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August 31, 1992

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

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

Dear Sir:

In compliance with our Technical Specifications reporting requirements, enclosed is one copy of the 1990-1991 University of Florida Training Reactor Annual Progress Report.

Though delayed, this document is intended to comply with the requirements of the UFTR Technical Specifications, Section 6.6.1.

Please advise if further information is needed.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

WGV/p
Enclosure

cc: D. Simpkins
Acting Reactor Manager

Cert No P8522203172
A020 1/1

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-AC05-76ER04014

Report #ORO--4014-20

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November, 1991

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I. INTRODUCTION

I.1 Overall Utilization

The University of Florida Training Reactor's overall utilization for the past reporting year (September, 1990 through August, 1991) 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. However, availability this year remained relatively low at 74.0%, not due to any single large outage like the two month outage for fuel inspection activities extended by the need to replace failed equipment in the last year but rather due to a series of scheduled and unscheduled corrective and preventive maintenance efforts primarily involving the nuclear instrumentation circuits, the reactor vent system including the stack radiation monitor, seals and valves on the primary coolant system and the area radiation monitoring systems.

The 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 ranging from 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 DOE Reactor Sharing Program and several externally supported usages. Significant effort has also been devoted to facility enhancement where a key ingredient accounting for this usage has been the need to license new operators after the Reactor Manager/SRO left early in the year and another SRO was unavailable to perform licensed duties after mid-year. 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 17.52 Megawatt-hours for the 1990-1991 reporting year represents a nearly 29% decrease over the previous reporting year. Nevertheless, despite this relatively low value as the lowest since beginning the Reactor Sharing Program, this value is only slightly below the median value of energy generation in the 22 year operational history of the UFTR licensed at 100 kW during which time energy generation has averaged only 23 Megawatt-hours. The decrease in energy generation this year was primarily due to the unavailability of licensed operators, the need to train new operators and unavailability for surveillances and maintenance work. The extended low power usage for education, training, plasma kinetics research and neutron radiography also reduced total energy generation during the year.

The run time, time when the reactor is running at any power level, is also decreased nearly 32% from the previous year. This decrease in run time is primarily attributed to personnel unavailability and partially due to reactor unavailability but, on a positive note, 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.

Additional significant time and resource commitments were made for efforts related to the SPERT LEU fuel. In the previous year, a total of 1200 SPERT fuel pins were transferred for shipment to Oak Ridge National Laboratory 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, a special NRC inspection and efforts to request permission to ship the fuel to a secure DOE facility involved over 65 hours of experiment time not counting the time spent in responding to security allegations.

Although there were no extended outages this year versus the 1989-1990 reporting year, periodic failures and repairs related to surveillances and the need for modifications continued to cause lost availability with repeated failures or preventive maintenance required for several circuits during the nuclear instrumentation calibration check (A-2 surveillance), for the Reactor Vent System including stack radiation monitor, dilute fan shaft and tach-generator, for the Area Radiation Monitoring System and for repair of several primary coolant leaks and connection failures accounting 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. With full implementation of the new console two-pen recorder at the beginning of the year eliminating this source of unavailability, the radiation monitoring system is the one system evaluated as most in need of replacement for which funds will be sought from DOE via the University Reactor Instrumentation Program funding in the next reporting year. As indicated above, the total run time for the facility was decreased about 32% from the previous year indicating considerable increases in surveillance and maintenance activities as well as time spent in preparing students and others for reactor-related demonstrations and exercises or other usages as well as extensive time spent in student laboratory usage and UFTR operator training. With the loss of the Reactor Manager(SRO) early in the year and another SRO ceasing to perform licensed activities in mid-year except to serve as Reactor Manager on a consultant basis, the availability of operating personnel this year was greatly reduced but is expected to be much increased 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 seven 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 over the last seven years. Implementation of the standard rabbit capsule size with larger carrying capacity during the 1986-1987 reporting year 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 five 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 past year saw implementation of the new ORTEC OMNIGAM software and spectrum analysis package to speed up as well as simplify spectrum analysis 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 the UFTR management the capability to promote it among University of Florida users and among researchers at other universities and colleges around the his total does 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 (DOE) Reactor Sharing Program. This reporting year was the eighth consecutive year in which the UFTR was supported as part of DOE's Reactor Sharing Program. Although this was the second consecutive year not to receive an increase in level of support due to DOE funding cuts, notification was received of a small but significant 8% increase for the next 1991-1992 reporting year.

