual flow. The second recommendation is to install a throttle or globe valve on the line. Currently there is a gate valve, which is used for isolation but does not give good throttling characteristics. These two adjustments would allow for more accurate flow rate information for operation in the city water mode and assure better valving of the flow rate. Use of this city water cooling mode for reactor protection is committed to be discontinued until these or equivalent changes are implemented. Since it is very infrequently used, this restriction is not a problem; as a result, the requirement that city water flow be used for the A-3 surveillance has been removed from SOP-E.7 per approval of the RSRS Executive Committee at its meeting on 25 November 1991. Craig Bassett of Region II was apprised of this change in an unrelated telephone call on 26 November 1991.

Current Status/Consequences

The Reactor Safety Review Subcommittee (RSRS) Executive Committee met on November 18, 1991 to review this event. The Committee essentially agreed with actions to that point and with the staff evaluation that the event is not promptly reportable. The Executive Committee also agreed that the event could be promptly reported as was done and approved the return of the UFTR to normal operations. Reactor Management and the RSRS Executive Committee agreed there has been no compromise to reactor safety in the occurrence, nor to the health and safety of the public. Other than making the improvements to the city water cooling system to allow better flow-control and flow monitoring as well as committing not to use the system for reactor protection until improvements are made and then considering the event in the next regular RSRS meeting, this occurrence is now considered closed.

If further information is needed, please advise.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

Notary Public — 11/27/91 Date

Notary Public, State of Florida

cc: R. Piciullo
Reactor Safety Review Subcommittee
Document Control Desk

Attachment I

ATTACHMENT I

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

W.G. Vernetson, Director
NUCLEAR REACTOR BUILDING
Gainesville, Florida 32611
Phone (904) 392-1429 - Telex 56330

Reactor Trip on Loss of
Secondary Cooling Flow

November 19, 1991

U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, GA 30323

Attention: Stewart Ebneter
Regional Administrator

Re: University of Florida Training Reactor
Facility License: R-56
Docket No. 5083

As per our telephone conversation of 18 November 1991 with Mr. Joe Troup, relative to a trip on partial loss of secondary coolant flow on city water, the gate valve on the city water flow was partially closed to allow operation at a higher temperature for a surveillance. As a result the lack of good flow determination in the city water system, when attempting to throttle the system, as well as expected fluctuations in water pressure from the local utilities, led to a secondary flow trip at a power level slightly above the 1kW power level (Point of Adding Heat). All safety and control systems functioned properly and there were no safety or radiological problems associated with the event.

Our Reactor Safety Review Subcommittee Executive Committee reviewed this event on 18 October 1991 and concurs with UFTR management evaluation and has approved restart to normal operations. These operations have proceeded with no problems. We are planning to provide a more detailed report per Section 6.6.2 of the UFTR Tech Specs which is the reason for this submission.

William G. Vernetson
William G. Vernetson
Director of Nuclear Facilities

WGV:lmc
cc: R. Piciullo
RSRS

APPENDIX D

FINAL REPORT TO NRC ON POTENTIAL VIOLATION OF TECHNICAL SPECIFICATIONS; SAFETY CHANNEL #2 CIRCUIT FAILURE

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

G. Vernetson, Director
NUCLEAR REACTOR BUILDING
Gainesville, Florida 32611
Phone (904) 392-1429 - Telex 66330

December 3, 1991

**Potential Violation of
Technical Specifications:
Safety Channel #2 Circuit
Failure - Final 14-Day Report**

Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, GA 30323

Attention: Regional Administrator, Region II

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Gentlemen:

Pursuant to the reporting requirements of paragraph 6.6.2(c) and (g) of the UFTR Technical Specifications, a description of a potential violation of the Technical Specifications was reported by telephone/telecopy(**Attachment I**) on 20 November 1991 and a final 14-day written report is submitted with this letter to include occurrence scenario, NRC notification, evaluation of consequences, corrective action and current status. The potentially promptly reportable occurrence involved the failure of the Safety Channel #2 meter circuit which represented a loss of the Safety Channel #2 overpower trip function for a brief(about 20 seconds) period of time, following and during which an unscheduled shutdown was in progress.

Scenario

On 19 November, 1991, after the second startup of the day was begun at 1340 hours and after 32 minutes of operation at full power and irradiation of several samples in the rabbit system, the Safety Channel #2 meter was noted to flicker and then drop out hard downscale(pegged). Because this event represented a loss of Safety Channel #2 overpower trip capability, an unscheduled reactor shutdown was commenced immediately at 1432 hours with the reactor shut down and secured at 1433 hours. The event was noted immediately by RO G.W. Fogle with SRO D. Simpkins present to observe the shutdown and system responses. All operator responses in the event were proper. During the shutdown with power at about 10 kW some 20 seconds or so after commencing the unscheduled shutdown, the Safety Channel #2 meter was noted to return to read normal.

After completion of the unscheduled shutdown, Maintenance Log Page #91-61 was opened and the test trip of Safety Channel #2 was noted to be operating normally. Because of the hard downscale nature of the channel failure and no indication on any other monitoring, recording, or trip channel, the fault was isolated to the Safety Channel 2 meter circuit which contains two amplifiers whose failure was initially thought to be a possible cause of the event. At this point in agreement with input from several members of the Reactor Safety Review Subcommittee(RSRS), reactor management decided to report this event to NRC Region II as a potential Tech Spec violation.

Subsequently, during extended bench testing and checks of the meter circuit assembly, an intermittent fault in the fine adjust potentiometer of the circuit was isolated. Although it was not the source of the Safety Channel failure, the fine adjust potentiometer obviously needed replacement. Per 10 CFR 50.59 Evaluation and Determination No. 91-09(Safety Channel #2 Calibration Module), both the coarse and fine gain potentiometers were replaced with sealed potentiometers to provide better resistance to environmentally-driven degradation. The coarse gain potentiometer was replaced with an identical component, only sealed for better environmental response; the fine gain potentiometer was also replaced with a sealed canister potentiometer but with a 250Ω versus a 200Ω adjustable potentiometer. This change was evaluated to represent only about 0.33% change in sensitivity with the circuit response left unchanged - only the adjustable setting will be slightly different to provide the proper full power calibration from an unchanged voltage input to this point. Extensive additional analysis and checks were performed on the meter and related circuits. Subsequently, the Safety Channel #2 amplifier card was reseated and further checks performed including circuit run checks, heat and cold tests and checks of all Safety Channel #2 harness assemblies and connectors with no further faults noted.

Since oxidation/corrosion on contacts has occasionally been a problem with the instrumentation in this console and since this intermittent type failure could have been caused by such oxidation of contacts, it was evaluated that the cleaning of the contacts by reseating the Safety Channel #2 amplifier card had corrected the fault with no further repair or maintenance needed especially in light of the extensive checks that had been run.

On 25 November 1991 the RSRS Executive Committee met to review the occurrence and corrective actions taken prior to approving restart. In particular, the specifics of the occurrence were reviewed per the completed Unscheduled Shutdown Review and Evaluation(UFTR Form SOP-0.6B). They also reviewed the event and concluded it to be a potential abnormal occurrence and a potentially reportable occurrence per UFTR Technical Specifications, Section 6.6.2 delineating requirements for special reports and per SOP-0.6, Section 3.2.3.3.3 indicating certain safety system failures are promptly reportable. The communications with Region II as documented in the prompt notification letter (**Attachment I**) and in a telephone conversation on November 20, 1991 with Mr. Ed McAlpine were also reviewed. Subsequently the unrelated corrective action to replace both the coarse and fine gain potentiometers in the Safety Channel #2 calibration module with sealed potentiometers for better environmental protection was reviewed and approved under 10 CFR 50.59 Evaluation and Determination No. 91-09 to include replacement of the fine gain potentiometer with a 250 Ω adjustable potentiometer. Based on the extensive circuit checks, the nature of the failure indicating the probable cause to be failure in the meter circuit and the corrective action involved in cleaning the meter circuit and other contacts, all members approved restart subject to resetting the meter circuit assuming the channel calibration was unchanged, performing a valid preoperational check and providing NRC Region II with notification of restart and subject to the recommendation to observe the safety channel for a period with an extra person following reaching power which UFTR management agreed to do.

Following completion of all checks and restart to full power performed by a reactor operator with a second SRO observing for the first two hours at full power, the Safety Channel #2 responded properly with no further problems noted.

NRC Notification

NRC Region II was informed of this event per a telephone conversation on 20 November 1991 with Mr. Ed McAlpine relative to the brief loss of Safety Channel #2 trip capability. The situation was confirmed in a following telecopy (**Attachment I**). Subsequently after the RSRS Executive Committee gave approval to restart subject to certain conditions and completion of all maintenance and tests, NRC Region II(Craig Bassett) was notified of the intent to restart with a commitment of a second reactor operator to be present for the first two hours at full power to assure noticing any recurrence of the failure. Subsequently the restart was successful as Safety Channel #2 responded properly. The UFTR was then considered to be returned to normal operations. The fact of the successful restart was communicated to NRC Region II (Craig Bassett) on 2 December 1991.

Evaluation/Corrective Action

The cleaning of contacts is considered to have corrected the cause of this Safety Channel #2 failure. The occurrence has been evaluated as a potential abnormal occurrence; however, the loss of the trip function on Safety Channel #2 was brief, the reactor was promptly shutdown and secured and the other reactor protection system channels were all operable. Therefore, the event is considered to have negligible effect on reactor safety and no effect on the health and safety of the public.

Current Status/Consequences

The Reactor Safety Review Subcommittee (RSRS) Executive Committee met late on November 25, 1991 to review this event and subsequent corrective actions and planned activities. The committee essentially agreed with actions taken and with the staff evaluation that the occurrence represented a violation of the Technical Specifications. The Executive Committee also agreed that the UFTR was in full compliance with the Technical Specifications at that point and approved the restart of the UFTR and subsequent return to normal operations. Reactor Management and the RSRS Executive Committee agreed there has been no significant compromise to reactor safety in the occurrence and no impact on the health and safety of the public. Other than considering the event in the next regular RSRS meeting, this occurrence is now considered closed.

If further information is needed, please advise.

Sincerely,

William G. Vernetson

William G. Vernetson
Director, Nuclear Facilities

Joan Marsham 12/3/91
Notary Public Date

cc: R. Piciullo
Reactor Safety Review Subcommittee

ATTACHMENT I

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

W.G. Vernetson, Director
NUCLEAR REACTOR BUILDING
Gainesville, Florida 32611
Phone (904) 392-1429 - Telex 66330

Potential Tech Spec Violation -
Safety Channel #2 Circuit Failure

November 20, 1991

U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, GA 30323

Attention: Stewart Ebneter
Regional Administrator

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Dear Sir:

As per our telephone conversation of 20 November 1991 with Mr. Ed McAlpine relative to an unscheduled shutdown conducted due to failure of Safety Channel #2 Circuit for the UFTR on 19 November 1991, we have concluded this occurrence is a potential abnormal occurrence and a potentially reportable occurrence per UFTR Technical Specifications, Section 6.6.2 delineating requirements for special reports and per SOP-0.6, Section 3.2.3.3.3 indicating certain safety system failures are promptly reportable. The RSRS Executive Committee has not yet met as a group but individuals have been notified and have recommended NRC notification as per Section 6.6.2 of the UFTR Tech Specs though the event may not be required to be promptly reportable depending on interpretation of the Tech Specs. Initial evaluation indicates the problem may be in the Safety Channel #2 meter circuit which recovered to normal indication about 20-25 seconds after the shutdown was commenced. RSRS permission to restart has not yet been sought but is expected to be dependent on a satisfactory completion of the daily checkout when the cause of the failure is corrected if the failure is in the meter circuit as suspected.

William G. Vernetson
William G. Vernetson
Director, Nuclear Facilities

WGV:lmc
cc: R. Piciullo
RSRS

APPENDIX E

FINAL REPORT TO NRC ON FAILURE OF FUEL BOX OUTLET THERMOCOUPLE

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

.G. Vernetson, Director
UCLEAR REACTOR BUILDING
ainesville, Florida 32611
hone (904) 392-1429 - Telex 56330

August 10, 1992

14 Day Report:
Failure of Fuel Box
Outlet Thermocouple

Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, GA 30323

Attention: Regional Administrator, Region II

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Gentlemen:

Pursuant to the reporting requirements of paragraph 6.6.2(g) of the UFTR Technical Specifications, a description of a potential violation of the Technical Specifications was reported by telephone/telecopy(**Attachment** I) on 28 July 1992 and a 14-day written report is submitted with this letter to include occurrence scenario, NRC notification, evaluation of consequences, corrective action and current status. The potentially promptly reportable occurrence involved the failure of the thermocouple circuit on fuel box #2 outlet line.

Scenario

On 27 July 1992 following a full power run for 10 minutes and after the second startup of the day was begun at 1505 and at 1609 after 35 minutes of operation at 100 kW full power, temperature recorder point #2 was noted to be reading downscale indicating a failure in the circuit monitoring the water temperature at the exit of the south center fuel box #2. Because of the failure, an unscheduled reactor shutdown was commenced at 1609 hours with the reactor shutdown and secured at 1610 hours. With the exception of the temperature recorder Point #2, all systems were noted to respond normally during the shutdown for which two(2) SROs were present.

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After completion of the unscheduled shutdown, Maintenance Log Page #92-24 was opened and circuit continuity was checked and verified from the temperature recorder in the control room back to the equipment pit from which point the circuit leads to the thermocouple in the fuel box #2 outlet line which is not normally accessible beneath the biological shield. A careful check of the temperature recorder showed that temperature recorder point #2 had failed downscale about 7-8 minutes prior to completion of the first run at 100 kW for which the reactor was shutdown and secured at 1430 hours. Subsequently, the failure downscale was not noted due to the downscale failure point printing on the thickly inked edge of the recorder paper with all the other points printing in a bunched area as expected. The SRO was the same for both runs but he had been relieved by a second SRO for eight minutes for sample insertion during the second run at the 1 watt power level prior to running up to 100 kW and neither noted the failure until the first SRO did so after about 30 minutes at full power.

Primarily because of the delay in noting the failure(understandable per the explanation above), this event was reported to a special Reactor Safety Review Subcommittee Executive Committee meeting on 28 July 1992. The unscheduled shutdown performed on July 27, 1992 was reviewed with agreement that the failure downscale of the thermocouple for fuel box #2 was not a violation of the technical specifications. Tech Spec items considered here were the Design Features in Section 5.6.1 listing all the thermocouples as well as Table 1 in Section 3.2.3 in the Limiting Condition for Operation(LCO) which only specify six(6) of the eight(8) thermocouples on the primary side. This LCO consideration was the key one applicable versus Specification(3) in the Limiting Safety System Settings as the water would not exceed 155°F for any conditions considered normal. Indeed normal maximum operating temperatures for the fuel box outlet water are in the range of 120°F. Dr. Vernetson indicated he would report the occurrence to Region II and follow any instructions they might have. There was considerable discussion about whether blockage of fuel box #2 could be detected in this case with indications in the negative reactivity effects of boiling, probable rupture disk breakage if any steam would be generated, flow changes due to increasing pressure differences and variations of the other temperature indications all giving the operator evidence of a flow blockage should such occur. The flow changes in other fuel boxes would occur long before any boiling could occur even in a partially blocked fuel box. On this basis the committee approved brief restarts with one failed thermocouple to complete several experiments provided the NRC would concur in this evaluation. One of the reasons for this consideration was that fuel inspection (B-2 Surveillance) requiring biological shield unstacking was already scheduled for mid-August; therefore, it was planned that both the repairs to the thermocouple system and the fuel inspection could be performed with one unstacking in the interest of ALARA and overall safety. The RSRS Executive Committee was also to be notified prior to such a restart with running limited to no more than three hours at power for the two experiments.

NRC Notification

After the RSRS Executive Committee meeting, NRC Region II was informed of this event per a telephone conversation on 28 July 1992 with Mr. Craig Bassett relative to the loss of the temperature indication from fuel box #2. The situation was confirmed in a following telecopy (**Attachment I**). At this time the failure was described, the key Tech Spec sections were reviewed especially the fact that there is no limiting condition for operation preventing startup provided 6 of the 8 primary temperature monitoring points are operable and the fact that the maximum normal fuel box outlet temperature is only about 120°F. There was agreement on a request by the Region II Inspector to treat the event as reportable.

In a subsequent conversation with Craig Bassett of Region II and NRC Project Manager Ted Michaels(Rockville), it was agreed that the UFTR could be restarted for the two experiments to be completed subject to special vigilance by the operators involved; one run would be at 100 kW for one hour, the other at 10 kW for one hour.

Current Status

This information on NRC permission to restart briefly was communicated to RSRS Executive Committee members and the two runs were completed uneventfully on July 30(100 kW) and July 31 (10 kW) respectively with the reactor then shutdown and secured awaiting fuel inspection and whatever repairs would be needed for the thermocouple system. As of this date(August 10), no further information can be provided until the core region can be accessed and inspected. Plans are to unstack the core shielding and proceed to inspect the fuel and repair the thermocouple system in a timely fashion. Plans are to inspect the fuel first allowing further decay of the activated materials around the thermocouple where most of the dose for these two projects is expected to be committed.

This inspection effort is expected to begin on August 11, 1992 with unstacking of the core biological shielding with fuel inspection occuring on August 12, 1992 and thermocouple system repairs to commence after fuel inspection is complete. Following completion of all checks and necessary surveillances the UFTR will be restarted to full power performed in steps to assure shielding replacement is adequate. After performing the requisite radiation surveys, the UFTR will then be returned to normal operations.

Evaluation Corrective Action

This event is evaluated not to have involved a violation of UFTR technical specifications. The planned maintenance will be used to correct the problem. Considering the difficulty of noting this failure, the reactor was shut down and secured in a responsive interval.

Current Status/Consequences

As indicated the Reactor Safety Review Subcommittee (RSRS) Executive Committee met on July 28, 1992 to review this event and the members were notified prior to the brief restarts. The committee essentially agreed with actions taken and with the staff evaluation that the occurrence did not represent a violation of the UFTR Technical Specifications. The Executive Committee will be consulted for approval of restart of the UFTR and subsequent return to normal operations after the corrective action has been implemented. Reactor Management and the RSRS Executive Committee agree there has been no significant compromise to reactor safety in the occurrence and no impact on the health and safety of the public. Other than considering the event in the next regular RSRS meeting, this occurrence is now considered closed, though NRC Region II will be notified prior to restart for the radiation surveys needed before return to normal operations.

If further information is needed, please advise.

Sincerely,

William G. Vernetson

William G. Vernetson
Director Nuclear Facilities

Kathleen A. Wilson 8/10/92
Notary Public Date

Notary Public, State of Florida
My Commission Expires March 22, 1995
Bonded Thru Troy Fain - Insurance Inc.

cc: D. Simpkins
Reactor Safety Review Subcommittee
USNRC - Document Control Desk

Attachment I

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

. Vernetson, Director
CLEAR REACTOR BUILDING
inesville, Florida 32611
one (904) 392-1429 - Telex 56330

July 28, 1992

Potential Tech Spec Violation -
Fuel Box Outlet
Thermocouple Monitor Failure

U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, GA 30323

Attention: Stewart Ebneter
Regional Administrator

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Dear Sir:

As per our telephone conversation of 28 July 1992 with Mr. Craig Bassett relative to an unscheduled shutdown conducted due to loss of indication/input from the thermocouple monitoring the water temperature in the outlet of fuel box #2, we have concluded this occurrence is probably not a potentially reportable occurrence per UFTR Technical Specifications, Section 6.6.2 delineating requirements for special reports. The RSRS Executive Committee(4 members) has agreed but recommended NRC notification as per Section 6.6.2 of the UFTR Tech Specs though the event does not appear to be promptly reportable depending on interpretation of the Tech Specs. Initial evaluation indicates the problem is probably in the thermocouple or connecting circuit in the high radiation field area at the outlet of fuel box #2 which will necessitate unstacking biological shielding for access to correct the problem.

William G. Vernetson
Director of Nuclear Facilities

WGV/p
cc: R. Piciullo
RSRS

APPENDIX F

UFTR EMERGENCY PLAN
REVISION 7
DOCUMENTATION

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

W.G. Vernetson, Director
NUCLEAR REACTOR BUILDING
Gainesville, Florida 32611
Phone (904) 392-1429 - Telex 56330

UFTR Emergency Plan
Revision 7
December 17, 1991

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

Re: University of Florida Training Reactor(UFTR)
Facility License: R-56; Docket No. 50-83

Gentlemen:

The enclosed package contains Revision 7 to the approved UFTR Emergency Plan. Revision 7 has been reviewed by UFTR management and the Reactor Safety Review Subcommittee(RSRS) to assure Revision 7 does not decrease the effectiveness of the UFTR Emergency Plan. All the changes are considered minor in nature.

Revision 7 consists of a set of updates and minor revisions to nine(9) pages(iii, v, 1-12, 8-1, 8-2, 8-3, 8-4, 10-3 and 10-6) as well as the addition of one new page to Chapter 8 (now page 8-3).

First, Section 1.5 (Credible Accidents and Consequences) in item (3) on Page 1-12 is updated to reflect UFTR energy generation over a ten-year period(September, 1981 - August, 1991) versus "last seven years" to be more representative of typical operations.