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-one(21) 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 and for 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. This total does not include several non-reactor usages for researchers at other schools for reevaluation of data using the NAA Laboratory PC-based analyzers.

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 mid-year. Fortunately, this Program has been put back on track from previous government reductions so the Grant has been renewed at the 8% increased funding level for the upcoming 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 as well as for the Freshman Honors Chemistry students. 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 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 increased activity in plasma kinetics research as part of the nuclear space power research program in the Nuclear Engineering Sciences Department and the Innovative Nuclear Space Power Institute after usage was limited in the previous year; although unfunded, this usage is hoped to provide impetus for future support. 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 the Florida Institute of Technology and the University of Central Florida. This year also saw usage by Stetson University for a course on Energy and the Environment.

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 have again indicated an interest in using the reactor facility and its experimental systems during the upcoming year. 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 the three 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 and has also been renewed for the next year.

I.2 Facility Improvements

For facility enhancement, the neutron radiography facility was available during the last two years and has been further optimized during the reporting year, again using a student project and staff time to obtain a more uniform neutron field for radiographs. 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 130 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 two 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 is obtained. There is already one researcher at the University of South Florida(Tampa) and one industrial firm who will use such a facility as well as one in the Material Science and Engineering Department on campus. Indeed, two users went to another facility for such usage during this most recent reporting year.

Another area of enhancement receiving considerable attention this 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 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. Nevertheless, one senior project was completed to support this area this year. This work is also needed to support the planned UFTR HEU-to-LEU fuel conversion.

Finally, another enhancement of the NAA Laboratory facility has been the installation of an automatic sample changer, developed as part of a senior project, in the NAA Laboratory. At the end of the 1989-1990 reporting year, the device was completed but would only change a single sample. During this year the timing circuit and computer software correlation 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. 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 UF students and researchers but also students and faculty from other educational institutions as part of the Reactor Sharing Program.

For staff enhancement prior to this past year, the facility upper-level management has been well set with a permanent full-time acting reactor manager functioning effectively.

However, this individual resigned his position effective October 5, 1990. As a result, in anticipation of the loss, the three part-time reactor operator trainees(1 SRO and 2 RO) previously hired were subjected to certification training on an accelerated schedule late in the previous year and early in the present year to assure continuity of staffing. The resultant requirement for special allocations of training time in the classroom and in the control room have greatly limited facility education and research usages. In mid-year another SRO trainee was hired. Later the two RO trainees dropped out to pursue their education full time and the two SRO-trainees then proceeded with their training to the point where they are now both scheduled for licensing examinations early in the next reporting year. Despite all the time devoted to training and lack of licensed staff, nearly all usages were able to be accommodated, though on a slightly extended schedule from past years. Management staffing conditions 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 other staff personnel have been part-time employees, which always necessitates detailed planning for some usages of the facility. During this year, with a part-time acting Reactor Manager this was even more so especially after mid-year when he essentially ceased performing licensed activities and served as Reactor Manager on a consultant basis. With all the training personnel available combined with careful planning of activities, impact on facility operations by availability of licensed operators was minimized especially with the additional part-time SRO trainee hired in mid-year to support operations.

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 licensing of two new-SROs early in the reporting year. Although unsuccessful to date, the expectation is that we will be able to hire a new full-time Reactor Manager in the upcoming year.