Second, Section 8.2 (Assessment Facilities) on page 8-1 is updated to include referencing Table 8.1 listing equipment typically available from the Radiation Control Office for emergency dose and radiation level assessment and referencing a new Table 8.2 which lists the equipment typically available in the UFTR facility for dose and radiation level assessment that may also be available from the UFTR depending on accessibility during an emergency event. Table 8.1 on Page 8-2 is then updated to include equipment typically available from Radiation Control Office while a new Table 8.2 is added as Page 8-3 to include equipment typically available in the UFTR facility for dose and radiation level assessment. These updated tables reflect better actual equipment available to address emergency events without requiring specific pieces of equipment.

Third, Section 8.3.1,Paragraph 2 on Page 8-3(now Page 8-4 due to the addition of Table 8.2 as Page 8-3) is updated to allow transporting contaminated victims using the multiple blanket contamination isolation method "or equivalent". This allowance is obviously intended but is now explicit allowing various methods of patient transport provided contamination control is followed. Similarly, Page 8-4 has now become Page 8-5 due to adding Table 8.2.

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Fourth, Table 10.1 on Page 10-3 is updated as several obvious typographical errors are corrected to include the first entry where"R eactor" should be "Reactor" and the first equipment entry which was not but should be marked with an asterisk(*) per the footnote to Table 10.1.

Fifth, Table 10.3 on Page 10-6 is updated as the word "assume" is corrected to read "assure" in the Table footnote. In addition, the listing of two radiation detectors in Table 10.3 is changed to allow equivalent detectors as follows:

* Teletector or equivalent (High level survey meter)
* E-140 or equivalent(Low level GM meter)

This change assures that a specific meter is not unreasonably required and the contents of the Plan can be correct even when detectors are replaced temporarily for repair and calibration or replaced permanently with a new meter.

Finally, the Table of Contents (Page iii) is updated to reflect page changes per the new Table 8.2 and the List of Tables (Page v) is updated to reflect the addition of Table 8.2 <u>and</u> to add page numbers for all figures and tables which had been missing but not noted in the original version of the Emergency Plan from which all copies have been made.

As indicated, all these changes have been reviewed by UFTR management and by the Reactor Safety Review Subcommittee to assure they do not decrease the effectiveness of the UFTR Emergency Plan. In general, these changes make the Plan better suited to assuring a proper response to Emergencies at the University of Florida Training Reactor.

Sincerely,

William G. Vernetson

William G. Vernetson
Director of Nuclear Facilities

R. Bernice Thornton
Notary
Alachua County
State of Florida
My Commission Expires:

Notary Public, State of Florida
My Commission Expires Oct. 5, 1995
Bonded Thru Troy Fain - Insurance Inc.

WGV:p
Enclosures
cc: NRC Region II(2 copies)
Reactor Safety Review Subcommittee
R. Piciullo

LIST OF FIGURES

LIST OF TABLES

this event is extremely unlikely; again, it is used only as the maximum hypothetical accident, not a credible accident.

Therefore, in agreement with the Battelle study, it is concluded that the most credible accident is the loss of cladding on one fuel plate due to a fuel handling accident. The cladding loss accident lacks a detailed causal explanation, but intuition suggests that the outer plates of a fuel element are the most likely to suffer mechanical damage. The Battelle postulated cladding loss is equivalent to two sides of a single fuel plate. The radiological consequences and summary conclusions, taken from the UFTR SER[5] are reproduced in Table 1.1.

As indicated in Table 1.1, the doses calculated by the staff for a person standing at the reactor building wall would be 32.7 mRem whole body dose from the noble gases and 4.35 Rem to the thyroid from the iodine gases. For this accident, the NRC staff concludes that the radiation doses to the public in unrestricted areas would be far below the limits stipulated in 10 CFR 100.

Even so, the assumptions used in these calculations are believed to be very conservative for three reasons:

(1) First, it is highly unlikely that dropping a fuel element would be severe enough to cause fuel damage equivalent to stripping the cladding from an entire fuel plate.

(2) Second, fuel transfer operations cannot begin immediately after shutdown. The shielding blocks first must be removed from the structure to reveal the fuel elements in the core. In addition, the UFTR does not shut down and immediately begin to manipulate fuel. Typically, the UFTR will shut down for more than 7 days prior to commencing fuel-handling operations. In all cases, the reactor would be shutdown at least three days to allow substantial decay of fission product inventory.

(3) The UFTR is not permitted to operate for the length of time needed for fission product equilibrium to be attained. The reactor has a license limit of 23.5 MW-hours per month versus the 72 MW-hours assumed in the analysis. In addition, the UFTR averaged less than 25.0 MW-hours per year for a typical ten year period(9/81-8/91).

Because of the conservative basis of the inventory and release calculations, the UFTR staff feels that it is extremely unlikely that members of the general public will receive radiation exposures greater than those permitted by 10 CFR 20[6] when the reactor building is secured following such an accident. This position is in agreement with the UCLA staff position as described in their proposed Emergency Plan. Nevertheless, in keeping with UFTR Tech Specs and the ALARA criterion, the appropriate accident control strategy is to evacuate and secure the entire reactor building, including the reactor cell. There will be no pressure increases from a dropped element accident so maintaining the integrity of the reactor cell can greatly mitigate the radiation doses to the public. Of more direct concern is protecting personnel within the UFTR facility. Securing the facility limits releases and allows time to analyze a situation and to take advantage of decay of activity released to the cell atmosphere.

8.0 EMERGENCY FACILITIES AND EQUIPMENT

This section of the Emergency Plan delineates and briefly describes the emergency facilities, types of equipment and their location tha are available in the event of a UFTR-related emergency.

8.1 Emergency Support Center

Emergency support is to be given from a location designated as the Emergency Support Center(ESC) which is to be moved to successively larger distances from the reactor building as conditions warrant. Since the onset of an emergency condition (sounding of the UFTR Building evacuation siren) necessitates evacuation of the entire Reactor Building (UF Building #557), the Emergency Support Center is to be established in the Nuclear Sciences Center(UF Building #634) directly adjacent to the south of but separate from the Reactor Building. The Emergency Support Center is to be established initially in the Nuclear Sciences Decontamination Room, Room 108, NSC (Telephone Number 392-1428) located just outside the reactor building. If warranted by emergency conditions, Emergency Support Center locations are identified at increasing distances from the reactor building facility first floor entrance as follows:

Location 1. Nuclear Sciences Center Decon Room, Room 108 of the Nuclear Sciences Center, (Telephone Number: 392-1428).

Location 2. Parking Lot behind Nuclear Sciences Center(service drive)-- To be used if the radiation level outside Room 108 NSC in the hall exceeds 10 mR/hr or if crowded conditions or involvement of contaminated and/or injured personnel make Location 1 undesirable or if high radiation areas, contamination, fire or other conditions warrant evacuation of the Nuclear Science Center.

8.2 Assessment Facilities

Equipment available at the Decontamination Room (Room 108 NSC) to be used to determine the need to initiate further emergency measures as well as that to be used for continuing assessment include a high level wide-range survey meter(usually a teletector) as well as a low level meter (usually a GM E-140 survey meter) as well as two or more high level and low level dosimeters. In addition, the Radiation Control office in the Nuclear Science Center can provide additional portable survey meters and is equipped with low level counting equipment for assessment of swipes. A high volume air-sampler for evaluating airborne particulate activity is also available at the radiation control office. A pancake detector to check for surface contamination as well as personnel contamination is also available from or through the Radiation Control Office. A list of equipment typically available from Radiation Control for radiation dose and level assessment is presented in Table 8.1. A similar list of survey equipment typically available in the UFTR facility is listed in Table 8.2.

Scintillation and semi-conductor gamma ray spectrometers are available in the Nuclear Engineering Department Laboratories, from the Radiation Control Office and elsewhere on the University of Florida campus for radioisotope identification. Additional equipment(portable survey and low level counting) is also available at, or through, the UF Radiation Control Office.

TABLE 8.1

Equipment Available from Radiation Control Office for Emergency Dose and Radiation Level Assessment

MANUFACTURER	MODEL	USE	RADIATION DETECTION	SENSITIVITY
TOTAL	6112 GM detector	exposure rate measurements	gamma, X-rays	5 log ranges 0-2 mR/h to 0-1000 R/h two energy compensated GM tubes
Victoreen	740G ion chamber	exposure rate measurements	α, β, gamma, X-rays	4 linear ranges 0-1000 mR/h to 0-100 R/h .00025 in. thick mylar end window
Victoreen	471 ion chamber	exposure rate measurements	α, β, gamma, X-rays	12 linear ranges 0-1 mR/h to 0-300 R/h 1.1 mg/cm^2 mylar window
Eberline	E-130G GM detector	exposure rate measurements	gamma, X-rays	3 linear ranges 0-10 mR/h to 0-100 mR/h energy compensated GM tube
W.B. Johnson	GSM-10 GM detector	contamination monitoring	β, gamma, X-rays	3 linear ranges 0-0.2 mR/h to 0-20 mR/h 1.5 mg/cm^2 aluminized mylar end window
W.B. Johnson	GSM-5 GM detector	contamination monitoring	β, gamma, X-rays	3 linear ranges 0-0.2 mR/h to 0-20 mR/h 1.5 mg/cm^2 aluminized mylar end window
*Eberline	PNR-4 Neutron detector	neutron dose monitoring	fast and slow neutrons	1 log range, 0-5000 Rem $^{10}BF_3$ and bonner ball
Eberline	PAL-ISA alpha meter	alpha contamination monitoring	α	4 linear ranges 0-2000 cpm to 0-2 x 10^6 cpm 1.5 mg/cm^2 mylar window
Victoreen	425A G[illegible] detector	contamination monitoring	β, gamma, X-rays	4 linear ranges 0 to 500,000cpm 1.4 mg/cm^2mica window
Victoreen	440 Ion Chamber	exposure rate	β, gamma, X-rays	5 linear ranges 0-3 mR/h to 0-300 mR/h 1/4 mil mylar end window

*PNR-4 normally st[illegible]ed in UFTR when not in use by Radiation Control.

TABLE 8.2

Equipment Available from UFTR for Emergency Dose and Radiation Level Assessment

MANUFACTURER	MODEL	USE	RADIATION DETECTED	SENSITIVITY
Automess	6112B GM Detector Teletector	exposure rate measurements	β, gamma X-rays	5 log ranges 0-2 mR/h to 0-1000 mR/h two energy compensated GM tubes
Eberline	2) E-140 GM detector	exposure rate measurements	β, gamma, X-rays	3 linear ranges 0-.5 mR/h to 0-50 mR/h Energy-compensated GM tubes
Eberline	ASP-1 GM Detector	exposure rate measurements	β, gamma, X-rays	6 linear ranges 0-0.01 mR/h to 0-1000 mR/h
Eberline	RO-2A ion chamber	exposure rate measurements	β, gamma, X-rays	4 linear ranges 0-50 mR/h to 0-50 R/h
Eberline	PNR-4 Neutron detector	Neutron dose monitoring	fast and slow neutrons	1 log range 0-5000 Rem $^{10}BF_3$ and bonner ball
Eberline	RM-14 GM detector	Contaminatioon monitoring	β, gamma, X-rays	3 linear ranges 0-500 cpm to 0-50000 cpm
Eberline	PMC-4A Portal monitor 8 GM channels	Contamination monitoring (personnel)	β, gamma, X-rays	Adjustable alarm 160 cpm to 7000 cpm ($\sim$ 0-2 mR/h)
Lionel	457 Ratemeter GM detector	Contamination monitoring	β, gamma, X-rays	2 linear ranges 0-1500 cpm to 0-15000 cpm
Victoreen	740F Ion Chamber	Exposure rate measurements	α, β, gamma, X-ray	4 linear ranges 0-25 mR/h to 0-25 R/h

8.3 First Aid and Medical Facilities

The Shands Teaching Hospital and Clinics, Inc. is a designated radiation accident emergency center. It has made a commitment through its "Plan for Emergency Handling of Radiation Accident Cases" to cope with irradiated and/or contaminated patients originating on the University of Florida Campus. The Shands Teaching Hospital and Clinics provides continuing training, including the handling of radiation exposure patients and contaminated victims as referenced in the "Plan for Emergency Handling of Radiation Accident Cases" which is included as Appendix I to this UFTR Emergency Plan.

8.3.1 Decontamination Facilities

A decontamination shower and sink is located in the Decon Room(Room 108 NSC) and may be utilized for limited decontamination purposes since both are plugged to hold up contaminated water which can then be directed to the radiological waste holdup tanks of the UFTR building. Other alternate showers and sinks are located in the Nuclear Science Center and the UFTR Facility complex; waste from these alternate facilities is directed to the waste holdup tanks. Note that waste from these tanks is not discharged into the sanitary sewer until cleared by the Radiation Control Office. Protective clothing and decontamination supplies are available in Room 108 NSC and on the Emergency Equipment Cart. Additional supplies are available through the Radiation Control Office.

If the extent of the victim's injuries are such that he/she cannot be decontaminated on site, then the victim will be transported to the designated decontamination site at the Shands Teaching Hospital and Clinics Emergency Room by the Alachua County Ambulance Service or designated alternate using the multiple blanket contamination isolation or equivalent method to control the spread of contamination.

8.3.2 First Aid

First aid is available at the Nuclear Sciences Center Decontamination Room through several UFTR personnel who are trained in first aid, or from the University Police Department or Gainesville Fire Department personnel who are certified in CPR and advanced Red Cross first aid. In addition, Alachua County Ambulance Service personnel are not only qualified in first aid but can provide paramedical assistance. First aid kits are available in the UFTR control room and the Decon Room. Stretchers and litters as well as splints to immobilize broken bones are also available in the Decon Room.

8.3.3 Ambulance Service

Ambulance service is provided through the Alachua County Ambulance Service. For a contaminated victim, a designated health physicist will accompany the victim in the ambulance to advise on proper handling, to minimize personnel dose rates and the spread of contamination during transport, and to convey dose estimate and contamination information.

60. "Lessons Learned in Planning and Analysis Phases of UFTR Fuel Conversion," Abstract and Accepted for Paper Presentation at 15th International Meeting on Reduced Enrichment for Research and Test Reactors Held September 27 to October 1, 1992 in Rothskilde, Denmark (Submitted in May, 1992).

61. "TRTR - National Organization of Test, Research and Training Reactors Newsletter," Volume 4, No. 2, W.G. Vernetson and T. Rousan, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, May, 1992.

62. "The Role of the UFTR in Supporting the Florida Educational System," W.G. Vernetson, Invited Paper Presentation on June 9, 1992 in a Session Entitled Role of Research Reactors in Education at the Annual Meeting of the American Nuclear Society Held in Boston, MA, June 7-12, 1992.

63. "Pulsed Ionization Chamber Methodology Applied to Reactor Power Measurements Revisited," W.H. Ellis, Paper Presentation in a Session Entitled Reactor Operations - General - II: Test Reactors at the Annual Meeting of the American Nuclear Society Held in Boston, MA, June 7-12, 1992.

64. "Neutron Damage Studies of Organic Materials With NQR Spectroscopy," K. Jamil, Paper Presentation on June 11, 1992 in a Session Entitled Nuclear Techniques II at the Annual Meeting of the American Nuclear Society Held in Boston, MA, June 7-12, 1992.

65. "Results of Detailed Gamma Spectroscopy Analysis on Dielectric (Beryl) Samples Following Lengthy Irradiation," W.G. Vernetson, Status Report on a Reactor Sharing Research Project Supplied to Dr. P. Gielisse and Colleagues of Florida A&M/Florida State Universities, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, June 17, 1992.

66. "The Role of Research Reactors in the Nuclear Engineering Curriculum Including National Academy Recommendations," W.G. Vernetson, Paper Presented on June 23, 1992, in a Session Entitled The Evolution and Maturing of the Nuclear Engineering Curriculum at the 1992 ASEE Annual Conference Held in Toledo, OH, June 21-25, 1992.

67. "Chlorine Analysis of Infusion Pump Tubing Filter Particles," W.G. Vernetson, Status Report on a Research Seed Project Supplied to Dr. Edward D. Staples of the Cardiothoracic Surgery Department, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, June 29, 1992.

68. "The Role of the UFTR in Supporting the Florida Educational System," W.G. Vernetson, Trans. Amer. Nucl. Soc., 65, p. 127, June 1992.

69. "Neutron Damage Studies of Organic Materials with NQR Spectroscopy," D.E. Hintenlang and K. Jamil, Trans. Amer. Nucl. Soc., 65, p. 169, June, 1992.

70. "Pulsed Ionization Chamber Methodology Applied to Reactor Power Measurements," W.H. Ellis, A.M. Ferrari, W.Y. Choi, Trans. Amer. Nucl. Soc., 65, p. 388, June, 1992.

71. "Report on Log of Security Events," W.G. Vernetson, Official Report Submittal to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, July 6, 1992.

72. "How a Nuclear Power Plant Operates - Comparison with a Research Reactor," W.G. Vernetson, Presentation to Participants in the 34th Annual Student Science Training Program, University of Florida, Gainesville, FL, July 8, 1992.

73. "An Evaluation of Mercury In Tuna," B. Morehouse, Mainland High School, Preliminary Oral Presentation on FFFS Summer Research Project, University of Florida, Gainesville, FL, July 17, 1992.

74. "Aluminum Traces in Canned Beverages," F.A. Chee, Piper High School, Preliminary Oral Presentation on FFFS Summer Research Project, University of Florida, Gainesville, FL, July 17, 1992.

75. "Proposed Testing Project on Borated Paints," D. Miko, Proposal Submitted to Sierra Nuclear Corporation, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, July 17, 1992.

76. "Results of Preliminary NAA Analysis of Silicon - Carbide Fiber Samples," W.G. Vernetson and R.T. Ratner, NAA Laboratory Report to Dr. Torecki of the Materials Science and Engineering Department, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, July 25, 1992.

77. "University of Florida Training Reactor: Facilities Information and Description," W.G. Vernetson, Presentation to Teachers, Coordinators and Students in the Florida Accelerated Initiatives Seminar, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, July 30, 1992.

78. "University of Florida Training Reactor: Facilities Information and Description," D. Simpkins, Presentation to Northeast Regional Data Center Staff Members, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, July 17, 1992.

79. "Pulsed Ionization Chamber Wide Range Power Reactor Measurement and Control System," W.H. Ellis, A.M. Ferrari, W.Y. Choi and Q. He, Paper Submitted and Accepted for Presentation at the IEEE Nuclear Science Symposium, Orlando, FL, October 25-31, 1992 (Submitted in July, 1992).

80. "Use of the UFTR Facilities for Pre-College Nuclear Education Programs," W.G. Vernetson, Paper Submitted and Accepted for Presentation at the American Nuclear Society Winter Meeting and International Conference on Fifty Years of Controlled Nuclear Chain Reaction: Past, Present and Future in Chicago, IL, November 15-20, 1992 (Submitted in July, 1992).

81. "Significant Results of Neutronics Analysis for Fuel Conversion of the UFTR," W.G. Vernetson and R. DeMartino, Invited Paper Submitted and Accepted for Presentation at the American Nuclear Society Winter Meeting and International Conference on Fifty Years of Controlled Nuclear Chain Reaction: Past, Present and Future in Chicago, IL, November 15-20, 1992 (Submitted in July, 1992).

82. "Unique Radiation Protection Issues and Competition for Resources at a Midsize University Reactor Facility," W.G. Vernetson, Paper Submitted and Accepted for Presentation at the American Nuclear Society Winter Meeting and International Conference on Fifty Years of Controlled Nuclear Chain Reaction: Past, Present and Future in Chicago, IL, November 15-20, 1992 (Submitted in July, 1992).

83. "Aluminum Traces in Canned Beverages," F.A. Chee, Research Project Submitted as a Participant from Piper High School in Florida Foundation for Future Scientists 1992 Summer Research Program (Prepared Also for Upgrade as a High School Science Fair Project), Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 4, 1992.

84. "An Evaluation of Mercury in Tuna," B. Morehouse, Research Project Submitted as a Participant from Mainland High School in Florida Foundation for Future Scientists 1992 Summer Research Program (Prepared Also for Upgrade as a High School Science Fair Project), Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 6, 1992.

85. "An Evaluation of Mercury in Tuna," B. Morehouse, Mainland High School, Final Oral Presentation on FFFS Summer Research Project, University of Florida, Gainesville, FL, August 6, 1992.

86. "Aluminum Traces in Canned Beverages," F.A. Chee, Piper High School, Final Oral Presentation on FFFS Summer Research Project, University of Florida, Gainesville, FL, August 6, 1992.

87. "Failure of Fuel Box Outlet Thermocouple," W.G. Vernetson, Final Report on Failure of Connection on Thermocouple #2 to USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 10, 1992.

88. "Preliminary Results of Trace Element Analysis of Mercury in Rat Kidneys and Brains," R.T. Ratner, Progress Report to Endodontics Department on Research Project Analyzing Rat Tissues for Mercury Content Following Mercury Implantation in Bones, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 13, 1992.

89. "Progress Report on Trace Element Analysis of Ancient Seashells," D. Farinha, Status Report on ENU-4905 Senior Research Project, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 24, 1992.

90. "Updating the Cost Estimate to Decommission the UFTR," W.G. Vernetson, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 25, 1992.

91. "Rare Earth Elemental Analysis of Egyptian Sedimentary Mineral Deposits Using Instrumental Neutron Activation Analysis," T. Downing, Status Report on ENU-4905 Senior Research Project, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 31, 1992.

92. "Air Sample Volume and Area Correction Factor Corrections," T. Downing, Internal Report for UFTR Radiation Protection Program, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 31, 1992.

93. "Effect of Ionizing Radiation of ^{14}N In Organic Compounds by Nuclear Quadrupole Spectroscopy," K. Jamil, Doctoral Dissertation in Progress, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August, 1992.