I.3 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. During this year the first NRC/UFTR Management Conference was held on January 29, 1991 concerning activities authorized for the UFTR facility(R-56 License). The issues discussed at this meeting related to UFTR programs, licensee performance and current regulatory requirements. A meeting summary, list of attendees and a copy of the licensee handout material are contained in Appendix A as documentation of the meeting which is to occur about once every 18 months to assure effective regulator/licensee communications. Although the facility received two NRC inspections during the reporting year, in the areas of Security and Safeguards including one to resolve an allegation concerning lax security, it was not cited for any violations. The public documentation of the results of these two NRC inspections, one conducted on October 25, 1990 in the area of Security and to review Revision 4 to the Physical Security Plan for the SPERT fuel facility (submitted to NRC in the previous reporting year) and one conducted on March 7, 1991 in the area of Safeguards, is contained in Appendix B.

Although the facility was not cited for any violations during the year, there was one promptly reportable occurrence involving a failure to check control blade interlocks per

SOP-A.2; as a failure to follow a procedural requirement, this occurrence was a potential violation of technical specifications and was so reported to the NRC. The final 14-day report on this event dated October 29, 1990 is contained in Appendix C. As indicated in the report, it was determined that the procedural specifications in this case were unnecessarily restrictive and they were subsequently relaxed to agree with the technical specification requirements on performance checks of the control blade interlocks. It was noted that this violation was primarily administrative in nature. There was no compromise to reactor safety in this event, nor was there any impact on the health and safety of the public or facility personnel.

In the last operations inspection in November 13-16, 1989 of the previous reporting year, the facility was cited for exceeding the allowable surveillance intervals for control blade drop time checks and for quarterly scram checks due to misinterpretation of allowable surveillance intervals, per the UFTR technical specifications. Corrective action has included tracking all required surveillances by total days to assure that allowable surveillance intervals are not exceeded or normal reactor operations have not been allowed so that subsequent violations of this type have not occurred. In addition, to avoid future violations of allowable surveillance intervals, all tracking has been converted to an elapsed-time tracking system. This violation was also primarily administrative in nature and involved no actual safety problem or potential for effect on the health and safety of the staff or the public. The facility has been in full compliance from discovery of the violation with all corrective steps committed to NRC to prevent recurrence shown to be effective but somewhat time consuming.

Other administrative activities have also involved large commitments of time and resources during the year. However, there have been no amendments to the Technical Specifications since Tech Spec Amendment 17 was fully implemented in the 1988-1989 reporting year when the requirement for the core vent sampling system plus the revision permitting certain activities to be conducted when the reactor is shutdown, the vent system secured and the stack monitor reading above 10 cps were all finally incorporated into the UFTR Standard Operating Procedures. 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. 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.

Second, one revision to the approved UFTR Emergency Plan was submitted to the NRC during this reporting year with a letter dated December 13, 1990. Other than correcting a number of typographical errors, Revision 6 consists of minor changes to three pages to update equipment and room locations in the first floor laboratory, the location of the emergency equipment cart and the allowed locations of the Emergency Equipment Inventory. These changes were evaluated as not decreasing the effectiveness of the Emergency Plan and were incorporated into copies of the Plan and transmitted to all external copy holders via a memorandum dated December 27, 1990. In a letter dated April 17, 1991, the NRC notified the facility of their evaluation that the changes do not decrease the effectiveness of the Plan so the changes previously transmitted were supported. Revision 5 documentation is contained in Appendix D.

As the Emergency Plan continues to be evaluated, it is likely that additional changes will be implemented during the upcoming year. At year's end Revision 7 is being prepared to address updating information on typical energy generation as well as information on emergency assessment facilities and allowable means of emergency victim transport. It is expected that Revision 7 will be more extensive than most recent changes.

A major administrative effort over the previous three years involved the generation and implementation of a policy statement on how radioactive material transfers are conducted and documented at the UFTR facility. This effort was undertaken primarily to assure proper radiological controls and documentation are used in the transfer of radioactive materials to or from the UFTR R-56 Licensee. The project was initiated by procedure review and upgrading in response to the NRC inspection of the Radiation Protection Program conducted in March, 1988 recommending that better documented controls of radioactive materials be implemented; in addition, facility management desired to simplify the tracking of materials between the UFTR R-56 license and the University of Florida 356-1 state license while meeting all NRC requirements. This policy statement was implemented in December, 1988, essentially at the same time as the applicable implementing procedures and has worked well.