94. "Report on Implementation of Automatic Sample Changer," C. Leipner, Status Report on ENU-6936 Special Project to Implement Software Controls for the NAA Laboratory Automatic Sample Changer, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August, 1992.

95. "TRTR - National Organization of Test, Research and Training Reactors Newsletter," Volume 4, No. 3, W.G. Vernetson and T. Rousan, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August, 1992.

96. "Updating and Expanding Reactor Operations Laboratory Manual Materials," R. Lower, Preliminary Status Report on ENV-4930 High Honors Project, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August, 1992.

NOTE: This list of reports and publications does not include the various presentations with visual aids made for the dozens of groups who visit the UFTR each year for tours and demonstrations.

APPENDIX A

DOCUMENTATION FOR NRC INSPECTION REPORT NO. 50-83/92-01

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

RECEIVED MAR 2 3 1992

MAR 1 8 1992

Docket No. 50-83
License No. R-56

University of Florida
ATTN: Dr. W. C. Vernetson
Director of Nuclear Facilities
202 Nuclear Sciences Center
Gainesville, FL 32611

Gentlemen:

SUBJECT: NRC INSPECTION REPORT NO. 50-83/92-01

This refers to the inspection conducted by C. H. Bassett of this office on February 24-28, 1992. The inspection included a review of activities authorized for your University of Florida Training Reactor. At the conclusion of the inspection, the findings were discussed with those members of your staff identified in the report.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observation of activities in progress.

The enclosed Inspection Report identifies activities that appeared to violate NRC requirements that are not cited; therefore, a response is not required.

In accordance with 10 CFR 2.790(a), a copy of this letter and its enclosure will be placed in the NRC Public Document Room.

Should you have any questions concerning this letter, please contact us.

Sincerely,

Douglas M. Collins

Douglas M. Collins, Chief
Nuclear Materials Safety
and Safeguards Branch
Division of Radiation Safety
and Safeguards

Enclosure:
NRC Inspection Report

cc w/encl: (See page 2)

cc w/encl:
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University of Florida
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

MAR 18 1992

Report No.: 50-83/90-01

Licensee: University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32601

Docket No.: 50-83 License No.: R-56

Facility Name: University of Florida Training Reactor

Inspection Conducted: February 24-28, 1992

Inspector: C Bassett 3/17/92
C. H. Bassett Date Signed

Approved By: EJ McAlpine 3/17/92
E. J. McAlpine, Chief Date Signed
Radiation Safety Projects Section
Nuclear Materials Safety and Safeguards Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This routine, unannounced inspection involved the biennial review of the University of Florida's Class II Operations. The onsite inspection included review of radiation protection program activities including radiation controls, environmental monitoring and surveillance, emergency planning, and transportation. The inspection also entailed a review of operational aspects of the licensee's program including organization and staffing, logs and records, procedures, experiments, surveillances, and training.

Results:

The licensee's staffing and current organizational structure met Technical Specification (TS) requirements and were adequate to implement the licensee's radiation protection and operational programs. The radiation protection and operational programs were adequate to ensure the safety of the facility personnel as well as that of the general public. The licensee has not made any shipments of radioactive material since the last inspection. The training program appeared to be current.

Strengths in the radiation protection program were noted in the areas of management involvement in facility operations, low facility radioactive contamination levels, and low radiation dose received by personnel. Strengths in the operational area included thorough and complete documentation of activities in operations and maintenance log books, and in test, experiment, and surveillance records. Analysis and evaluation of the measurements and results of required surveillance tests met or exceeded regulatory requirements.

No program weaknesses were noted. Two non-cited violations (NCVs) were identified during this inspection. These NCVs were for: 1) failure to follow procedures for checking control blade interlocks prior to reactor restart when the daily checkout is omitted as allowed in TS 4.2.2(7) (Paragraph 9.a), and 2) failure to adhere to surveillance requirements to check whether a loss of pump power on secondary deep well cooling would cause a reactor trip (Paragraph 9.b)

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*D. Munroe, Radiation Control Officer, Environmental Health and Safety (EHS) Division
*M. Ohanian, Chairman, Reactor Safety Review Subcommittee
R. Piciullo, Acting Reactor Manager, University of Florida Training Reactor (UFTR)
*J. Tulenko, Chairman, Nuclear Engineering Sciences Department
*W. Vernetson, Facility Director, UFTR

Other licensee employees contacted included operators, Radiation Control technicians (RC techs), and office personnel.

*Attended exit interview

2. Organization and Staffing (40750)

Technical Specifications (TSs) 6.2.1, 6.2.2, and 6.2.3 detail organizational structure and management responsibility for safe operation of the UFTR facility.

The inspector reviewed and discussed with cognizant licensee personnel the current staffing associated with operating the UFTR and providing radiation protection coverage for daily work. There have been no changes in the organization as outlined in the TS since the last inspection. However, a different person is occupying the position of Acting Reactor Manager. The person filling this position is doing so on a "consultant-type" basis which means that he does not actively operate the reactor but reviews documents, gives training if needed, and provides an over-check of the reactor operations in general.

In the operational area, the licensee has two part-time senior reactor operators (SROs) and one part-time Reactor Operator (RO), as well as the Director of Nuclear Facilities who is an SRO. These individuals operate the reactor as required, perform the required surveillances and most of the maintenance, and complete the associated records. Currently, this provides sufficient coverage and support during operation of the reactor for experiments, training, and reactor sharing projects.

Concerning the radiation protection program, the operators complete certain weekly contamination surveys and provide limited job coverage. However, the majority of radiation protection coverage is provided by two RC technicians who work for the Radiation Control Officer (RCO) in the University of Florida's EHS Division. These individuals perform monthly and quarterly radiation level and contamination surveys in the restricted and unrestricted areas of the facility and ensure that adequate dosimetry is available for use. They also perform other environmental monitoring functions for the facility including preparation of liquid radioactive waste tank releases. In addition, they calibrate certain radiation protection equipment used in the UFTR cell and provide job coverage for non-routine and unusual jobs such as fuel movement and maintenance activities.

During the inspection and tours of the facility, the inspector noted that the current staffing level, composed of both UFTR and EHS Division personnel, appeared adequate to safely conduct the operational and radiation protection activities at the facility.

3. Reactor Safety Review Subcommittee (40750)

a. Minutes

TS 6.2.5 requires that the Reactor Safety Review Subcommittee (RSRS) conduct quarterly meetings at intervals not to exceed four months.

The inspector reviewed the minutes of the RSRS meetings conducted from February 15, 1990 through December 19, 1991. During that time period, the RSRS and Executive RSRS met approximately 19 times, thus exceeding the TS requirement. Items reviewed included unscheduled shutdowns of the reactor, 10 CFR 50.59 safety reviews, facility status and operating reports, possible TS violations, revisions to Standard Operating Procedures (SOPs), the high enriched uranium (HEU) to low enriched uranium (LEU) fuel conversion program and progress, experiment proposals, security plan changes, emergency plan changes, unusual events, the facility annual report, and NRC inspection reports.

b. Audits

TS 6.2.5 also requires an independent review and audit of safety aspects of reactor facility operations to advise management of adverse trends. The TS requires that the review and audit functions be performed by the RSRS.

The inspector reviewed the last two audits conducted by the RSRS for the calendar years 1989 and 1990. The audits covered the facility emergency plan, fire protection system records, the security plan, special nuclear material records, the requalification training program, health physics records, TS surveillance requirements, documentation of experiments, correspondence/commitments made to the NRC, the Quality Assurance program, and a review of maintenance records, procurement, and process control documents. The audits did not identify any serious deficiencies but some problems were noted. The licensee addressed these problems by initiating corrective actions for each item. The inspector also reviewed the actions taken by the licensee to correct the problem areas noted by the RSRS. From this review, the inspector determined that the RSRS was providing adequate oversight of the UFTR operations and that management was committed to and involved in proper operation of the facility and maintaining an adequate radiation protection program.

c. Safety Evaluations

TS 6.2.5(3)(a) requires that the RSRS review proposed changes in equipment, systems, tests, experiments, or procedures and determine that the changes do not involve an unreviewed safety question.

The inspector reviewed selected 10 CFR 50.59 safety evaluations that had been performed during 1990 and 1991 and that had been reviewed by the RSRS. Seven evaluations had been conducted in 1990 and 10 were done in 1991. The inspector determined that the evaluations had been performed in accordance with the UFTR procedure, O.4, 10 CFR 50.59 Evaluation and Determination, Rev. 2, dated July 1991. The evaluations appeared to be adequate and were performed when required. No unresolved safety questions were identified.

4. Radiation Control (40750)

a. Training

10 CFR 19.12 requires the licensee to instruct all individuals working in or frequenting any portion of the restricted area in health physics protection problems associated with exposure to radioactive material or radiation, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed, applicable provisions of

Commission regulations, individuals' responsibilities and the availability of radiation exposure reports which workers may request pursuant to 10 CFR 19.13.

The inspector discussed the training provided to those individuals who provide the radiation protection coverage for daily operation of the UFTR facility. Applicable radiation protection training is given to the operators during their initial qualification training or biennial requalification. Initial and subsequent annual training is provided to all the RC personnel who may work in the reactor cell by one of the qualified RC technicians in the EHS Division.

The inspector reviewed the training records of the operators and selected personnel authorized to use the laboratories in the reactor area. The training records were complete and subjects outlined as having been presented appeared to be appropriate and adequate for radiation protection and control.

b. Posting and Labeling

10 CFR 19.11 requires each licensee to conspicuously post current copies of (1) 10 CFR Parts 19 and 20; (2) the license; (3) the operating procedures; and (4) Form NRC-3, in sufficient places to permit individuals engaged in licensed activity to observe them on the way to and from any licensed activity location. If posting of the documents specified in (1), (2), and (3) is not practicable, the licensee may post a notice which describes the documents and states where they may be examined.

All routine entries into the UFTR restricted area are made through the reactor control room. During tours of the facility, the inspector noted that the applicable documents and/or references to their location were posted at the entrance to the control room. The posted documentation indicated that copies of the license and procedures were maintained in the control room and in the Facility Director's office.

10 CFR 20.203 specifies the requirements for posting radiation areas, high radiation areas, and labeling containers of radioactive materials.

During tours of the facility, the inspector noted that entrances into the restricted area were posted as required and that containers of radioactive material were labeled. One door, leading to the outside of the building from the reactor cell, was not posted on the outside. Although this was not a normal access to the reactor cell and the actual radiation area existed inside the door, the licensee agreed to post a radiation area sign on the door to give anyone on the outside of the building an indication of what to expect if they had to enter through that door.

c. Restricted Area Surveys

10 CFR 20.201(b) requires the licensee to make or cause to be made such surveys as (1) may be necessary for the licensee to comply with regulations in this part and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present.

TS 3.9.2(2)(a) requires weekly measurements of surface contamination in the restricted area.

TS 3.9.2(2)(b) requires airborne particulate contamination to be measured using a high volume air sampler during the weekly checkout.

TS 3.9.2(3)(a) requires surveys measuring the radiation doses in the restricted area to be conducted quarterly, at intervals not to exceed four months, and at any time a change in the normal radiation levels is noticed or expected.

Changes to the following procedures outlining radiological surveys to be conducted in and around the UFTR restricted area were reviewed by the inspector:

- UFTR Radiological Procedure D.1, UFTR Radiation Protection and Control, Rev. 4, dated August 29, 1991.
- UFTR Radiological Procedure D.2, Radiation Work Permits, Rev. 10, dated March 1987, with Temporary Change Notice (TCN) dated October 1989, TCN dated April 1990, and TCN dated December 1990.
- UFTR Radiological Procedure D.4, Removing Irradiated Samples From UFTR Experimental Ports, Rev. 5, dated October 1989.
- UFTR Radiological Procedure D.5, UFTR Reactor Waste Shipments: Preparations and Transfer, Rev. 1, dated February 1992 (not yet approved).

- UFTR Radiological Procedure D.6, Control of UFTR Radioactive Material Transfers, Rev. 0, dated December 1988 with TCN dated March 1989.

The inspector reviewed selected UFTR restricted area weekly and quarterly radiological survey results conducted from January 1990 to February 1992. Surface contamination within the restricted area was found to be low. Survey data indicated that beta-gamma contamination levels were generally maintained below 100 disintegrations per minute per one hundred square centimeters (dpm/100 cm^2). Anytime surface contamination levels above that figure were encountered, the area or item was immediately decontaminated or the item was bagged and stored in a storage area.

Airborne particulate radioactive material levels were also low. Survey data indicated that airborne particulate beta-gamma activity concentrations varied generally from 1.0 E-13 to 1.5 E-12 microCuries per milliliter (uCi/ml).

Radiation survey results in the UFTR cell indicated general area levels from 1 to 8 milliRoentgens per hour (mR/hr) around the reactor and from 10 to 50 mR/hr on top of the reactor at 100% power. The survey results also indicated the existence of "hot spots" (as measured at twelve inches from reactor shielding or shielded beam ports) with radiation levels from 7.5 to 53 mR/hr.

d. External Exposure Reviews

10 CFR 20.101 delineates the quarterly radiation exposure limits to the whole body, the skin of the whole body, and the extremities for individuals in restricted areas.

The inspector reviewed the exposure records of persons working in or frequenting the UFTR facility from January 1, 1990, through December 31, 1991. Personnel exposure measurements were obtained using film badges and thermoluminescent dosimeters (TLDs) provided by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor. Vendor specifications reported a detection limit of 10 millirem (mrem) for the dosimetry provided to the licensee. The highest reported dose for 1990 was 130 mrem and was assigned to a reactor operator. The highest reported dose for 1991 was 110 mrem which was also assigned to a reactor operator. The exposure resulted from activities associated with neutron radiography, experiments, and maintenance activities. All other cumulative annual doses assigned to personnel working in or frequenting the UFTR facility for either year were less than 100 mrem per individual for the period.

e. Continuous Air Monitoring

TS 3.4.4 requires the reactor cell environment to be monitored by at least one air particulate monitor, capable of audibly warning personnel of radioactive particulate airborne contamination in the cell atmosphere.

During a previous inspection, the inspector had reviewed the operations logs of the licensee which detailed that the air particulate detector (APD) or continuous air monitor in the reactor cell was checked to verify that it was operational prior to reactor startup. The inspector had also reviewed the quarterly calibration log for the APD and had determined that the calibrations were being performed. When asked about the APD alarm set point and detection capabilities however, the licensee had indicated that the APD was set to alarm at 30,000 counts per minute (cpm) but that that number could not be related to any Maximum Permissible Concentration in air (MPCa). The licensee had agreed that a new/different APD or continuous air monitor with greater sensitivity would improve the radiation protection program of the facility and provide a current indication of any airborne activity present.

During this inspection, the inspector noted that the licensee had obtained a new APD for use in the reactor cell. Although the APD was not operational at the time of the inspection, the licensee indicated that progress was being made on its installation and that it would give a better indication of the air activity in the cell. The new APD was designed to subtract out the effects of radon and only give the results of any other airborne activity present.

5. Environmental Protection Program (40750)

a. Effluents

10 CFR 20.303 details liquid effluent release limits to the sanitary sewerage system.

TS 3.4.5 requires liquid waste from the radioactive liquid waste holding tanks to be sampled and the activity to be measured, with the results to be within limits specified in 10 CFR 20, Appendix B, Table 1, Column 2, before release to the sanitary sewer.

The inspector reviewed the data from the ten reported discharges that had been made from the facility from September 1, 1989 through August 31, 1991. During the period from September 1, 1989 to August 31, 1990, the total average radionuclide concentrations in the liquid released from the facility's holdup tanks ranged from 4.66 E-9 to 1.18 E-8 uCi/ml. During this same period, approximately 320,000 liters of liquid were released containing approximately 1.511 uCi of gross beta activity. These data reflect a reduction in the amount of radioactivity discharged compared to the previous year.

Although the final figures were not available for the period from September 1, 1990 through August 31, 1991, the data appeared to indicate a further reduction in the quantity of liquid and activity released.

TS 4.2.4(2) requires that the Argon-41 (Ar-41) concentration in stack effluents be measured semiannually at intervals not to exceed eight months.

TS 3.4.2 requires the average Ar-41 concentration averaged over a consecutive 30-day period to be less than 4.0 E-8 uCi/ml.

Through discussions with licensee representatives and review of release data, the inspector determined that calculation of the licensee's total releases and average monthly concentrations are based upon semiannual Ar-41 release concentration measurements made at equilibrium full power (100 Kw) conditions. During the period from September 1, 1989 to August 31, 1990, average monthly concentrations of gaseous releases from the facility ranged from 0.383 E-9 to 5.066 E-9 uCi/ml. For this same reporting period, the total amount of Ar-41 released from the stack was approximately 113.865 Ci.

Final figures were not available for gaseous releases for the period from September 1, 1990 through August 31, 1991. However, based on the measurement of the stack samples taken in January 1992, the average monthly concentration of gaseous releases from the licensee's stack for January 1992 was 1.81 E-9 uCi/ml.

Total Ar-41 activity released for January was approximately 6.8 Ci. These numbers are consistent with those of past reporting periods and past analyses.

b. Environmental Monitoring with TLDs and Film Badges

TS 3.9.2(1) requires monthly environmental radioactivity surveillance outside the restricted area to be conducted by measuring the gamma doses at selected fixed locations surrounding the UFTR facility.

Environmental radiation exposure as a result of UFTR operations was considered minimal. The total yearly exposure reported during the period from September 1, 1989 through August 31, 1990, ranged from less than 10 to 150 mrem as measured by film badge and from less than 10 to 60 mrem as measured by TLD. These results were somewhat higher than previous years. However, an evaluation performed by the licensee indicated that the months in which the film badges and/or TLDs received the "highest" exposure were generally not the months of highest UFTR energy generation. The licensee concluded that the recorded exposures were probably close to background.

Again the final figures for the period from September 1, 1990 through August 31, 1991 were not available. However, the data indicated that the exposures for the period were very similar to those recorded in past years and somewhat lower than those of the previous reporting year.

c. Environmental/Unrestricted Area Surveys

TS 3.9.2(3)(b) requires quarterly radiation exposure surveys to be conducted in unrestricted areas surrounding the UFTR complex.

The inspector reviewed the quarterly radiation level surveys conducted from January 1990 through February 1992, in the unrestricted areas surrounding the UFTR facility. Areas immediately outside the reactor cell had radiation levels between 0.1 and 0.3 mR/hr. Radiation surveys outside the UFTR building indicated levels ranging from 10 to 75 microRoentgen per hour (uR/hr). No problem areas were noted.

d. Environmental Reports

TS 6.6.1(5) requires the licensee to issue a routine annual report covering the activities of the reactor facility during the previous calendar year which ends August 31 for the UFTR. The annual report is to include a summary of the nature and amount of radioactive effluents released or discharged to the environment, the environmental surveys performed outside the facility, and exposures received by facility personnel and visitors where exposures are greater than 25 percent of the allowable limits.

The inspector verified that the annual report for the period from September 1, 1989 to August 31, 1990, had been compiled and issued as required. The annual report for the period from September 1, 1990 through August 31, 1991, had not been completed as of the date of the inspection. The inspector reviewed the most recent issue. The report was found to be in compliance with the applicable TS requirements.

6. Emergency Planning (40750)

a. Procedures

The inspector reviewed the following licensee's emergency preparedness procedures:

- UFTR Operating Procedure B.1, Radiological Emergencies, Rev. 4, dated December 1988, with TCN dated October 1989,

- UFTR Operating Procedure B.2, Emergency Procedure - Fire, Rev. 8, dated May 1985, with TCN dated October 1989,

- UFTR Operating Procedure B.3 (this procedure had been superseded by another), and

- UFTR Operating Procedure B.4, Emergency Procedure - Flood, Rev. 1, dated April 1983, with TCN dated October 1989.

The procedures appeared to be adequate and outlined the actions to be taken in case of the particular emergency described.

b. Emergency Drills

TS 4.2.6(3) requires that evacuation drills for facility personnel be conducted quarterly, at intervals not to exceed 4 months, to ensure that facility personnel are familiar with the emergency plan.

The inspector reviewed the licensee's surveillance file, Q-3, Quarterly Radiological Emergency Evacuation Drill. Eight quarterly emergency drills had been held since the last inspection. Most drill scenarios were based upon the sounding of an evacuation alarm due to removal of irradiated material from the reactor. Some scenarios involved a simulated injury to a person resulting in contamination entering the wound and requiring the person to be taken to the university hospital for treatment. However, as has been noted in past inspections, none of the drills simulated the design basis accident of a dropped fuel assembly with a contaminated injured person. The inspector suggested that the licensee should consider having a drill with the design basis accident scenario for training and to ensure proper coordination with off site agencies. The licensee indicated that they would consider the need for such a drill.

7. Transportation (40750)

10 CFR 71.5 requires each licensee who transports licensed material outside the confines of its plant or other place of use to comply with the applicable requirements of the Department of Transportation (DOT) in 49 CFR 170 through 189.

The inspector discussed the processing, storage, and shipping of radioactive material with licensee representatives. The inspector also reviewed the licensee's revised procedure for the shipment of radioactive materials as indicated in Paragraph 4.c. The licensee indicated that there had been no shipments of radioactive materials from the facility since the last inspection.

8. Reactor Operations (40750)

a. Operational Logs and Maintenance Records Review

The operations log sheet for the period from December 1989 to January 1992, were reviewed. Log entries were complete and descriptive of the events that occurred and the actions taken by the operators. During the review, specific attention was given to power level entries for the nuclear instruments and primary coolant temperature rise. No instances of overpower operation were identified.