To implement this policy, a number of new and revised procedures were generated to control UFTR radioactive material handling and transfers and to control utilization of the rabbit system during past three reporting years. During this reporting year, for the first time, there has been no need to generate new or revised procedures in this area.

Though no new standard operating procedures were generated during the year, considerable administrative efforts were involved in revising three(3) other procedures. First, Revision 2 for UFTR SOP-0.1, "Operating Document Controls" was generated to clarify what is meant by document control files, where they are kept and who is to update them. This revision could have been treated as a temporary change notice but Revision 2 was also used to collect and incorporate five(5) previous TCNs as well as reformatting the applicable forms in a single revision. Second, Revision 2 for UFTR SOP-O.5, "UFTR Quality Assurance Program" was generated to relax requirements on Auxiliary Operating Instructions, to have the SOP text match audit areas on Form SOP-0.5E, to delete the operational restriction on the Emergency Drill Card, to update specifications on the recorder used to measure control blade drop times, to delete surveillance data sheets for the Annual Nuclear Instrumentation Calibration Check(A-2 Surveillance) which is now controlled by SOP-E.4 and to update Surveillance data sheets for the Biennial Evaluation of UFTR SOP Manuals for completeness(B-3 Surveillance). Again all these changes could have been treated under the TCN category; however, Revision 2 was also used to collect and incorporate twenty-two(22) previous TCNs as well as provide uniform pagination of surveillance data sheets. Finally, Revision 4 for UFTR SOP-D.1, "UFTR Radiation Protection and Control" was generated to implement changes in the new University of Florida Radiation Control Guide(Revision: 10/89) and to make several other minor changes to facilitate SOP usage including incorporating monthly versus weekly exposure limits, requiring 10 CFR Part 19 instruction in certain cases plus other changes including collecting and incorporating five(5) TCNs into the single revision. Again to meet Tech Spec requirements, the SOPs 0.1. 0.5 and D.1 are contained in Appendix E.

The current Operator Requalification and Recertification Program 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 is contained in Appendix F of this report and addresses the training program from July 1, 1991 to June 30, 1993. At years' end there had been no response from NRC; since the previous submittal in May, 1989 had also received no response, this program has continued to be implemented to control requalification training requirements. Although there were no changes to the Plan as written, a large effort was expended throughout the reporting year to generate objective question and answer banks for the various portions of the Program as they are tested for the new SRO candidates. Indeed, such banks were effectively implemented early in the year for the Annual Walkthrough Examinations and the Annual Practical Operation Examinations. The various banks now contains sufficient numbers of questions and answers to support NRC-administered requalification examinations when needed.

Considerable administrative efforts were also devoted to the HEU to LEU Conversion during this year. A new proposal updating the UFTR conversion schedule and work status per 10 CFR 50.64(b)(2) requirements was submitted in March, 1991 as DOE funding received in November, 1987 has been continued to support conversion analysis though on a delayed schedule.

During the previous year, following the decision made the previous year not to utilize SPERT fuel for conversion, 1200 SPERT fuel pins were transferred to Oak Ridge National Laboratory under QA Program Approval 0578(Revision 1) contained in Appendix G of this report. In addition the SNM-1050 "storage only" license was revised to allow moving the fuel to a new location in the Nuclear Research Field Building. The fuel transfer plus fuel move and decontamination efforts involved nearly 140 hours of experiment time, as well as considerable administrative effort. Efforts have continued without success to ship the remaining SPERT fuel to a DOE or other secure facility.

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 was further delayed, real progress was being made at the end of the previous 1989-1990 reporting year in assuring the computational methodology is adequate to analyze the existing core as a benchmark for further calculations. The neutronics benchmark work was completed this year as a special project; subsequently, a masters degree project was utilized to produce extensive neutronics calculations of the proposed LEU core. The likely fuel bundle design has 14 plates. At year's end, therma   'raulics calculations are beginning with analytical model development to be followed by analysis of several potential fuel bundle designs and core loadings. As expected, considerable facility management effort was again devoted to completing the neutronics analysis. It is expected that a similar management effort will again be devoted to the thermal-hydraulics analysis and then to preparing the license amendment package for the HEU-to-LEU conversion during the upcoming year with another extension for the submittal of the safety analysis to NRC likely to be needed.

A final administrative effort in this area has been devoted to considerations for shipping the remainder of the SPERT fuel from the SNM-1050 Facility. Complete documentation for NRC QA Program Approval for Radioactive Materials Packages No. 0578, Revision No. 1 is contained in Appendix G. The program approval is valid until October 31, 1992 and was used to transfer 1200 SPERT pins to an Oak Ridge National

Laboratory reactor facility this year. 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 before the end of the next reporting year before the QA Program expires.

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.

The considerable test, maintenance and surveillance activities required by the facility license, Technical Specifications and other controls 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 remained relatively constant from last year even though there was no large single outage and despite elimination of maintenance problems with replacement of the console two-pen recorder. This effect is primarily because there were a number of corrective as well as preventive maintenance outages to address circuit changes in Safety Channels as part of the Annual Nuclear Instrumentation Calibration Check(A-2 Surveillance) as well as multiple failure in the components of the Reactor Vent System, the Area Radiation Monitoring(ARM) System and in seals and connections on the primary coolant system with the ARM system now being given high priority for replacement as funds become available.

Another considerable administrative effort during the last reporting year involved documenting an estimate of UFTR decommissioning costs. In accordance with the requirements of 10 CFR 50.33 and 50.75, the UFTR made its official submittal estimating decommissioning costs and delineating the means of funding decommissioning with a letter dated July 19, 1990. Considerable efforts were involved to obtain information on estimated 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 assumes most work will 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 will be requested from the Florida Legislature if and when a decision to decommission the facility is made. The submittal also stated the cost estimate for decommissioning for 1991 and later years would be adjusted for inflation by the consumer price index and the new estimate kept on file at the facility as required. Per the requirements of 10 CFR 50.82 the UFTR also committed to submit an application for renewal of the license or a formal decommissioning plan at least two years prior to license expiration on August 30, 2002. During this year this cost estimate for decommissioning was updated based on the increase in the Consumer Price Index from June, 1990 to June, 1991; the cost estimate increased from $2.02 to $2.115 million dollars as documented in a memorandum dated July 30, 1991. The original submittal as well as the memorandum updating the cost estimate are contained in Appendix H of this report.

I.4 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 three 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 has become extensive over the past few years of increased utilization. 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 (10) 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 five reporting years (1986-1991). 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 professors utilize the reactor for a significant class-related usage or a research project. Continuity of Reactor Sharing Program funds at the 8% increased level for the next year gives the facility renewed expectations for increased external usage as does the expected licensing of two new senior reactor operators. In general, the level of interest in the facility is high though expanded on-campus usage for funded research is a continuing objective.

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 expected increase in licensed senior reactor operators in the next reporting year. Implementation of a prompt [illegible]ma 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 1990-1991 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 license two new operators. With sufficient support, there is no limit to 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 (September 1, 1990 - August 31, 1991)
P.M. Whaley[2]	-	Senior Reactor Operator and Acting Reactor Manager (September 1, 1990 - October 5, 1990)
R. Piciullo[3]	-	Senior Reactor Operator (1/2 time) (September, 1990 - October 8, 1991)
		Senior Reactor Operator and Acting Reactor Manager (1/2 time)(October 8, 1990 - January, 1991)
		Senior Reactor Operator and Acting Reactor Manager - Administrative Consultant (1/20 time)(February, 1991 - August, 1991)
G.W Fogle	-	Reactor Operator (1/2 time) (September, 1990 - August, 1991)
D. Simpkins	-	Student Senior Reactor Operator Trainee(1/2 time)(September, 1990 - August, 1991)
D. Cronin	-	Student Senior Reactor Operator Trainee (1/2 time)(March 21, 1991 - August, 1991)
G.R. Wheeler	-	Student Reactor Operator Trainee/Technician (1/4 time) (September, 1990 - February, 1991)

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[1]At years end the two student senior reactor operator trainees D. Simpkins and D. Cronin, both with U.S. Navy experience, have completed training and are scheduled to take the NRC-administered SRO license examination in early October, 1991.