The maintenance log was reviewed for the same time period, from December 1989 to January 1992. The maintenance load appeared to be the same as in past years. During 1988, a total of 53 maintenance activities were logged; during 1989, a total of 66 activities were logged; during 1990, a total of 49 maintenance activities were logged; and, during 1991, a total of 66 activities were logged as being completed. One item that had caused a great deal of maintenance activity and reactor down time in the past had been the 2-pen recorder. The 2-pen recorder was replaced with a new one in 1990 and maintenance on that item dropped to zero in 1991. The current high-maintenance systems (or at least high activity items) appear to those that have continually required such attention. These include the stack monitor and dilution fan, area radiation monitors, the shield tank, and the overhead crane. Previous problems with the safety channels appear to have been resolved. No specific problem areas were noted.

b. Surveillances

Surveillance requirements for the UFTR are stipulated in Section 4 of the facility TS. Unless otherwise specified, quarterly surveillances (Q) are to be performed at an interval not to exceed 4 months, semiannual surveillances (S) are not to exceed 8 months, annual surveillances (A) are not to exceed 14 months, and biennial surveillances (B) are not to exceed 30 months between surveillances.

The inspector reviewed the following surveillances for timeliness and completion:

- Q-1, Quarterly Check of Scram Function. During 1990, this check was performed on March 1, June 8, September 17, and December 13. During 1991, the surveillance was performed on March 4, June 10, and September 10. During 1992 to date, the surveillance was performed on January 1 and February 13. The checks appeared to be adequate and no operational problems or significant drifts were identified during these checks.

- Q-2, Calibration Check of Area and Stack Radiation Monitors. During 1990, this surveillance was performed on March 15, May 22, August 2, October 16, and November 16. During 1991, the check was performed on January 25, March 13, April 23, May 20, July 18, and October 22. The calibration checks of these monitors had to be performed more frequently than required by TS due to some minor maintenance problems with the monitors. Following maintenance on the various monitors, calibration checks were performed as required.

- Q-3, Quarterly Radiological Emergency Evacuation Drills. Drills were conducted in April, July, October, and December during 1990 and 1991. The drills appeared to be adequate to meet the intent of the requirement. (Refer to Paragraph 6.b for more information on emergency drills.)

- Q-4, Quarterly Radiation Survey Unrestricted Areas. In 1990, this surveillance was performed on January 11, June 29, September 19, and December 10; in 1991, it was performed on March 8, June 12, October 1, and November 27. In 1992, this surveillance was performed on February 18. Although there was no quarterly surveillance performed within the required 4 month interval between January 12 and June 29, 1990, this was not a safety problem. During the period from April 27 through June 29, the reactor was shutdown due to problems encountered during the biennial fuel inspection. The survey was not performed because the reactor was not operational. Prior to bringing the reactor back up to full power on June 29, radiation surveys were performed with the reactor power level at 1 Kw, 10 Kw and then at 100 Kw. No problems or abnormal radiation readings were noted during any of the surveys.

- Q-5, Quarterly Radiation Survey of the UFTR Restricted Area. In 1990, this surveillance was performed on January 11, June 29, September 19, and December 10; in 1991, it was performed on March 8, June 12, August 8, and November 21. In 1992, this surveillance was performed on February 18. No problems or abnormal radiation readings were noted during any of the surveys. (See the paragraph above for an explanation of why the surveillance was not performed within the 4 month interval between January 12 and June 29, 1990.)

- S-1, Measurement of Control Blade Drop Times. This surveillance was performed on June 12, 1990, and on February 12, April 10, and October 29 in 1991. Satisfactory results were reported in all cases and no trends of increasing or decreasing drop times were apparent. The inspector noted that the period from June 12, 1990 to February 12, 1991 was the maximum time that the licensee could have waited to perform this particular surveillance, 8 months.

- S-2, Annual Reactivity Measurements. The annual (not semiannual) surveillance of reactivity measurements was performed in March and June of 1990 and in July of 1991. There appeared to be good consistency between blade worth distributions from measurement to measurement.

- S-4, Measurement of Argon-41 Stack Concentration. Measurements were conducted on January 1 and July 12 in 1990, on January 30 and June 18 in 1991, and on January 2, 1992. The results of the measurements performed during 1990, 1991, and 1992 were in general agreement and provided the licensee with sufficient information to calculate the amount of gaseous Ar-41 released.

- S-5, Blade Controlled Insertion Time Measurement. This surveillance was performed on June 12, 1990, and on February 12, April 10, and October 29 in 1991. The results for these measurements were satisfactory and demonstrated good correlation with previous time measurements.

- A-2, UFTR Nuclear Instrumentation Calibration Check and Calorimetric Heat Balance. The NI calibration check and the heat balance was performed on April 6, 1990, and on April 4, 1991. There was no significant change in instrument readings between surveillances and the results were satisfactory. Following a previous inspection, the licensee had indicated that they would review the need and methods for recalibrating the flow instrument used for this surveillance. The inspector determined that this had not been done but the licensee indicated that they would perform such a review and install a recalibrated flow instrument, if needed, during the conversion to the use of low enriched uranium (LEU) fuel.

- A-3, Annual Measurement of UFTR Temperature Coefficient of Reactivity. This measurement was performed on November 5, 1990, and on November 26, 1991. The results appeared to be satisfactory and no problems were noted.

- B-1, Biennial Check to Assure Negative UFTR Void Coefficient of Reactivity. The satisfactory check was performed on March 15, 1991, as required. During a previous test, rapid closing of a gas pressure valve led to an unstable indication of water level and a reactor trip. The trip report recommended adding a caution to the operating procedure to secure gas pressure more slowly. The inspector reviewed the procedure and verified that the caution step had been added.

- B-2, Biennial Inspection of Incore Reactor Fuel Elements. This inspection was performed from May 7 through June 8, 1990. During this inspection, small "blisters" were noted on one of fuel elements. Through extensive evaluation of this problem and after consulting with various people, including Argonne National Laboratory personnel, the licensee concluded that the phenomenon was not routinely representative of the potential for thermal hydraulic problem or failed fuel. A 10 CFR 50.59 safety evaluation was also performed which included the following items:

  1) previous fuel handling operations shifted the bundle with the deformations from a "hot" location in the core (in 1985),

  2) there were not safety concerns from thermal hydraulic considerations in this occurrence,

  3) no fuel element failure had been detected through the routine UFTR surveillance program,

  4) the TS require periodic (biennial) inspection of fuel elements to find fuel element problems; the detection of the occurrence occurred through the proper surveillance action, and

  5) the Safety Analysis Report addresses the Maximum Credible Accident as complete removal of cladding from one fuel plate - the "blister" effect was within that envelope of analysis.

The conclusion was that this phenomenon was not a safety issue and did not represent the potential for an unreviewed safety question. Even though this conclusion was reached, the licensee subsequently removed the fuel element from the reactor and another element was put is its place. No problems have been noted to date.

c. Experiments

TS 6.4 requires that experiments be reviewed and approved as outlined in TS 3.5 to ensure compliance with the requirements of the license, the TS, and applicable regulations.

The inspector reviewed selected experiments conducted in 1990 and 1991. A total of 47 experiments were conducted in 1990 and 37 were conducted in 1991. All those conducted in 1990 were either Class I or Class II experiments which meant that they were routine or that the experiments needed to be documented for each new group of experimenters but posed no hazards to the reactor, personnel, or the public.

Of the 37 experiments conducted in 1991, all but one were Class I or Class II experiments. The one experiment that was a Class III experiment, which indicated that it could pose significant questions regarding safety to the reactor, personnel, or the public, was reviewed by the inspector. It involved a series of temperature dependent plasma kinetics measurements (using a helium and uranium hexafluoride gas mixture) to be carried out in the reactor using a multi-probe ionization chamber system developed by the experimenters.

This experiment was closely reviewed by the RSRS and approval was given to only use helium-3 gas at low pressure in the detector to obtain the desired measurements. This changed the classification of the experiment to a Class II experiment (a similar experiment had been conducted in the past with helium-3 gas used in the detector) and reduced the likelihood of other problems as well. A 50.59 evaluation was also performed on this Class II experiment and no problems were identified.

d. Operation of the Reactor

The inspector observed an SRO perform a daily check of the reactor and then operate the reactor. The check out and operation were performed in accordance with the appropriate Standard Operating Procedures (SOPs). The inspector also reviewed the following operating procedures:

- UFTR SOP-A.1, Pre-operational Checks, Rev. 14, dated December 1988, with TCNs dated October 1989, April 1990, January 1991, and July 1991.

- UFTR SOP-A.2, Reactor Startup, Rev. 12, dated May 1987, with TCNs dated June 1988, November 1990, and July 1991.

- UFTR SOP-A.3, Reactor Operation At Power, Rev. 11, dated May 1987, with TCNs dated June 1988, May 1989, and July 1991.

- UFTR SOP-A.4, Reactor Shutdown, Rev. 11, dated October 1989.

The inspector noted that the SRO used the SOPs during these operations and followed them as written. No problems were noted during this observation period.

9. Unusual Events, Abnormal Occurrences, and Reactor Trips (40750)

The inspector reviewed four events which had been reported to NRC Region II by the licensee. The events are as follows:

a. Failure to Check Control Blade Interlocks Per SOP-A.2.

TS 6.3 requires that the facility be operated and maintained in accordance with approved written procedures.

UFTR SOP-A.2, Reactor Startup, Rev 12, dated May 1987, requires in Paragraph 4.4.6 that the control blade interlocks be checked prior to the restart when the daily checkout is omitted as allowed under TS 4.2.2(7).

TS 4.2.2(6) requires that the reactor shall not be started unless (a) the weekly checkout has been satisfactorily completed within 7 days prior to startup, (b) a daily checkout is satisfactorily completed within 8 hours prior to startup, <u>and</u> (c) no known condition exists that would prevent successful completion of a weekly or daily checkout.

TS 4.2.2(7) states that the limitations stipulated under Paragraph 4.2.2(6) (a) and (b) can be deleted if a reactor startup is made within 6 hours of a normal reactor shutdown on any one calendar day.

On October 2, 1990, a daily checkout was performed at about 8:30 a.m. The reactor was then run several times during the day and was shutdown at about 3:30 p.m. Shortly after 5:00 p.m. the reactor was started up for an extra series of operations lab exercises for an RO trainee and a reactor operations lab student. Prior to the startup after 5:00 p.m., the control blade withdrawal interlocks were checked as required by SOP-A.2, Paragraph 4.4.6. However, the control blade interlocks were not checked following shutdown for successive rapid restarts that were begun at about 5:30, 6:00, and 6:30 p.m. Although TS requirements on the restarts were met in all four startups which occurred after 5:00 p.m., the last three startups failed to meet the additional requirement in UFTR SOP-A.2 that required that the control blade interlocks be checked prior to the restart when the daily checkout is omitted as allowed in TS 4.2.2(7).

Following this event, the facility director noted the potential problem and reported it to the NRC on October 25, 1990. The licensee investigated the event and determined that there was no compromise to reactor safety and no danger posed to personnel from receiving excessive radiation doses. The problem was determined to be administrative in nature and the procedure was subsequently changed to eliminate the requirement that the blade interlock checks be performed prior to every startup after the 8 hour limit on the daily checkout is exceeded. Even though this was considered to be an administrative problem, all operators were given retraining on the requirements for performing daily checkouts under UFTR SOP-A.2.

Following a review of this event, the inspector determined that this was a violation of the TS 6.3 requirement for operating in accordance with written procedures. However, the inspector indicated that this violation will not be subject to enforcement action because the licensee's efforts in identifying and correcting the violation meet the criteria specified in Section V.G. of the Enforcement Policy (NCV 50-83/92-01-01).

b. Failure to Perform Required Surveillance of a Limiting Safety System Setting (LSSS) on Loss of Secondary Coolant Pump Power

TS 3.2.2(2) requires that tests for (reactor) operability shall be made in accordance with Table 3.2. Table 3.2 requires that loss of secondary coolant well pump power be tested quarterly, at an interval not to exceed 4 months.

Following SRO licensing examinations which were administered on October 2, 1991, the NRC license examiner questioned whether a loss of pump power on secondary deep well cooling would cause a reactor trip as required by TS. The question was raised by the examiner because the SRO candidates seemed to be less than knowledgeable on this point. Because the question could not be readily answered, the licensee performed an evaluation of the surveillance they had been conducting to comply with this requirement. They wanted to verify whether the loss of secondary coolant well pump power caused a trip and whether it had been tested at the required quarterly intervals.

It was determined that the daily checkout of the reactor was the only regular check on the secondary cooling trip where the loss of flow/loss of pump power were checked as one check. However, the trip checks on the primary coolant system involved separate LOW FLOW and Loss of Primary Coolant Pump Power on the quarterly scram surveillance. Therefore, it was decided to implement separate checks on the secondary cooling system also to insure that the most restrictive interpretation of the TS surveillance requirements were met. (When a test was performed, on October 7, 1991, it was determined that removing power to the secondary pump while maintaining secondary flow above the trip point did cause a trip just as low flow caused a trip.)

The event was evaluated by the RSRS and the committee decided that the event should be reported to the NRC. The licensee reported this event to the NRC on October 3, 1991, even though the feeling of the UFTR staff was that the intent of the TS to check both trips was considered to be met by the check of the secondary coolant low flow trip on the daily checkouts. The UFTR staff felt that the one check was valid since a loss of pump power necessarily gives a loss of flow as well.

5.5 Radiation Control Techniques

5.5.1 Radiation Control Technique #1, "Instructions for Performing Swipe Samples:

5.5.2 Radiation Control Technique #4, "Instructions for Performing Radiation Surveys"

6.0 Records Required:

6.1 Shippers Declaration For Dangerous Goods

6.2 Radioactive Waste Shipment and Disposal Manifest

6.3 UFTR Radiation Work Permit (UFTR Form SOP-D.2A)

6.4 UFTR Dosimeter Log

6.5 UFTR Personnel Exposure Records

NOTE: The responsibility for maintaining personnel radiation exposure records remains with the University of Florida Radiation Control Office.

6.6 Swipe Log (Contamination Records)

6.7 Radioactive Shipping Labels (White I, Yellow II and Yellow III) and Placards

6.8 UFTR Form SOP-D.5A, "Radioactive Reactor Waste Shipment Checklist"

6.9 UFTR Form SOP-D.5B, "Notification Records For Radioactive Reactor Waste Shipments".

6.10 UFTR Form SOP-D.5C, "Radioactive Reactor Waste Container Inventory Form"

6.11 UFTR Form SOP-D.5D, "Swipe Sample Analysis Report"

6.12 UFTR Form SOP-D.5E, "Radioactive Waste Shipment Radiation Survey Form"

6.13 UFTR Form SOP-D.5F, "Record of LSA Calculations"

6.14 UFTR Form SOP-D.5G, "DOT Sub-Type Calculations"

6.15 UFTR Form SOP-D.5H, "Typical Shipper's Declaration For Dangerous Goods"

6.16 UFTR Form SOP-D.5I, "Typical Radioactive Waste Shipment & Disposal Manifest".

6.17 UFTR Form SOP-D.5J, "Miscellaneous Survey For Waste Shipment"

7.0 Instructions

7.1 Preliminary Preparations

7.1.1 Assure UFTR management personnel have reviewed the key applicable CFR requirements for waste shipments delineated in Section 4.10 of this procedure.

7.1.2 Arrange radioactive reactor waste shipment with a carrier and obtain Shipment Manifest Number (if required); this step should be accomplished at least 10 days prior to the planned shipment date.

NOTE: This arrangement can be made through the Radiation Control Office upon request.

7.1.3 Make prior notification of waste shipment to State of Florida HRS per 10 D-91.2009 at (305) 297-2095; record notification information on UFTR Form SOP-D.5B contained in Appendix I to include:

7.1.3.1 Name of person contacted at Health and Rehabilitative Services(HRS), phone number and date contacted

7.1.3.2 Name, address, phone number of generator (UFTR)

7.1.3.3 Contact person for generator (UFTR Manager, Facility Director, or Radiation Control Officer)

7.1.3.4 Name and phone number of carrier

7.1.3.5 Florida permit number of carrier

7.1.3.6 Burial Site or Waste Processor Radioactive Material License

7.1.3.7 Location of departure (UFTR West Lot)

7.1.3.8 Scheduled date and time of departure

7.1.3.9 Proposed route to be taken by carrier

7.1.4. Establish a radioactive reactor waste packaging preparation area, preferably within the reactor cell;

7.1.5 Obtain one or more appropriate shipping containers (normally approved Type 17-H steel drums) for reactor waste;

7.1.6 Assemble the necessary portable survey instrument(s), paper swipes, dosimeters, stepoff pad, etc.;

7.1.7 Obtain appropriate liners for waste containers (the minimum thickness for such waste containers is a 4 mil polyethylene liner);

7.1.8 Obtain waste packaging/spacing material as approved by the Radiation Control Officer;

7.1.9 Open a Radiation Work Permit (Level I or Level II as appropriate per SOP-D.2) to control waste preparation;

7.1.10 Assure that packaging of waste has been authorized by the Director of Nuclear Facilities and the Radiation Control Officer.

7.2 Waste Packaging Activities

7.2.1 Assure that the Reactor Manager or his designated alternate and a representative of the Radiation Control Office are present during packaging of reactor waste;

7.2.2 Assure all unnecessary personnel are removed from the UFTR cell;

7.2.3 Secure all reactor cell doors;

7.2.4 Package the waste in approved containers via the following steps:

7.2.4.1 Fill the bottom of the container with approximately 4 inches of absorbent material.

7.2.4.2 Make an inventory of the radioactive material and place the material in the container. Inventory should be recorded on UFTR Form SOP-D.5C (Radioactive Reactor Waste Container Inventory Form); records should indicate principal nuclide(s) and activities placed in the container.

7.2.4.3 Fill all voids around the waste with absorbent material to prevent shifts in container content and cover over top of waste with at least 4 inches of absorbent material.

7.2.4.4 Close liner securely and verify that the gasket is installed in the cover before closing container.

7.2.4.5 Close the container (drum).

7.2.4.6 Install seal on container closing device to provide tamper indication for contents if required.

NOTE: Per 49 CFR 173.412(b) seals are required only for Type A containers shipped in non-exclusive use vehicles not containing LSA material.

7.2.4.7 Mark the container in a manner that will allow positive identification of the container.

7.2.4.8 Repeat Steps 7.2.4.1 through 7.2.4.7 for each waste container to be used; note that a separate UFTR Form SOP-D.5C inventory form is required for each container (drum) packaged.

7.2.4.9 Record number of drums packaged on the space provided on UFTR Form SOP-D.5A.

7.3 Shipping container surveillances:

7.3.1 Assure lids are secure, there is no visible damage, and no visible leakage for each waste container (drum).

7.3.2 Perform a swipe survey on the exterior of each container (drum) following Radiation Control Technique #1; record results on UFTR Form SOP-D.5D contained in Appendix II.

7.3.3 Perform a radiation survey on each container (drum) following Radiation Control Technique #4 and

7.3.3.1 Record results of survey for contact over the entire surface of the container (including bottom) on UFTR Form SOP-D.5E contained in Appendix II.

7.3.3.2 Record results of survey at a distance of 1 meter from the container on all sides (including bottom) on UFTR Form SOP-D.5E contained in Appendix II.

CAUTION

The Radiation Level Limitations in 49 CFR 173.441 shall be strictly followed.

7.3.4 Weigh each filled and closed waste container (drum); record results on UFTR Form SOP-D.5C and on the container (drum).

NOTE: An appropriate scale is available from the University of Florida Radiation Control Office.

7.4 Shipping container material assay analysis, labeling and marking:

7.4.1 Determine the concentration of principal nuclide(s) from the information recorded on the appropriate Radioactive Reactor Waste Container Inventory Form (UFTR Form SOP-D.5C);

7.4.2 Determine whether radioactive waste material is low specific activity(LSA) (see 49 CFR 173.403(n)for the determination). UFTR Form SOP-D.5F, Record of LSA Calculations (in Appendix III) may be used.

7.4.2.1 If material is LSA, label drum as shown in Figure III-1 of Appendix III for exclusive shipments or in Figure III-2 of Appendix III for non-exclusive use shipments and skip to Step 7.5.

7.4.2.2 If material is not LSA, proceed to Step 7.4.3 below.

7.4.3 Determine DOT Sub-type (Limited Quantity, Type A or B Quantities, or Highway Route Control (HRC) Quantity) per 49 CFR 173.421 and 173.431. DOT Sub-type Calculations Sheet (UFTR Form SOP-D.5G in Appendix IV) should be used.

7.4.3.1 If material is Limited Quantity (49 CFR 173.421), label drum as shown in Appendix IV, Figure IV-1;

NOTE: 49 CFR 173.421-1 has additional requirements for excepted radioactive material while 49 CFR 173.421-2 has requirements for multiple hazard limited quantity radioactive materials.

7.4.3.2 If material is Type A or B quantities, label drum as shown in Appendix IV, Figure IV-2;

7.4.3.3.If material meets the special limits of 49 CFR 173.422 (Exceptions for Instruments and Articles), label container as shown in Appendix IV, Figure IV-3;

7.4.3.4 If material meets the definition of Special Form Radioactive Material per 49 CFR 173.403(z), label drum as shown in Appendix IV, Figure IV-4.

7.5 Complete all required shipping papers per 49 CFR 172 Subpart C.

NOTE: The University of Florida Radiation Control Officer shall be consulted to assure proper completion of shipping papers.

7.5.1 A typical Shippers Declaration for Dangerous Goods is provided as UFTR Form SOP-D.5H in Appendix V. This form is not required for all shipments. 49CFR 172.200 provides general requirements and 49 CFR 172.203(d) lists specific items of concern for a radioactive material shipment.

7.5.2 Radioactive Waste Shipment & Disposal Manifest Forms are required for waste shipments. These forms are provided by the broker contracted to haul waste and vary slightly from broker to broker. Each broker provides specific instructions for completing his form. A typical Radioactive Waste Shipment & Disposal Manifest is provided as UFTR Form SOP-D.5I in Appendix V.

7.6 Transfer waste containers (drums) to a carrier or licensed waste processor for transport to a licensed disposal facility.

NOTE: All radioactive reactor waste transfers will be completed to carriers within the west reactor lot.

7.6.1 Assure that prior notification has been made to State of Florida HRS per 10D-9.2009 at (305) 297-2095 (Step 7.1.3 on UFTR Form SOP-D.5A).

7.6.2 Assure a copy of the receiver's license is on file and that the receiver is authorized to receive the radioactive reactor waste container(s) to be shipped.

7.6.3 Secure all entrances to the west reactor lot.

7.6.4 Make Daily Operations Log entry noting access restriction.

7.6.5 Perform such swipe and radiation surveys as are required per 49 CFR 173.441 and 173.443, and record results on UFTR Form SOP-D.5D and UFTR Form SOP-D.5E contained in Appendix II.

7.6.6 Remove waste containers from the cell.

7.6.7 Load containers on the shipping vehicle and assure they are secured for transport; make Daily Operations Log entry noting transfer of waste container(s) to carrier.

7.6.8 Assure shipping vehicle has proper placarding per 49 CFR Part 172(Subpart F - Placarding; Part 172.556).

7.6.9 Perform radiation survey of transportation vehicle if waste is shipped on an exclusive use vehicle per 49 CFR 173.441; record results on UFTR Form SOP-D.5J.

7.6.10 Assure that Sections I through VII of the checklist have been properly checked off showing all steps are complete.

7.6.11 After receiving authorization from DHRS inspector, release the carrier vehicle; signatures of Reactor Manager and Radiation Control Officer or their designated alternates are required on UFTR Form SOP-D.5A to authorize release.

7.7 Make Notifications concerning reactor waste shipment to include:

7.7.1 Notify State of Florida and Receiving Facility;

7.7.2 Arrange for Accident and Release Notifications;

7.7.3 Assure shipment is received at ultimate disposal facility as expected;

7.7.4 Record receipt on checklist.

7.8 Assure completion of UFTR Form SOP-D.5A, "Radioactive Reactor Waste Shipment Checklist" to include signatures by the Reactor Manager or his designated alternate and the Radiation Control Officer or his designated alternate.

APPENDIX I

UFTR Form SOP-D.5A,	"Radioactive Reactor Waste Shipment Checklist"
UFTR Form SOP-D.5B,	"Notification Records For UFTR Radioactive Waste Shipments"
UFTR Form SOP-D.5C,	"Radioactive Reactor Waste Container Inventory Form"

UFTR FORM SOP-D.5A
RADIOACTIVE REACTOR WASTE SHIPMENT CHECKLIST

7.1 PRELIMINARY PREPARATIONS

7.1.1 Assure Review of Waste Shipment Regulations .... ____

7.1.2 Arrange Shipment With Broker .... ____

7.1.3 Make Prior Notification to HRS and Record on UFTR Form SOP-D.5B .... ____

* 7.1.3.1 Name, phone number, date contacted .... ____

* 7.1.3.2 Name, address, phone number of generator (UFTR Contact) .... ____

* 7.1.3.3 Contact person for generator (Reactor Manager or Facility Director) .... ____

* 7.1.3.4 Name and phone number of carrier .... ____

* 7.1.3.5 Florida permit number of carrier .... ____

* 7.1.3.6 Burial Site/Waste Processor RadMaterial License .... ____

* 7.1.3.7 Location of departure (UFTR West Lot .... ____

* 7.1.3.8 Scheduled date and time of departure .... ____

* 7.1.3.9 Proposed route to be taken by carrier .... ____

7.1.4 Establish Waste Preparation Area .... ____

7.1.5 Obtain Shipping Containers .... ____

7.1.6 Assemble Radiation Protection Equipment .... ____

7.1.7 Obtain Liners for Shipping Containers .... ____

7.1.8 Obtain Approved Waste Packaging Material .... ____

*7.1.9 Open RWP (if appropriate) .... ____

*7.1.10 Assure Packaging Authorized by Facility Director and Radiation Control Officer .... ____

7.2 WASTE PACKAGING ACTIVITIES

7.2.1 Reactor Manager and Rad Con Representative Present .... ____

7.2.2 Remove All Unnecessary Personnel .... ____

7.2.3 Secure All Cell Doors .... ____

7.2.4 Package Waste .... ____

7.2.4.1 Fill Bottom of Container .... ____

*7.2.4.2 Inventory Container Material on UFTR Form SOP-D.5C .... ____

7.2.4.3 Fill Voids and Top of Container .... ____

7.2.4.4 Close Liner, Verify Gasket Installed .... ____

7.2.4.5 Close/Seal Drum .... ____

*7.2.4.6 Install Tamper Indicating Seal (If Required) .... ____

*7.2.4.7 Mark The Container For Later ID .... ____

7.2.4.8 Repeat Steps 7.2.4.1-7.2.4.7 as necessary for each container .... ____

**7.2.4.9 Record Number of Drums Packaged .... ____

7.3 SHIPPING CONTAINER SURVEILLANCES

7.3.1 Assure Integrity of Drums .... ____

*7.3.2 Perform Swipe Survey(UFTR Form SOP-D.5D) .... ____

*7.3.3 Perform Radiation Surveys(UFTR Form SOP-D.5E) .... ____

*7.3.4 Weigh Each Container; Record Results on Inventory Form SOP-D.5C .... ____

7.4 MATERIAL ASSAY ANALYSES

*7.4.1 Determine Conc. of Principal Nuclide(s) .... ____

*7.4.2 Determine Whether (UFTR Form SOP-D.5F) Waste Material is LSA and Label Drum(if applicable) ..... ____

*7.4.3 Determine DOT Sub-Type for Waste Material (UFTR Form SOP-D.5G) and Label Each Drum (if applicable) .... ____

7.5 SHIPPING PAPERS

*7.5.1 Complete Shipper's Declaration For Dangerous Goods (UFTR Form SOP-D.5H) .... ____

*7.5.2 Complete Radioactive Waste Shipment & Disposal Manifest(UFTR Form SOP-D.5I) .... ____

7.6 WASTE CONTAINER TRANSFER

7.6.1 Assure Prior Notification to HRS .... ____

7.6.2 Assure Burial Site/Waste Processor License Authorizes Receipt of Waste .... ____

7.6.3 Secure West Reactor Lot .... ____

*7.6.4 Record Access Restriction in Daily Operations Log .... ____

*7.6.5 Perform Final Swipe and Radiation Surveys .... ____

7.6.6 Remove Waste Containers From Cell .... ____

*7.6.7 Load Containers and Record in Daily Operations Log .... ____

7.6.8 Assure Proper Placarding of Carrier Vehicle .... ____

*7.6.9 Perform Radiation Survey of Carrier Vehicle If Exclusive Use .... ____

7.6.10 Assure Previous Sections are Complete .... ____

**7.6.11 Authorize Release .... ____________/____________

7.7 NOTIFICATIONS OF WASTE SHIPMENT

7.7.1 Notify State of Florida/Delivery Facility .... ____

7.7.2 Arrange For Accident/Release Notifications .... ____

7.7.3 Assure Proper Receipt For Disposal .... ____

7.8 FINAL CHECK OF WASTE SHIPMENT RECORDS

7.8.1 Reactor Manager/Date .... ____

7.8.2 Radiation Control Officer/Date .... ____

* These items require information to be recorded and attached to this form for storage in UFTR files.

** These items require numerical or other actual entry on this form.

Reactor Manager/Facility Director	Date	Rad Con Officer	Date

UFTR FORM SOP-D.5B

NOTIFICATION RECORDS FOR UFTR RADIOACTIVE WASTE SHIPMENTS

7.1.3 Records of Prior Notification Given To State of Florida

7.1.3.1 Name of HRS Contact/Phone Number/Date Contacted: ______________________

____

7.1.3.2 Name/Address/Phone Number of Generator: ______________________

____

7.1.3.3 Contact Person For Generator: ______________________

7.1.3.4 Name/Phone Number of Carrier: ______________________

7.1.3.5 Florida Permit Number of Carrier: ______________________

7.1.3.6 Burial Site/Waste Processor
Radioactive Material License: ______________________

7.1.3.7 Location of Departure: ______________________

7.1.3.8 Scheduled Date/Time of Departure: ______________________

7.1.3.9 Proposed Route To Be Taken By Carrier: ______________________

____

7.7 Records of Post Shipment Notification

7.7.1 State of Florida Contact: ______________________

7.7.2 Ultimate Disposal Facility Contact: ______________________

7.7.3 Arrange for Accident/Release Notification: ______________________

7.7.4 Confirmation of Receipt: ______________________

______________________	__________	______________________	__________
Signature For Part 7.1.3	**Date**	**Signature For Part 7.7**	**Date**

UFTR FORM SOP-D.5C

RADIOACTIVE REACTOR WASTE CONTAINER INVENTORY FORM

Container Identification Number	Item Number	Nuclide(s)/Activities

Container Total Weight (lbs): ____________________

APPENDIX II

WASTE CONTAINER SURVEY FORMS

UFTR Form SOP-D.5D,"Swipe Samples Analysis Report"

UFTR Form SOP-D.5E, "Radioactive Waste Shipment Radiation Survey Form"

UFTR Form SOP-D.5D

SWIPE SAMPLES ANALYSIS REPORT

Principal Investigator ______________________ Lab ______________________

Assayed By ______________________________ Date ______________________

The following swipes were taken and assayed for Alpha and/or Beta activity utilizing a:

( ) GAS-FLOW PROPORTIONAL COUNTER ( ) LIQUID SCINTILLATION SPECTROMETER

α efficiency __________ β efficiency ____________

Each swipe represents approximately 300 sq. cm. of surface being surveyed.

ALPHA-BETA	bkg. _____c/m			ALPHA-BETA	bkg. ______c/m		
Sample Ident.	Net CPM	DPM	Comments	Sample Ident.	Net CPM	DPM	Comments

NOTE: See 173.443 for limits: swipes are over 300 cm^2

NON EXCLUSIVE USE: Beta/Gamma/Some Alpha = 22 dpm/cm^2 or 10^{-5} $\mu Ci/cm^2$
All other Alpha = 2.2 dpm/cm^2 or 10^{-6} $\mu Ci/cm^2$

EXCLUSIVE USE: 10 times above nonexclusive use values

UFTR FORM SOP-D.5E

RADIOACTIVE WASTE SHIPMENT RADIATION SURVEY FORM

OTE: See 49 CFR 173.441 for limits

ON-EXCLUSIVE USE: 200 mr/hr on contact and transport index does not exceed 10.

XCLUSIVE USE: 200 mr/hr except may go up to 1000 mr/hr if: closed transport vehicle is used; 200 mr/hr on outer surface of vehicle; 10 mr/hr at 2 meters from outer lateral surfaces of vehicle; and 2 mr/hr in any normally occupied space in the vehicle.

Surveyor: ____________________

Instrument used: ____________________

Last cal date: ____________________

Serial No.: ____________________

LABELS: see 172.403 (unless exempt; LQ or LSA NON-Exclusive use)

BACKGROUND ______________				**BACKGROUND** ______________			
Survey Identification	**On Contact**	**At 1 Meter**	**Label Affixed**	**Survey Identification**	**On Contact**	**At 1 Meter**	**Label Affixed**

APPENDIX III

Form and Figures Applicable

for

LSA Waste Calculation and Labeling

References: 49 CFR 173 Subparts A and B
49 CFR 173.401-173.448

RECORD OF LSA CALCULATIONS

(WEIGHT ______ LBS.)

NUCLIDE	STEP 1 ACTUAL ACTIVITY IN MCI	STEP 2 ACTUAL ACTIVITY IN CI	STEP 3 A 2 CI	STEP 4 LSA LIMIT MCI/GRAM	STEP 5 CONVERT LBS. TO GRAMS 454g/lb.	STEP 6 SP. ACT. STEP 1 / STEP 5	STEP 7 IS IT LSA? STEP 6 / STEP 4	STEP 8 TYPE A or B? STEP 2 / STEP 3
							Σ	Σ

STEP 1. CONVERT ACTIVITY TO MCI IF GIVEN IN CI.
STEP 2. CONVERT ACTIVITY TO CI IF GIVEN IN MCI.
STEP 3. DETERMINE A 2 VALUE FOR ALL NUCLIDES. (SEE 173.435)
STEP 4. USE A 2 VALUE TO DETERMINE LSA LIMIT FOR EACH NUCLIDE. (SEE 173.403(n))
STEP 5. CONVERT LBS. TO GRAMS.
STEP 6. DETERMINE SPECIFIC ACTIVITY FOR EACH NUCLIDE BY DIVIDING TOTAL ACTIVITY BY TOTAL GRAM WEIGHT.
STEP 7. DIVIDE STEP 6 (SPECIFIC ACTIVITY) BY STEP 4 (LSA LIMIT), USE THE SUM OF THE FRACTIONS FOR MIXTURES. IF ≤ 1 THEN MATERIAL DOES QUALIFY AS LSA, IF > 1 THEN MATERIAL IS NOT LSA, IT WOULD BE A TYPE A QUANTITY, TYPE B QUANTITY, OR HIGHWAY ROUTE CONTROLLED QUANTITY.
STEP 8. DIVIDE STEP 2 (TOTAL ACTIVITY IN CURIES) BY STEP 3 (A 2 VALUE), USE THE SUM OF THE FRACTIONS FOR MIXTURES, IF ≤ 1 THEN MATERIAL IS LSA TYPE A QUANTITY, IF > 1 THEN MATERIAL IS LSA TYPE B QUANTITY.

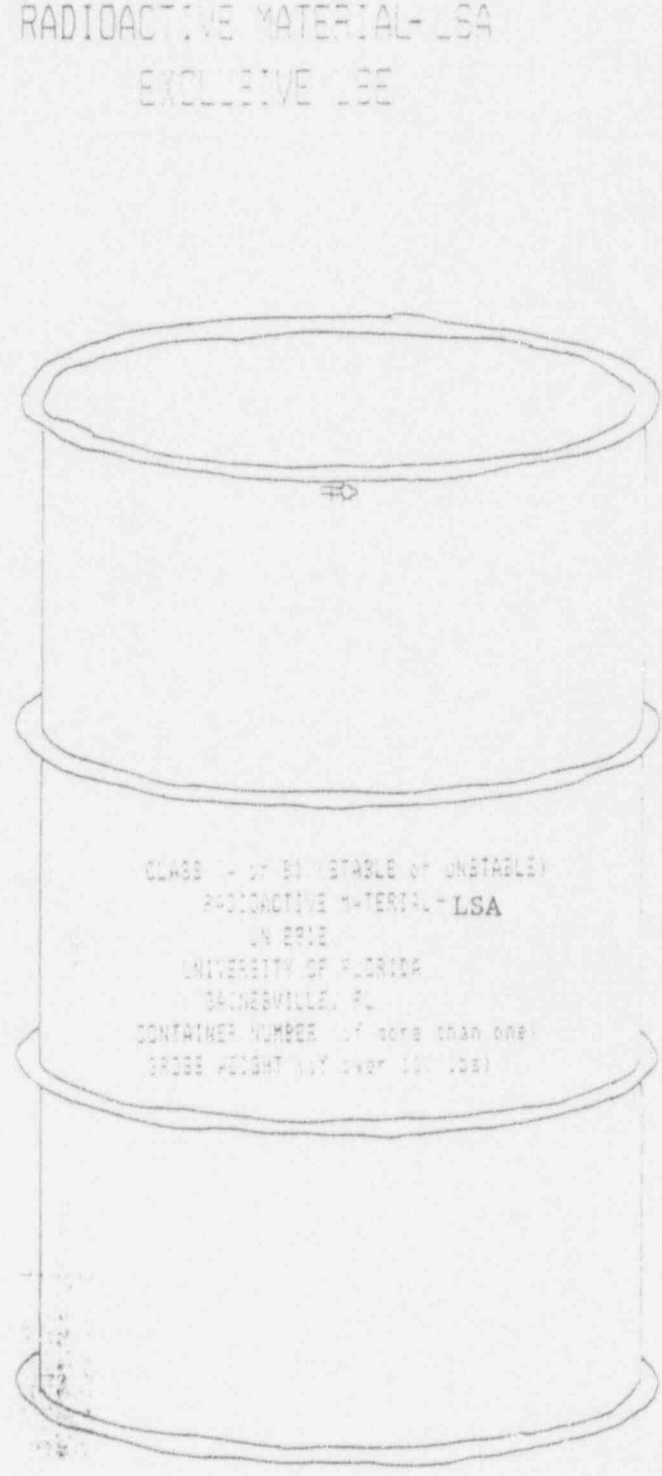
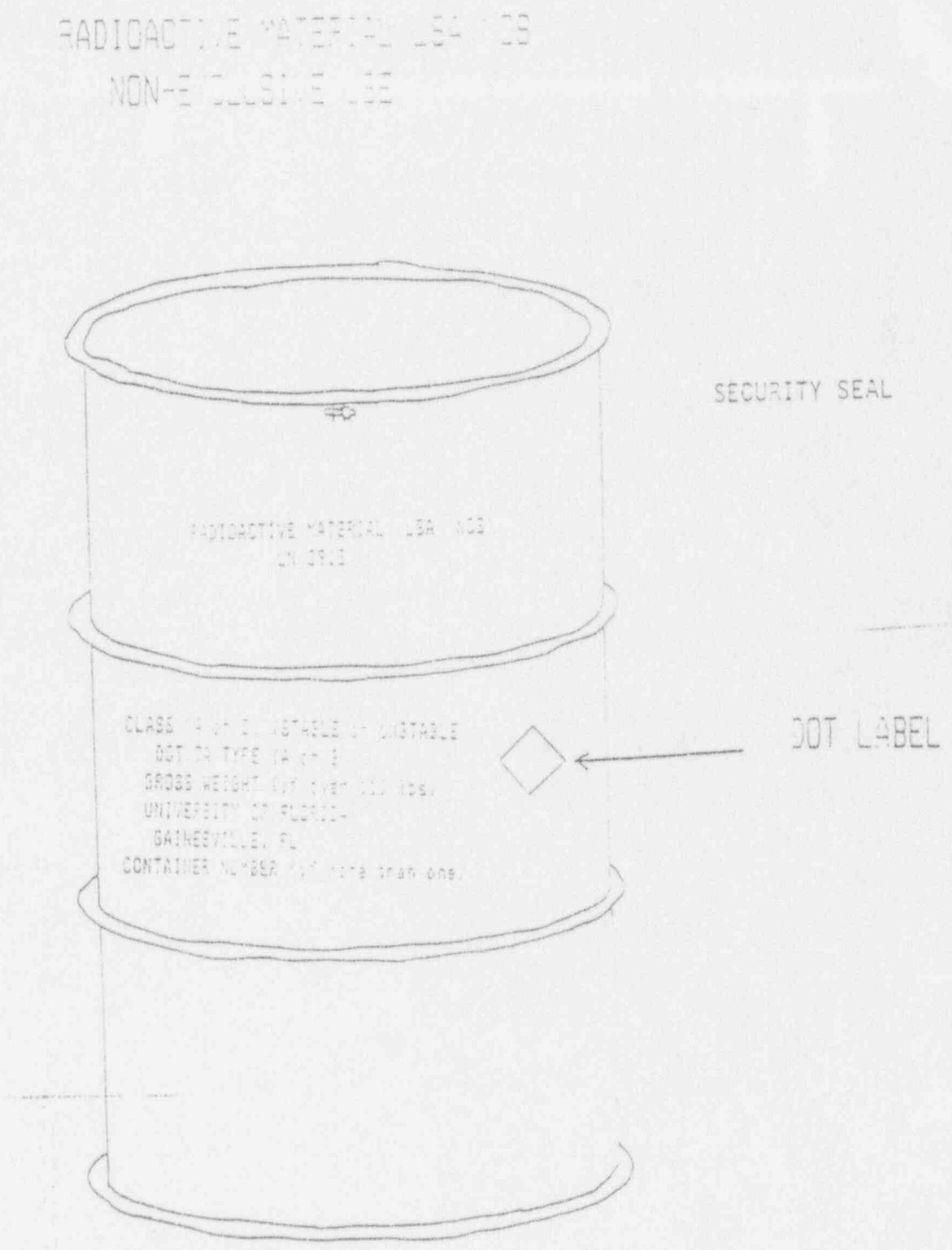


FIGURE III-1. LABELING OF CONTAINERS FOR EXCLUSIVE USE WASTE SHIPMENTS



NOTE: This package is limited to certain activity, see 173.-31.
Type A quantities require Type A package (173.412 and 173.415), Type B quantities require Type b package (173.413 and 173.416)

FIGURE III-2. LABELING OF CONTAINERS FOR NON-EXCLUSIVE USE WASTE SHIPMENTS

APPENDIX IV

Form and Figures Applicable

for

DOT Sub-Type Waste Calculations and Labeling

References: 49 CFR 173 Subparts A and B
49 CFR 173.401-173.448

DOT SUB-TYPE CALCULATIONS PER PACKAGE

NUCLIDE(S)	STEP 1 ACTUAL ACTIVITY IN Ci	STEP 2 A_1/A_2 VALUE TYPE A QTY LIMIT	STEP 3 LIMITED QTY LIMIT $A_1/A_2 X 10^{-3}$ *SEE NOTE	STEP 4 IS IT LIMITED QTY? $\frac{\text{STEP 1}}{\text{STEP 3}} \leq 1$	STEP 5 IS IT TYPE A QTY? $\frac{\text{STEP 1}}{\text{STEP 2}} \leq 1$	STEP 6 HRCQ MINIMUM LIMIT 3000 X A_1/A_2 OR 30000 Ci WHICHEVER IS LESS	STEP 7 IS IT A TYPE B QTY OR A HRC QTY $\frac{\text{STEP 1}}{\text{STEP 6}} \leq 1$ = B $\frac{\text{STEP 1}}{\text{STEP 6}} > 1$ = HRCQ
				Σ	Σ		Σ

STEP 1. ENTER ACTUAL ACTIVITY IN CURIES OF MATERIAL YOU ARE TRYING TO CATERGORIZE.

STEP 2. DETERMINE A_1 VALUE IF SPECIAL FORM, A_2 VALUE IF NORMAL FORM FOR EACH NUCLIDE. (SEE 173.435 or 173.433)

STEP 3. USE A_1/A_2 VALUE AND MULTIPLY TIMES 10^{-3} TO DETERMINE THE LIMITED QUANTITY LIMIT. *NOT FOR LIQUIDS, TRITIUM GASES TRITIUM IN ACTIVATED LUMINOUS PAINT, AND TRITIUM ABSORBED ON A SOLID CARRIER SEE 173.423, TABLE 7.

STEP 4. DIVIDE STEP 1 (ACTUAL ACTIVITY) BY STEP 3 (LIMITED QUANTITY LIMIT), USE SUM OF THE FRACTIONS FOR MIXTURES, (173.433(b)(3)), IF $\leq$ 1 THEN MATERIAL QUALIFIES AS A LIMITED QUANTITY BY ACTIVITY, IF > 1 GO TO STEP 5.

STEP 5. DIVIDE STEP 1 (ACTUAL ACTIVITY) BY STEP 2 (TYPE A QUANTITY LIMIT), USE SUM OF THE FRACTIONS FOR MIXTURES, (173.433(b)(3) IF $\leq$ 1 THEN MATERIAL QUALIFIES AS A TYPE A QUANTITY, IF > 1 GO TO STEP 6.

STEP 6. DETERMINE HIGHWAY ROUTE CONTROLLED QUANTITY MINIMUM LIMIT BY MULTIPLYING 3000 X A_1/A_2, OR USE 30000 CURIES FOR NUCLIDE WITH AN A_1/A_2 VALUE OF 10 CURIES OR GREATER. (SEE 173.403(1))

STEP 7. DIVIDE STEP 1 (ACTUAL ACTIVITY) BY STEP 6 (HRCQ MINIMUM LIMIT), USE SUM OF THE FRACTIONS FOR MIXTURES, IF $\leq$ 1 THEN MATERIAL QUALIFIES AS A TYPE B QUANTITY, IF > 1 THEN MATERIAL QUALIFIES AS A HRCQ.

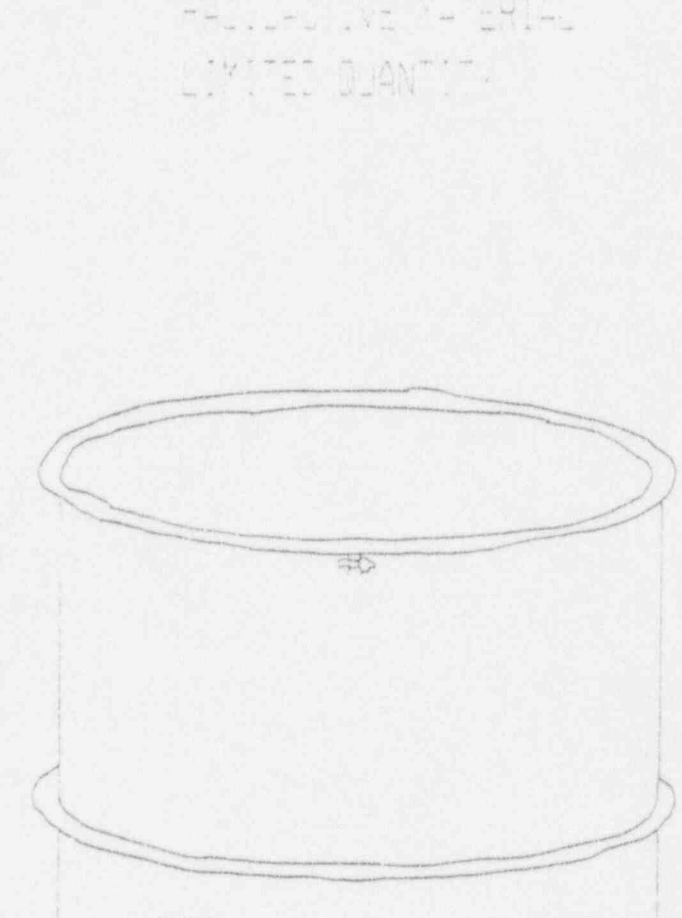
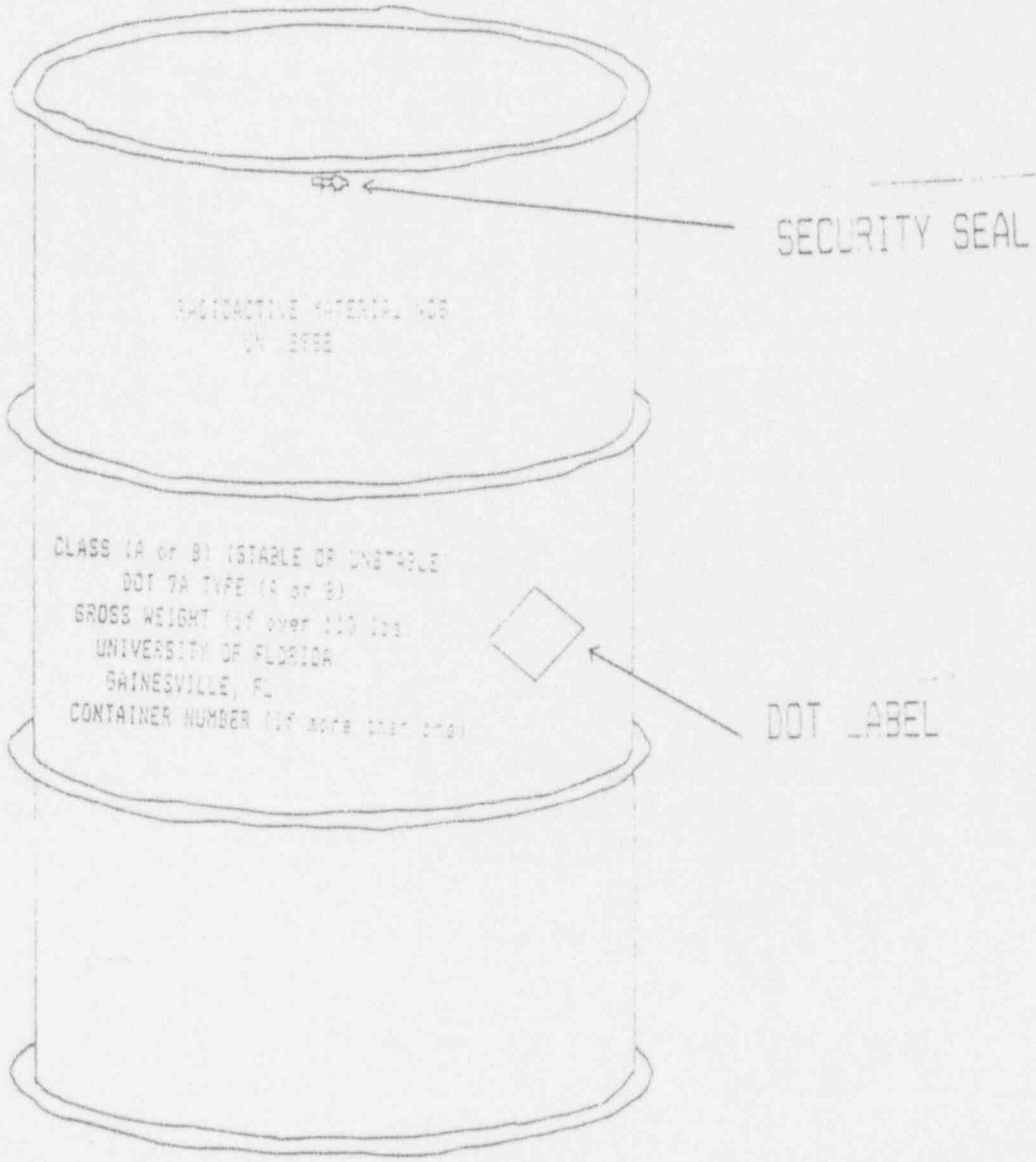


FIGURE IV-1

RADIOACTIVE MATERIAL NOS



NOTE: This package is limited to certain activity, see 173.431.
Type A quantities require Type A package (173.412 and 173.415), Type B quantities require Type B package (173.413 and 173.416)

FIGURE IV-2

RADIOACTIVE MATERIAL
INSTRUMENTS AND ARTICLES

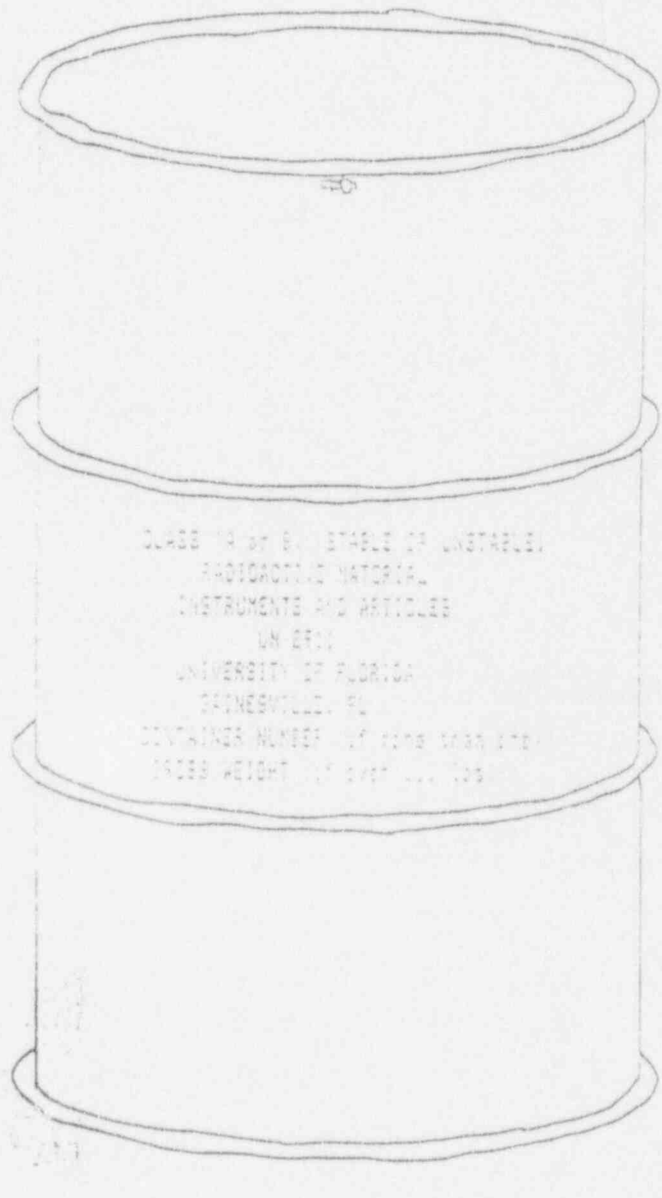
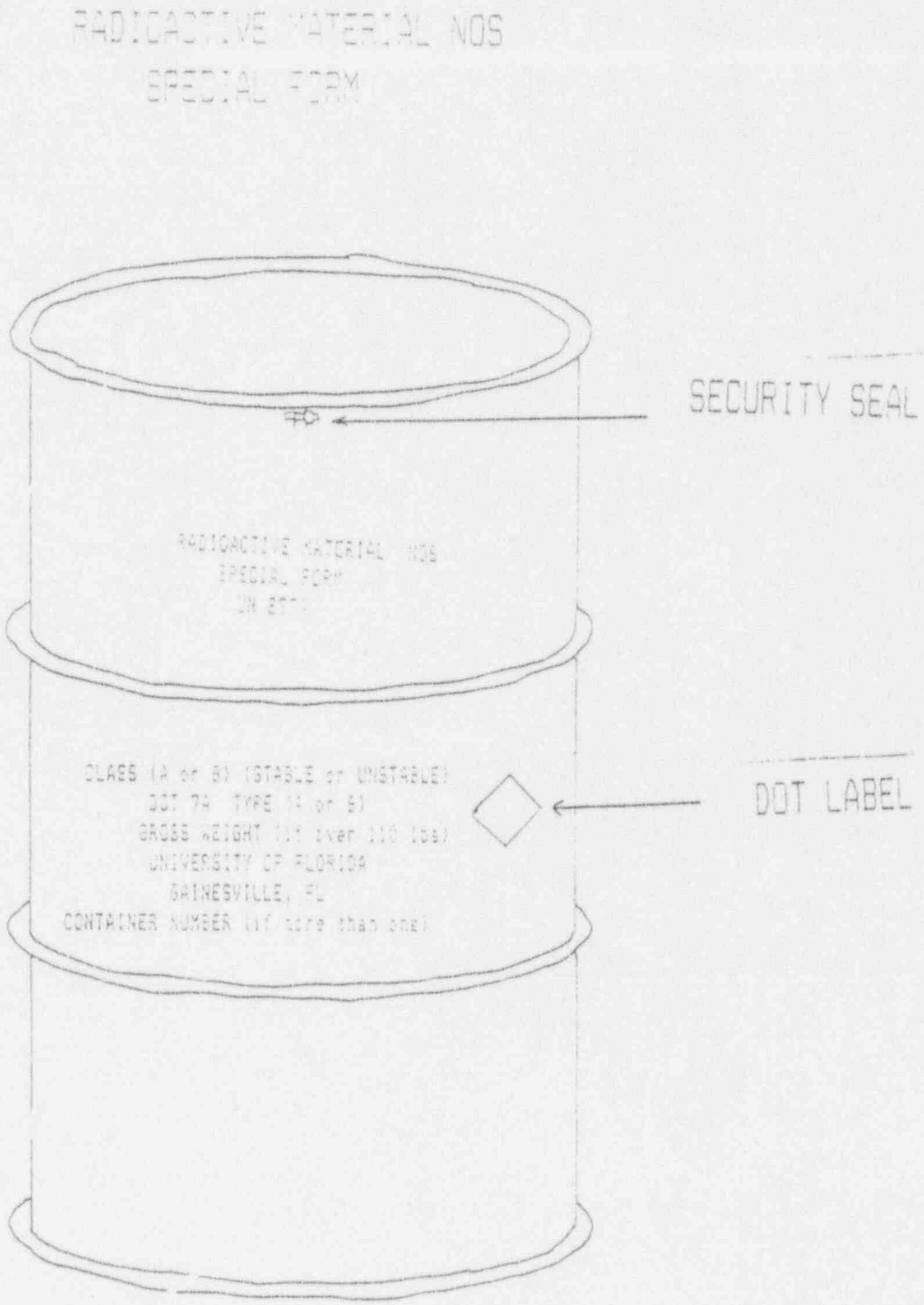


FIGURE IV-3



NOTE: This package is limited to certain activity, see 173.431.
Type A quantities require Type A package (173.412 and 173.415), Type B quantities require Type B package (173.413 and 173.416)

FIGURE IV-4

APPENDIX V

Shipping Paper Forms

for Radioactive Reactor Waste

UFTR Form SOP-D.5H, "Typical Shippers's Declaration For Dangerous Goods"

UFTR Form SOP-D.5I, "Typical Radioactive Waste Shipment & Disposal Manifest"

UFTR FORM SOP-D.5H

TYPICAL SHIPPER'S DECLARATION FOR DANGEROUS GOODS

Shipper

Consignee

[redacted]

Five completed and signed copies of this Declaration must be handed to the operator.

TRANSPORT DETAILS

Airport of Departure

[redacted]

Airport of Destination

WARNING

Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must not, in any circumstances, be completed and/or signed by a consolidator, a forwarder or an IATA cargo agent.

[redacted] RADIOACTIVE

NATURE AND QUANTITY OF DANGEROUS GOODS

Dangerous Goods Identification

Additional Handling Information

This shipment prepared according to: ☐ 49CFR ☐ IATA Regulations

I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labelled, and are in all respects in the proper condition for transport by air according to the applicable International and National Government Regulations.

Name/Title of Signatory

Place and Date

Signature
(see warning above)

Form OP - 30 JAN 1983

DESTINATION COPY

TYPICAL RADIOACTIVE WASTE SHIPMENT & DISPOSAL MANIFEST

GENERATOR NUMBER

GENERATOR NAME

ADDRESS

CITY STATE ZIP

CONTACT PHONE

USEA PERMIT # SHIPMENT #

BILL DISPOSAL CHARGES TO:

NAME

ADDRESS

CITY ST PURCHASE ORDER #

MANIFEST NO.

DATE

TOTAL FOR EACH CLASS		PROPER SHIPPING NAME & HAZARD CLASS
# OF PACKAGES	WEIGHT (Pounds)	
		Radioactive Material, empty packages
		Radioactive Material, fissile, n.o.s. — Radioactive Material
		Radioactive Material, low specific activity, n.o.s. — Radioactive Material
		Radioactive Material, n.o.s. — Radioactive material
		Radioactive material, limited quantity, n.o.s. — Radioactive Material
		Radioactive material, special form, n.o.s. — Radioactive Material
		Radioactive Material, instruments and articles — Radioactive Material
		Thorium Nitrate — Radioactive material
		Uranyl Acetate (RQ 5000/2270) — Radioactive Material
		Uranyl Nitrate, Solid (RQ 5000/2270) — Radioactive Material

SHIPMENT TOTALS

VOLUME cu. ft.	TOTAL # OF PACKAGES	SOURCE MATERIAL kgs	SPECIAL NUCLEAR MATERIAL (grams)			
			U-233	U-235	PLUTONIUM	[illegible]

SUPPLIES DELIVERED

ACTIVITY

NOTE #1 Waste Description Codes

1. Vials
2. Dry Solid
3. [illegible]
4. Biological
5. [illegible]
6. [illegible]
9. Solidified Resins
10. Absorbed Aqueous Liquid
11. Absorbed Scintillation Liquid
99. Other

* ANY USE OF "OTHER" AS A DESCRIPTION MUST INCLUDE A WRITTEN AND SIGNED EXPLANATION ATTACHED TO THIS MANIFEST

NOTE #2 Solidification/Absorbent Media Codes

1. Diatomaceous Earth
2. Speedi Dry
3. Cabosil
4. [illegible]
5. [illegible]
6. [illegible]
7. Instant Dri
8. Safe T Sorb
9. [illegible]
10. [illegible]
11. [illegible]
12. Cement
13. Asphalt
14. [illegible]
15. [illegible]
99. Other

Customer represents and warrants that data set forth in this Radioactive Waste Shipment & Disposal Manifest is true and correct in all respects.

I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

APPENDIX F

APPENDIX VI

Radiation/Contamination Survey Form

For

Carrier Vehicle

UFTR Form SOP-D.5J,

"Miscellaneous Survey For Waste Shipment: Box Trailer"

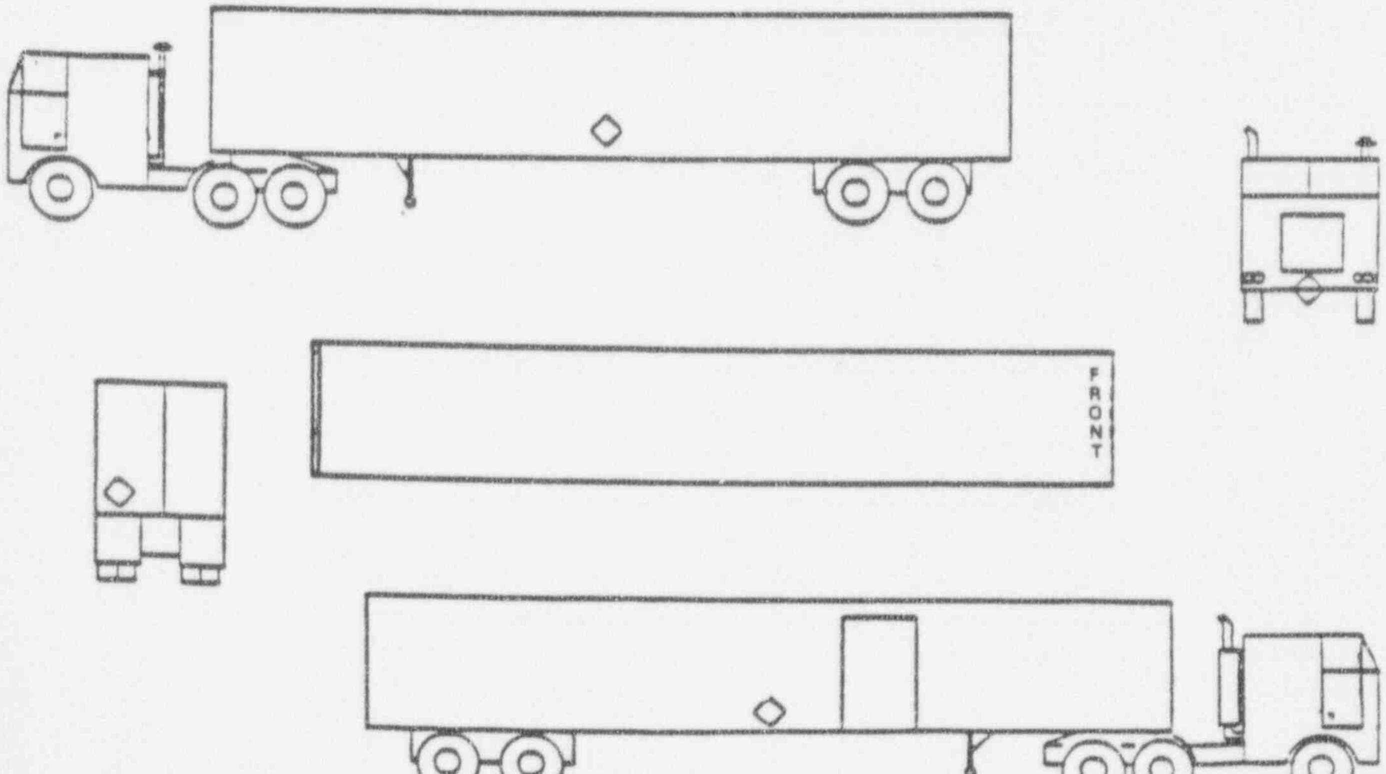
UFTR Form SOP-D.5J

MISCELLANEOUS SURVEY FOR WASTE SHIPMENT
Box Trailer

Survey Number	Date & Time	Technician
CONTAMINATION	Scaler	BKG.

DOSE RATE				
Instrument Type (1) ☐ NA	Instrument Type (2)	Contact (mr/hr)	Six Foot (mr/hr)	Trailer Number
Serial Number (1) ☐ NA	Serial Number (2)	Three Feet (mr/hr)		

NO.	NET CPM	DPM/100 CM 2	INIT.	NO.	NET CPM	DPM/100 CM 2	INIT.	NO.	NET CPM	DPM/100 CM 2	INIT.



8.3.4 Shands Teaching Hospital and Clinics

The Shands Emergency Room handles all emergency cases and is also a designated radiation accident emergency facility with the capability of handling radiation exposed and contaminated victims. This facility previously served as the designated radiation accident emergency facility for the Crystal River 3 nuclear power plant on the coast of Florida about 75 miles away. Although this facility no longer serves as such a radiation accident emergency facility for the Crystal River Facility, it maintains the capability to address the handling of radiation exposed or contaminated victims as outlined in its Plan for Emergency Handling of Radiation Accident Cases included as Appendix I to the UFTR Emergency Plan. Shands is a regional resource facility for handling radiation accident-related cases, even as a backup to the primary facility for the Crystal River Plant should a major accident occur.

8.3.5 Other Medical Support

All conceivable medical assistance requirements can be supplied by Shands Teaching Hospital and Clinics so that assurance of services from off-site agencies is unnecessary.

8.4 Communication Equipment

The Decontamination Room (Room 108 NSC) outside the UFTR building is equipped with a normal telephone for primary communications(904-392-1428). Shands Hospital has a red emergency phone which is to be used to notify Shands directly of radiation accident or other victims about to be transported and to keep proper records on such personnel. Walkie-talkies are used for communicating with support groups around the facility, using Physical Plant frequency. The UPD will be the primary communication center and can provide communications assistance via portable, hand-held radio equipment. If Civil Defense actions are warranted, then they become the primary control center and direction/communications originate from this office.

The UFTR Building intercom system links the reactor control room, the facility director's office and the operating staff office for internal communications. Telephones also connect various areas of the UFTR Building to the control room, main Nuclear Engineering office and the outside. Word-of-mouth communications will provide back-up for internal communications.

Table 10.1

Maintenance and Calibration Schedule for Radiation Detection and Measuring Equipment

Equipment	Frequence	Basis
Reactor Safety Systems*	Variable	Technical Specifications
Area Radiation Monitors	Quarterly	Technical Specifications
Stack Monitor	Quarterly	Technical Specifications
Air-Particulate Monitor	Quarterly	Technical Specifications
Evacuation Alarm	With Weekly Checkout	Technical Specifications
Stack Vent and Air Conditioning Interlock with Evacuation Alarm	With Daily Checkout	Technical Specifications
Portable Detectors	Quarterly	Radiation Control Procedures and NRC Requirements
Spectrometers and Fixed Counting Equipment	Quarterly	Radiation Control and NRC Requirements
Environmental Monitoring Devices (Film Badges and TLDs)	Monthly	Technical Specifications

*See Table 10.2

Table 10.3

Decontamination Room

Emergency Equipment Inventory

The followng listing details the mnimum emergency equipment available in the Emergency Support Center (Rooms 106/108 NSC)

Item	Quantity Required
Self Contained Breathing Apparatus	2
Respirator with spare filters	2
Pair full cover shoes	2
Cotton hoods	2
Anti-C coveralls	2
Pair waterproof coveralls	2
2 in. roll masking tape	1
Pair cotton gloves	2
Pair rubber gloves	2
High level dosimeters	2
Low level dosimeters	2
Dosimeter charger	1
*Telector or equivalent(High level survey meter)	1
*E-140 or equivalent(Low level survey meter)	1
D-Cell batteries	4
Walkie-Talkie Radios(Recommended Only)	2

Note: Starred items are in the Emerengency Support Center(Room 108 NSC); remainder of items are on the Emergency Equipment Cart in Room 106 NSC adjacent to and readily available to Room 108 NSC except for the Walkie-Talkie Radios kept in the locker in Room 106 NSC to assure operability.

APPENDIX G

UFTR SAFETY ANALYSIS REPORT
REVISION 7
DOCUMENTATION

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

W.G. Vernetson, Director
NUCLEAR REACTOR BUILDING
Gainesville, Florida 32611
Phone (904) 392-1429 - Telex 56330

April 3, 1992

UFTR Safety Analysis Report
Revision 7, 4/92

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

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Gentlemen:

The enclosed package contains Revision 7 pages for the UFTR Safety Analysis Report dated January, 1981 submitted as part of our relicensing effort. Revision 7 consists of changes to two pages. The revision has resulted from the need to make certain minor changes in the descriptions of the resins used in the primary coolant system demineralizer and makeup water system demineralizer as well as the need to make a change in the secondary cooling system pump. All changes have been reviewed by UFTR management and the UFTR Safety Review Subcommittee and are not considered to involve any unreviewed safety question or to impact the UFTR Safety Analysis as outlined below; all text changes are denoted by vertical lines in the right hand margin of the attached affected replacement pages. Reasons for all text changes are explained in the following paragraphs.

The first change is included on Page 5-8 to allow the use of an equivalent deep well pump per the slightly changed description in Section 5.2 describing the UFTR Secondary Cooling System. This change to a more efficient pump was necessitated by the failure of the previous pump in February, 1992 and the unavailability of an exact replacement; it was evaluated and determined not to involve any unreviewed safety questions per 10 CFR 50.59 Number 92-01.

The second change is included on Page 9-6 because the Amberlite IRN-150, nuclear-grade resins specified for use in the Demineralized Water Makeup System and the primary coolant Purification System are no longer available. These systems were converted to utilizing equivalent Purolite NRW-37 resins in January, 1991; however, the changes in Section 9.2.3 and Section 9.2.4 are included to allow the use of any equivalent resin. In this way any future substitution can be made following an in-house evaluation of equivalency. This change was evaluated and determined not to involve any unreviewed safety question per 10 CFR 50.59 Number 91-01.

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As indicated, these Revision 7 changes have been fully reviewed by UFTR Management and the Reactor Safety Review Subcommittee to involve no unreviewed safety question per 10 CFR 50.59 evaluations and determinations and so are not considered to relax the requirements for assuring protection of the health and safety of the public and of the reactor facility. The changes simply update the SAR.

The entire enclosure consists of one(1) signed original letter of transmittal with enclosure plus ten(10) copies of the entire package. If further information is required, please advise.

Sincerely,

William G. Vernetson

William G. Vernetson
Associate Engineer and
Director of Nuclear Facilities

WGV/p
Enclosures
cc: U.S. NRC Region II
R. Piciuilo
Reactor Safety Review Subcommittee

Jean Mirham — 4/3/92
Notary — Date

5.2 Secondary Cooling System

A system schematic diagram of the secondary cooling system of the UFTR is shown in Figure 5-5. This figure depicts two sources of water for this secondary cooling system: the deep rock well, used during principal operation; and the city water used as a back-up system during operation above 1 kW (thermal). The well water is pumped by a submersible, 10 horsepower pump. The nominal design specifications of this pump are as follows:

Manufacturer:	Goulds Pumps, Inc.
Pump Series:	225 GPM Series H, 10 H.P.
Pump Model:	3 stg. Model 225H103F
Operation/Control:	Pump on-off from the reactor console

The deep well is 238 ft. deep with a casing diameter of 3", the static water level is approximately 87 ft. below grade. The well pump has approximately 200 gpm pumping capacity for this arrangement. The well water flows through a basket strainer, with a stainless steel mesh of approximately 1/16". This water flows into the shell side of the heat exchanger and subsequently into the storm sewer as depicted in Figure 5-5.

There is a sample flow valve in the heat exchanger discharge line which continuously bleeds a small sample flow into the hold-up sample tank. A second sample valve normally kept closed is used for actual sample collection.

5. Demineralizer,

6. Sampling valve.

This test tank is primarily used for experimental purposes. If necessary, the tank can be drained and lifted out of the way with the bridge crane. All water drained from this tank will go directly to the reactor sink and the holdup tanks where it will be monitored. It will then be released to the University of Florida Sanitary Sewage System if, as expected, the activity level is below those established by the Radiation Control Office. If activity levels exceed those established by the Radiation Control Office, then the water will be held up in the reactor sink until activity levels have decayed sufficiently to allow release.

9.2.3 Demineralized Water Makeup System

Demineralized water is used as makeup to the primary coolant system. The makeup system consists of two demineralizers in series that are filled with Amberlite IRN-150, Purolite NRW-37 or other equivalent nuclear-grade resin as is the demineralizer in the primary loop. The unit has a hose with a connection that can be made to the primary tank when water is needed. As indicated, the schematic of the makeup system is shown in Figure 9-1. The makeup connection for the primary system is found on the side of the coolant storage tank, and is located on the top of what is called the "ice chute."

9.2.4 Purification System

The purification loop is provided with a separate pump in order to maintain a continuous purification flow. The purification pump is interlocked with the primary coolant pump in a manner which shuts off the purification pump when the primary coolant pump is running.

The arrangement of the purification loop provides the system with continuous monitoring of the resistivity of the primary water and the functioning of the Amberlite IRN-150, Purolite NRW-37 or other equivalent nuclear-type resin(H-OH; H control) in the purification system. The in-line, wall-mounted resistivity bridge is set up to accept two conductivity cell signals--one before the demineralizer and the other after the ceramic filter. A schematic diagram of the primary loop purification system is presented in Figure 9-2, showing the feed and bleed nature of the system and its various components.(5)

9.2.5 Potable and Sanitary Water System

The UFTR Building does have potable and sanitary water system connections. Tap water and a utility sink are located in the northwest corner of the reactor cell. A "back flow preventer," as required by the National Plumbing Code, is installed in the city water line ahead of any industrial type use of this water.

9.3 Process Auxiliaries

9.3.1 Compressed Air System

An air compressor and associated system components is located in the Air Conditioner Equipment Room on the north side of the Reactor Building. This system

APPENDIX H

UFTR REACTOR OPERATOR REQUALIFICATION AND RECERTIFICATIONTRAINING PROGRAM FOR JULY, 1991 THROUGH JUNE, 1993

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

W.G. Vernetson, Director
NUCLEAR REACTOR BUILDING
Gainesville, Florida 32611
Phone (904) 392-1429 - Telex 56330

December 26, 1991

Mr. Theodore S. Michaels, Senior Project Manager
Non-Power Reactors, Decommissioning and
Environmental Project Directorate
Division of Advanced Reactors
and Special Projects
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: UFTR Requalification Program

Dear Mr. Michaels:

In response to your letter dated November 13, 1991 asking for responses to eleven(11) questions concerning the UFTR operator requalification program submitted May 31, 1991, we have completely revised the UFTR Operator Requalification and Recertification Training Program Plan to reflect more accurately the program as we have been implementing it. As per our telecom of November 6, 1991, we are and have been in compliance with the new requirements of 10 CFR Part 55 and have decided to completely revise the Plan to reflect this compliance.

Previously this Training Program Plan was updated only by adding items to the Training Schedule in Appendix A. Although a considerable number of items have been added in the past six(6) years to nearly double the number of scheduled training, examination or other sessions, these changes were not reflected in the body of the plan. This is why the Plan as submitted did not appear to meet the new Part 55 requirements while the Plan as implemented has been considered to meet all Part 55 requirements.

Because so many changes were involved to update the body of the Plan and to renumber all Sections in a consistent format, the decision was made to revise the Plan in its entirety. Nevertheless, the opening section and the general order of items are unchanged. The entire new Plan also had to be reentered for storage on disk since it no longer existed on any machine at our facility. In addition, the schedule in Appendix A is rekeyed but the two-year schedule of training sessions and other items in <u>unchanged</u> from that submitted in May, 1991 for the July, 1991 to June, 1993 time period.

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To facilitate your review, the numbered questions posed in your enclosure with the letter of November 13, 1991 are answered here along with reference to the original Plan submitted in May, 1991 and to the appropriate sections of the enclosed UFTR Operator Requalification and Recertification Training Program(Revision 1, 12/91):

Question Number	Answer
1	Yes, the requirements of the revised 10 CFR 55 and the current revision of ANSI/ANS 15.4 are being met as referenced(per Section 0 now labelled Section 1.0, first paragraph).
2	Section IIA of the previous Plan requires covering all but certain security procedures every year. Security procedures not available to the public are covered in Security Plan training conducted biennially. In the revised Plan, see Appendix A where SOP training is scheduled for February, 1992 and April, 1993 with Physical Security Plan Training scheduled once in December, 1992.
3	Yes, a comprehensive written examination is give to all operators biennially; only the exam producer is exempted. This required examination is scheduled for June, 1993 in Appendix A of the original Plan; in the revised Plan it is still scheduled in Appendix A for June, 1993 but the requirement is also delineated in Section 1.2.2.2.
4	No practical examination is given after fuel handling training; all operators are required to perform manipulations with the proper tools, cask and dummy fuel bundles as part of this practical training. The training is evaluated as satisfactory or not satisfactory and documented on training forms found in SOP-0.8. The annual examination on procedures does cover fuel handling procedures and so there is an examination at this point.
5	Yes, OJT is part of the UFTR training program. Though not delineated in the body of the original Plan, certain OJT training requirements are listed on the schedule in Appendix A. In the revised Plan, the same items are listed on the schedule in Appendix A but the requirements are also outlined in the body of the plan in Section 1.3.2.6.

Mr. Theodore S. Michaels
U.S. Nuclear Regulatory Commission
December 26, 1991
Page 3

Question Number	Answer
6	Yes, there is a continuing requirement that a designated Senior Reactor Operator review the training folders/notebooks semiannually. See Section VIII of the original plan and Section 1.9, Paragraph 1 of the revised Plan.
7	Yes, the 10 CFR 55.53(f) requirements are being met and have been met since the new Part 55 was effective. Though not referenced in the original Plan, this requirement is specifically addressed in Section 1.3.2.4 of the revised Plan. The remediation requirements of 10 CFR 55.53(f) in the event the requirements of Section 1.3.2.4 are not met are delineated in Section 1.3.2.5. In addition, the facility monthly reports have referenced the 4-hour requirement for licensed reactor operators since May, 1987 when the new 10 CFR 55 became effective. Since the four-hour requirement was first tracked, the monthly reports indicate continual attention to this requirement.
8	Yes, Section VI A in the original Plan does refer to the two-year licenses allowed prior to March, 1987. However, this meets the requirements for biennial examinations. Currently the biennial evaluations are performed biennially(every two years) per Section 1.6.6 of the revised Plan. There is also a written comprehensive examination administered biennially per Section 1.2.2.2 of the revised Plan; this examination is also referenced in the answer to Question 3.
9	The reason for the differing times is that a nearly passing grade of 65%-79% generally indicates less additional study is required so only 60 days is allowed for retraining while accelerated retraining for grades below 60% is allowed 4 months for completion because of additional time that will be needed for study. These requirements are delineated in Sections 1.6.1.1 and 1.6.1.2 of the revised Plan.
10	In this area of grade requirements and retraining, there is considerable change in the revised Plan, in general using the guidance in ANS/ANSI 15.4. Per Section 1.6.1.3, a 65%-79% grade does not necessitate removal of an operator from licensed duties. Per Section 1.6.1.3, a grade of less that 65% necessitates an evaluation and the individual may be removed from licensed duties. In addition, Section 1.6.4 requires that any deficiency that affects safety shall be promptly remediated.

Question Number	Answer
11	Yes, the operator requalification training records are maintained in auditable form via the individual notebooks and the master training notebook. This requirement is addressed in Section VIII of the original Plan and in somewhat more detail in the revised Plan in Section 1.8.3 for Records Retention and in Section 1.9 for Requalification Document Review and Audit.

We trust that this submittal is complete and will facilitate review of our Training Program Plan. If you have further questions, please let us know.

Sincerely,

William G. Vernetson

William G. Vernetson
Director of Nuclear Facilities

Notary

WGV:p
Enclosure
cc: R. Piciullo
RSRS

OPERATOR REQUALIFICATION AND RECERTIFICATION TRAINING PROGRAM PLAN OF THE UNIVERSITY OF FLORIDA TRAINING REACTOR

July, 1991 through June, 1993

Submitted By

Dr. William G. Vernetson

Director of Nuclear Facilities

Department of Nuclear Engineering Sciences

University of Florida

Gainesville, Florida

December 29, 1991

UNIVERSITY OF FLORIDA TRAINING REACTOR

OPERATOR REQUALIFICATION AND RECERTIFICATION

TRAINING PROGRAM PLAN

(July, 1991 through June, 1993)

1.0 GENERAL

A training program for the periodic requalification of UFTR operators shall be conducted in accordance with the requirements established by this document. The requalification and recertification training for UFTR personnel meets or exceeds the requalification training requirements established by 10 CFR 55 and the ANSI/ANS-15.4-1988 standard entitled, "Selection and Training of Personnel for Research Reactors."

The objectives of this program are to refresh in areas of infrequent operation, to review facility and procedure changes, to address subject matters not usually reinforced by direct use, and to improve in areas of performance or knowledge weakness. The Program is designed to evaluate an operator's knowledge and proficiency for his duties and to provide and assure retraining where necessary in order to assure improvement. Emphasis is on those subjects considered necessary for continued proficiency. In addition, the Program takes into consideration the specialized nature and mode of operation of the UFTR as well as the background, skill, degree of responsibility, and participation of certified personnel in related facility activities. The Program also reflects facility modifications and changes in procedures.

Responsibility for the administration of the program shall rest with the Director of Nuclear Facilities for the Department of Nuclear Engineering Sciences and his/her duly designated representative. Requalification examinations shall be administered by one knowledgeable of facility operation and applicable subject matter.

All licensed and certified operators are required to participate in all phases of this program except where specifically exempted. Normally exemptions are allowed only for the individual responsible to produce and administer the examinations. Persons in training for an operator's license also participate in the requalification program. An operator receiving a license during a requalification period is required to complete only those portions occurring after the effective date of the license received.

The requalification training program effective at the UFTR shall consist of ten(10) component areas described in the following sections and listed in Table 1. The requirements that must be met in order to complete the requalification program successfully are delineated in these sections.

Table 1

Operator Requalification and Recertification Program Requirement Areas

1. Requalification Schedule
2. Lectures, Reviews and Examinations
3. Operations and Checkouts
4. Emergency Drills
5. Absence from Authorized Activities
6. Evaluation and Retraining of Operators
7. Certification
8. Requalification Documentation and Records
9. Requalification Document Review and Audit
10. References

1.1 REQUALIFICATION SCHEDULE

The UFTR requalification and recertification training program shall be conducted biennially and shall be followed by successive two-year programs. To assure that the program is effective, the various requirements should be executed according to the time schedules outlined in this program guide. The current two-year Requalification Training Schedule (July, 1991 - June, 1993) is contained in Appendix A of this Program Plan.

1.2 LECTURES, REVIEWS AND EXAMINATIONS

1.2.1 Lectures

The requalification and recertification training program is divided into the group of topics listed below in Table 2, for which preplanned training or preparation is scheduled. The schedule is set up so that the entire program covering the topics listed in Table 2 is completed over the two year period.

Table 2

Requalification Training Lecture Program Topics

1. Nuclear Theory and Principles of Operation
2. Design and Operating Characteristics
3. Instrumentation and Control Systems
4. Reactor Protection System
5. Normal, Abnormal and Emergency Operating Procedures (all procedures except certain security response procedures are covered once per year minimum, independent of emergency drills)
6. Radiation Control and Safety
7. Technical Specifications and Applicable Portions of Title 10, Code of Federal Regulations.
8. Emergency Plan.
9. Security Plan.

Self-study methods are also considered to be an adequate and appropriate training method for the lecture program topics when learning objectives are properly measured by examination or documentation of expertise. Self-study methods are especially advised in combination with lectures.

1.2.2 Examinations

1.2.2.1 Lecture Program Topics

An examination shall be administered at the end of each lecture session listed in Table 2; each examination should be administered no later than four weeks after the lecture or review session. For designated cases, a final examination covering all topics in a series of lectures may be substituted for individual examinations. Results of the certified individual's evaluation from the examinations is used as one input to determine the operator's proficiency, weakness or deficiency.

Examination is encouraged but not required for training sessions given but not required by this program.

The individual responsible for developing the examinations for the requalification program may be exempted from the examination. This exemption should be rotated among the eligible staff members as appropriate.

1.2.2.2 Biennial Comprehensive Examination

A comprehensive requalification written examination shall be required for all operators on a biennial schedule. A lecture may be given prior to this examination but is not required.

1.2.2.3 Annual Operations Test

Each reactor operator and senior reactor operator is required to take an annual operations test to demonstrate operational proficiency and understanding of system responses. This examination is administered by a designated Senior Reactor Operator.

1.2.2.4 Annual Walk-through Examination

Each licensed Reactor Operator and Senior Reactor Operator shall demonstrate satisfactory understanding of the operation of the facility systems, operating procedures and license as well as facility procedure and license changes during an annual walk-through examination administered by a designated Senior Reactor Operator.

1.2.3 Fuel Handling

Practical training in fuel handling shall be conducted biennially. Prior to any refueling operation and/or fuel handling operation, a special training session shall be held discussing/practicing the required operations and reviewing procedures to assure proficiency of all personnel involved, including emergency actions. This training may be credited as the required biennial fuel handling practical training.

1.2.4 Procedure/Technical Specifications Changes

Any changes in procedures, technical specifications, regulations, as well as any change with safety significance to the facility shall be reviewed by every licensed operator. Any procedural changes will be distributed directly to all licensed reactor operators and discussed as needed. Furthermore, a written monthly report summarizing the activities in the reactor facility, including modifications, maintenance, results of calibrations and tests, as well as significant occurrences such as potential violations, failures of systems, etc. will be made available as required reading for all licensed operators.

1.2.5 Required Reading List

Documents, letters and memos pertinent to operational safety shall be maintained in the Required Reading List prior to permanent filing. Each operator is responsible for reviewing the list periodically and in a timely manner to remain current with the information contained in the Required Reading List. This reading list will be indexed with a master listing with spaces provided for initials of all required readers. This list should be reviewed at intervals not to exceed one month; when an item has been reviewed, the proper initials should be affixed to acknowledge completion of review.

1.2.6 Yearly Review

A yearly review of facility operations, maintenance, modifications, etc. is conducted with the operating staff by the Director of Nuclear Facilities or the Reactor Manager using the UFTR Annual Report as a basis for the review. More frequent reviews may be conducted as appropriate.

1.3 REQUALIFICATION OPERATIONS AND CHECKOUTS

1.3.1 Reactivity Control Manipulations

Over the two year requalification period, each certified individual shall perform at least ten reactivity control manipulations in any combination of reactor startups, shutdowns, or significant reactivity changes.

1.3.2 Schedule of Operations and Checkouts

To insure operator proficiency over a range of ordinary operations, the following schedule of operations and checkouts shall be maintained by all licensed operators when the reactor is operable.

1.3.2.1 Startups and Shutdowns

Each licensed operator shall perform at least one reactor startup quarterly at intervals not to exceed four months. This operation shall include at least one additional reactivity manipulation on a quarterly basis.

1.3.2.2 Daily Checkouts

Each licensed operator shall perform at least one daily checkout quarterly at intervals not to exceed four months.

1.3.2.3 Weekly Checkouts

Each licensed operator shall perform at least one weekly checkout semi-annually at intervals not to exceed eight months.

1.3.2.4 Quarterly Licensed Activities

To maintain certification, each licensed reactor operator shall exercise his/her operator's license for a minimum of four(4) hours of licensed activities during each calendar quarter.

1.3.2.5 Remediation Requirements

Any operator who fails to perform the required licensed activities listed in Section 1.3.2.1 through 1.3.2.4 must receive supervised practical training to meet each of these requirements prior to resuming solo operation for certified activities. In particular, if the requirement to exercise the operator's license for a minimum of four(4) hours of licensed activities during each calendar quarter is not met, then the license becomes inactive; prior to reactivation of the license (recertification), the Reactor Manager or alternate must verify that qualifications are current and the operator must perform six(6) hours of licensed activities under the direction of a licensed operator or senior reactor operator.

1.3.2.6 On-the-Job Training

The specific operational practices delineated in this Training Program Plan including the annual operations test, the annual walk-through examination, and the requirements for conducting facility checkouts, startups, shutdowns, reactivity manipulations including at least four(4) hours of certified activities per calendar quarter constitute the bulk of the operator on-the-job training requirements. In addition, the biennial fuel handling training as well as semi-annual training on emergency response equipment, quarterly emergency drills, and annual special equipment training are also considered a major portion of the practical on-the-job training and are considered adequate to assure safe operation of the facility.

1.3.3 Credit for Reactivity Control Manipulations

For the purpose of meeting minimum requalification and recertification requirements, other than the four(4) hours of licensed activities required per Section 1.3.2.4, each licensed operator may take credit only for reactivity control manipulations which they perform themselves. For senior reactor operators, direct supervision of these operations may be considered equivalent to actual performance.

1.3.4 Records

It is the responsibility of each operator to insure that Requalification Training Program's training requirements are met and logged in the operator's Requalification Notebook. Each operator shall also be responsible to ensure that monthly operating hours are logged in the same notebook.

1.4 EMERGENCY DRILLS

1.4.1 Scheduling and Participation

Emergency drills shall be held quarterly, per UFTR Technical Specifications Section 4.2.6(3). At least once per year these drills shall involve the participation of the University Police Department, the Gainesville Fire Department and other emergency assistance teams as appropriate for the drill in question. Each operator is required to participate in two emergency drills per year at intervals not to exceed eight months.

Any operator failing to meet this two-drill requirement must receive special training on proper response to emergencies and must receive a documented review of the last drill missed as well as a walkthrough of the facility related to proper emergency responses. This remediation shall be conducted prior to performing certified activities.

1.4.2 Postdrill Critique

A review of the drill and applicable emergency procedures shall be performed with all certified individuals within 30 days after completion of the drill. This review should include any deficiencies as well as recommendations for improvement and is normally conducted immediately after the drill for all operators and other staff and radiation control personnel involved in the drill. Nonparticipating certified individuals may perform this review using the drill record in the required reading file or participate in a special training session. Documentation is provided via initials in the Required Reading List or on forms documenting special training sessions.

1.5 ABSENCE FROM AUTHORIZED ACTIVITIES

An operator who has not been actively performing certified functions for a period in excess of four months shall be required to demonstrate to the Reactor Manager or duly authorized representative that his/her knowledge and understanding of the operation and administration of the facility are satisfactory before returning to certified duties. This shall be accomplished through an interview and evaluation or a written, oral or operational examination or a suitable combination thereof. Any deficiencies uncovered must be corrected before the individual resumes performance of certified functions.

1.6 EVALUATION AND RETRAINING OF OPERATORS

1.6.1 Grade Requirements

The acceptance criterion on all graded examinations shall be 80%; all operators are required to complete each examination satisfactorily according to the following requirements:

1.6.1.1 A score on the written or other examinations equal to or greater than 80% may require no additional training. Nevertheless, the results of all examinations to include missed questions should be reviewed with the operator to assure proper understanding.

1.6.1.2 A score on the written or other examination in the range of 65%-79% requires additional training in those areas or topics where weaknesses or deficiencies are indicated. This retraining and retesting shall be completed within 60 days from the date the examination was administered and prior to the candidate being recertified. In this case the candidate need not be removed from licensed duties subject to the evaluation of the Reactor Manager or his/her duly authorized representative.

1.6.1.3 A score on the written or other examination of less than 65% requires that an evaluation be performed by the Facility Director or designated representative within one month. The evaluation shall determine if the deficiencies require that the individual's certification be withdrawn pending completion of any accelerated retraining effort. The evaluation shall take into account the individual's past performance record, the supervisor's evaluation, and past test scores as well as current deficiencies. Additional oral or operational examinations may also be given to aid in the evaluation. In any case certification shall be withdrawn within four months if the candidate does not achieve passing scores after reexamination.

1.6.2 Accelerated Training

Accelerated training programs shall be completed within four months following the grading of an examination. Furthermore, within one month after the grading of the examination, there shall be an evaluation by the Reactor Manager or a designated representative to determine if the deficiencies uncovered warrant withdrawal of the individual's certification pending completion of the accelerated training program. The evaluation shall consider the individual's past performance record, the supervisor's evaluation and past test scores as well as current deficiencies. Additional oral or operational exams may also be given to aid in the evaluation.

1.6.3 Additional Training Requirements

Additional training shall be provided whenever needed to correct weaknesses or deficiencies uncovered. Such additional training shall be completed prior to the conclusion of the specific requalification program or application for renewal of operator's license, whichever occurs first.

Additional appropriate training requirements in the form of formal lectures, tutoring, self-study or on-the-job training shall be based on the results of examinations conducted.

1.6.4 Deficiencies Affecting Safety

Regardless of the score, if the individual's test indicates a deficiency in a critical area that affects safety, training shall be promptly administered to correct the deficiency or the operator will be removed from performing certified duties in the affected area until the deficiency is corrected.

1.6.5 Evaluation Via Annual Examinations

The annual operations test and the annual walkthrough examination are key factors in evaluating the continued competence of the certified operator both for demonstrating operational proficiency and understanding of system responses and for demonstrating overall satisfactory understanding of the operations of the facility, operating procedures and facility license changes. The results of these two examinations should be utilized as primary input for evaluating operator performance for recertification purposes.

1.6.6 Biennial Evaluations

An in-depth evaluation of the operating performance of each licensed operator shall be performed and documented biennially as a minimum by a summary and judgmental statements. The operational evaluation provides an estimate of the knowledge, competence and dexterity of the operator to operate the reactor safely and to take appropriate actions in response to abnormal and emergency situations that may arise. Additional operational training shall be provided to correct performance weaknesses that may be identified.

The biennial evaluation shall include results from the written examinations, the annual operations test, the annual walkthrough examination and other on-the-job evaluation of operational proficiency as well as any other available indications of the operator's capability to discharge his/her duties in a safe and competent manner including participation in practical and special training, instructional activities and other work activities.

1.6.7 Additional Evaluations

An evaluation shall be made of an operator at any time his/her physical or mental condition appears impaired in a manner that his/her performance of duties as an operator appears to be affected. Any exemplary performances or additional duties performed by an operator should be noted in his/her Requalificational Folder/Notebook to aid later evaluations.

1.7 RECERTIFICATION

1.7.1 Certified individuals who have successfully completed the requalification program may be recertified by the Facility Director or designated alternate.

1.7.2 All certified individuals must be cognizant of facility technical specifications, design and procedure changes in a timely manner.

1.8 REQUALIFICATION DOCUMENTATION AND RECORDS

1.8.1 Operator Requalification Records

Operator requalification records shall be kept to assure that all the requirements of the "UFTR Operator Requalification and Recertification Program Plan" are met.

Each operator shall have an individual folder or notebook containing signature blocks for lectures attended, prepared or assigned self-study sessions, reactivity manipulations performed, weekly and daily checkouts performed, and quarterly drills participated in by the operator. The notebook shall also contain copies of written examinations administered, the answers given by the operator, results of any evaluations and documentation of any additional training administered in areas in which an operator has exhibited deficiencies. The performance of, or participation in, special training such as for fuel handling, use of emergency equipment, crane operation, etc., should also be logged in the applicable Requalification Notebook.

1.8.2 <u>Requalification Training Manual</u>

A Master Requalification Training Manual will be used to organize training requirements; this manual shall contain a schedule of all required lectures, reviews, emergency drills, and other exercises. The date the item is performed shall be indicated in this manual. A section of this manual shall be designated to contain completed training items, attendance sheets, master copies of tests given and lecture outlines if available.

A separate section of this manual shall also indicate operator license amendment commitments and the dates for each including relicense dates for all licensed operators.

1.8.3 <u>Records Retention</u>

Required documents and records pertaining to the Requalification and Recertification Program shall be maintained at the UFTR as part of the facility records for at least six years. Per 10 CFR 55.59(5)(i), these records including the master training file shall be retained for each reactor operator or senior reactor operator until the respective operator's license is renewed or surrendered.

1.9 REQUALIFICATION DOCUMENT REVIEW AND AUDIT

The individual Requalification Folders or Notebooks shall be reviewed on a semi-annual basis, at intervals not to exceed eight(8) months, by a designated Senior Reactor Operator and shall be noted by the inclusion of the SRO's dated signature. Any deficiencies noted during the review shall be brought to the attention of the Director of Nuclear Facilities or the Reactor Manager who will then insure that appropriate corrective action is taken.

An audit of requalification program records shall be conducted by the Reactor Safety Review Subcommittee (RSRS) biennially at intervals not to exceed thirty (30) months. Such an audit should be performed annually at intervals not to exceed fifteen (15) months. All such audits shall be documented by the RSRS via its audit report or equivalent document.

1.10 REFERENCES

1.10.1 Title 10 Code of Federal Regulatory Part 55, "Operators' Licenses"

1.10.2 American National Standard ANSI/ANS-15.4-1988," Selection and Training of Personnel for Research Reactors".

APPENDIX A

UFTR REQUALIFICATION

TRAINING PROGRAM SCHEDULE

UFTR REQUALIFICATION TRAINING SCHEDULE 1991-1992

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	(L) Design & Operating Characteristics	(P) EMERGENCY DRILL	(P) Emergency Equipment Training	(L) Nuclear Theory & Principles of Operation	(P) EMERGENCY DRILL involves outside agencies as appropriate
			(P) Special Equipment Training (Rabbit System, Overhead Crane)	(S) Annual Report Review	(L) Security Plan
					(I/P) Annual Operations Test

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
	(L) Normal, Abnormal and Emergency Procedures	(P) EMERGENCY DRILL	(L) Reactor Protection System	(I) Operator Walk-through Exams	(P) EMERGENCY DRILL
	(P) Fuel Handling Training		(P) Emergency Equipment Training		

(P) = PRACTICAL TRAINING (S) = STAFF TRAINING (I) = INDIVIDUAL TRAINING (L) LECTURE/EXAM

UFTR REQUALIFICATION TRAINING SCHEDULE 1992-1993

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
(L) Instrumentation & Control Systems	(L) Radiation Control and Safety	(P) EMERGENCY DRILL	(L) Technical Specifications	(S) Annual Report Review	(L) Emergency Plan
			(P) Emergency Equipment Training		(P) EMERGENCY DRILL involves outside agencies as appropriate
			(P) Special Equipment Training (Rabbit System, Overhead Crane)		(I/P) Annual Operations Test

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
	(I) Operator Walk-through Exams	(P) EMERGENCY DRILL	(L) Normal, Abnormal and Emergency Procedures		(P) EMERGENCY DRILL
			(P) Emergency Equipment Training		BIENNIAL COMPREHENSIVE EXAM

(P) = PRACTICAL TRAINING (S) = STAFF TRAINING (I) = INDIVIDUAL TRAINING (L) LECTURE/EXAM

APPENDIX I

UFTR STANDARD OPERATING PROCEDURES
MAJOR REVISIONS GENERATED FOR
1991-1992 REPORTING YEAR:

1. "UFTR SOP-D.5, "UFTR REACTOR WASTE SHIPMENTS: PREPARATIONS AND TRANSFER" (REV 1, 4/92)

UFTR Operating Procedure D.5

1.0 UFTR Reactor Waste Shipments: Preparations and Transfer

2.0 Approval

Reactor Safety Review Subcommittee .... ________ -/1/92
Date

Director, Nuclear Facilities .... William G. Vernetson April 9, 1992
Date

3.0 Purpose and Discussion

3.1 The purpose of this procedure is to

3.1.1 Establish a standard method for preparing and transferring solid radioactive reactor waste shipments from the UFTR R-56 License to a carrier or licensed waste processor for ultimate disposal.

3.1.2 Ensure that the requirements of UFTR R-56 License, 10 CFR Part 71 (Packaging and Transportation of Radioactive Material) and 49 CFR DOT regulations are met for all radioactive reactor waste shipments.

3.2 All radioactive reactor waste shipment activities including Preliminary Preparations, Packaging, Shipment Container Surveillances Labeling, Generation of Shipping Papers, Transfer of Waste to a Carrier and Subsequent Notifications will be performed in accordance with the checklist starting with Step 7.0 with UFTR Form SOP-D.5A used to document performance of the steps delineated in this procedure.

3.3 This procedure does not address shipments of unirradiated or irradiated special nuclear material; special nuclear material is not to be considered waste.

4.0 Limits and Precautions

4.1 All material designated as reactor waste must remain within the reactor facility under control of the R-56 License until transfer for shipment.

4.2 Radioactive Reactor Waste is defined to include all radioactive byproduct material generated from reactor operation and with no further useful purpose; for example gloves used to remove samples, worn out shielding materials for experiments, worn out reactor parts such as bushings, drive shafts, etc., used graphite stringers, experiment holders, shield plugs, absorbent paper laid down to provide a work space around a port or equipment pit, anti-C's used in the cell and booties used in performing work in the cell would all be considered Reactor Waste. All else would not be Radioactive Reactor Waste to include experiment parts which remain in the cell following removal of experimental facilities, samples, radiographs, etc., which are intended for further utilization.

4.3 A Radiation Work Permit (Level I or II) should be used as necessary per UFTR SOP-D.2 to control the packaging of all reactor waste for transfer to a carrier or licensed waste processor.

4.4 All radioactive waste transfers shall be made directly to a carrier or licensed waste processor within the UFTR site assuring the requirements of 10 CFR 71.5 are met.

4.5 The minimum radiation protection equipment required to package radioactive reactor waste shall include: gloves, film badge and dosimeters and a calibrated radiation survey instrument suitable for the radiation levels to be expected.

4.6 Two individuals must be involved in all waste packaging activities - one representing UFTR management, the other representing the University of Florida Radiation Control Office.

4.7 Radioactive reactor waste shall not be packaged unless specifically authorized by the Director of Nuclear Facilities and the Radiation Control Officer; both authorizations are required.

4.8 As a minimum, the Reactor Manager or his designated alternate and a representative of the Radiation Control Office, shall be present during transfer of radioactive reactor waste to a carrier or licensed waste processor for shipment.

4.9 All reactor cell doors should be secured to limit access during waste packaging operations. All unnecessary personnel should be removed from the cell.

4.10 Key sections of the Code of Federal Regulations must be reviewed by UFTR management prior to commencing preparations for shipment of radioactive reactor waste. Key sections to be reviewed are:

4.10.1 10 CFR 71 "Packaging and Transportation of Radioactive Material"

4.10.1.1 Section 71.0 "Purpose and Scope"

4.10.1.2 Section 71.4 "Definitions"

4.10.1.3 Section 71.5 "Transportation of Licensed Material" with special reference to DOT 49 CFR regulations in the following seven areas:

1. Packaging (49 CFR Part 173, Subparts A and B; 49 CFR Part 173.401-173.478)

2. Marking and Labeling (49 CFR Part 172, Subpart D, 172.400-172.407; and 172.436-172.440)

3. Placarding (49 CFR Part 172.500-172.519, 172.556 and Appendix B)

4. Accident Reporting (49 CFR Part 171.15 and 171.16)

5. Shipping Papers (49 CFR Part 172, Subpart C)

6. Shipment by Public Highway (49 CFR Part 177)

4.10.2 49 CFR 172.101 "Hazardous Materials Table" and "List of Hazardous Substances and Reportable Quantities: Table 2 - Radionuclides"

4.10.2.1 Subpart C "Shipping Papers"

4.10.2.2 Subpart D "Marking" including Sections 172.300 to 172.310 which address Radioactive Materials

4.10.2.3 Subpart E "Labeling" Sections 172.400-172.407, 172.436, 172.438 and 172.440

4.10.2.4 Subpart F "Placarding" Section 172.556

4.10.3 49 CFR 173 "Shippers - General Requirements for Shipments and Packagings" Subpart I - "Radioactive Materials", Sections 173.401-173.478

4.10.4 49 CFR 177 "Carriage by Public Highway"

4.10.4.1 Section 177.817 "Shipping Papers"

4.10.4.2 Section 177.842 "Radioactive Material"

4.11 UFTR management must have a copy of the facility license for the ultimate disposal facility designated to receive a waste shipment to assure the facility is licensed to receive reactor waste prior to transfer to a carrier at the UFTR site.

4.12 The Radioactive Reactor Waste Shipment Checklist (UFTR Form SOP-D.5A) must be used to assure that all requirements have been met before containers holding radioactive reactor waste are transferred to a carrier or licensed waste processor. Copies of all documents generated for waste shipments controlled by this procedure and the checklist should be stored in the UFTR Radioactive Waste Shipment files.

5.0 References

5.1 10 CFR 71, "Packaging and Transportation of Radioactive Material"

5.2 Title 49 Code of Federal Regulations, Parts 170-189

5.3 10D-91 Control of Radiation Hazard Regulations (Florida Administrative Code).

5.4 UFTR Standard Operating Procedures