[2]A letter indicating Mr. Whaley's license was no longer needed was submitted to NRC via letter dated October 9, 1991. Mr. Whaley's notification of license expiration dated November 1, 1991 was received on November 5, 1991.

[3]A letter indicating Mr. Piciullo has assumed the Acting Reactor Manager position was submitted to NRC dated October 9, 1990.

V. Singleton	-	Student Reactor Operator Trainee(1/3 time)(September 1, 1990 - July 10, 1991)
C. Wheeler	-	Facility Clerk (1/3 time)(November 20, 1990 - May 2, 1991)
B. A. Reynolds	-	Radiation Control Technician/Facility Clerk (1/3 time)(April 30, 1991 - July 3, 1991)
T. Becker	-	Student Radiation Control/Facility Technician (1/2 time)(July 19, 1991 - August 31, 1991)
P. Merrow	-	Secretary Specialist (3/4 time) (September, 1990 - August, 1991)

E. Radiation Control Office

D.L. Munroe[4]	-	Radiation Control Officer (September, 1990 - August, 1991)
J.A. Keeley	-	Radiation Control Technician (September, 1990 - August, 1991)
S.E. Martin	-	Radiation Control Technician (September, 1990 - August, 1991).
B.A. Reynolds	-	Nuclear Technician (September, 1990 - May, 1991)
M. Raja	-	Nuclear Technician (September, 1990 - August, 1991)

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.

[4]The specified alternates for the Radiation Control Officer position are Ms. Kathleen Buckley, J. Keeley, and W. Coughlin.

C. Reactor Safety Review Subcommittee (RSRS)

M.J. Ohanian	-	RSRS Chairman, Associate Dean for Research, College of Engineering and Professor, Nuclear Engineering Sciences Department
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[5]	-	Director of Nuclear Facilities
P.M. Whaley	-	Acting Reactor Manager

E. Line Responsibility for the Radiation Control Office

J.V. Lombardi	-	President, University of Florida (September 1, 1990 - August 31, 1991)
G. Schaeffer	-	Vice President, Administrative Affairs (September 1, 1990 - August 31, 1991)
W.S. Properzio	-	Director, Environmental Health and Safety
D.L. Munroe	-	Radiation Control Officer

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[5]Dr. W.G. Vernetson continues to serve as Director of Nuclear Facilities and Reactor Manager with Mr. P.M. Whaley serving as full-time Acting Reactor Manager through October 5, 1990. Mr. Picihllo served as a half-time Acting Reactor Manager until February, 1991 and then on an administrative consultant basis for the remainder of the year.

III. FACILITY OPERATION

The UFTR continues to experience a high rate of utilization especially when compared to 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 although some indicators are down for the year because of the loss of 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. 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.

As noted over the last seven 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 seven 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 four 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 and exercises 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 good consistent results over the past several years. Further improvements were implemented in the radiography facility during this 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 reduce installation time and standardize exposure time during the upcoming year. This work was at a much reduced level in this year due to efforts to train new reactor operators.

During the last reporting year, a senior project was completed to design an automatic sample changer for the NAA Laboratory. Before the year began, the manufacture of this device was completed and it was partially implemented but its timing circuit will only allow it to insert a single sample. During this current year plans were 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. At year's end this redesign is only partially complete as the effort must also include software development for the attached computer system to assure samples are properly counted and the data stored for later analysis. 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 assures these PC-based analyzer systems remain state-of-the-art in analysis capability though the computers themselves are now in need of replacement to speed analysis of samples and save analysis time while maintaining throughput. During the next year plans are also underway to obtain additional computer modules to improve the speed with which analysis is performed and perhaps at least one new computer. In addition, it is planned to obtain and implement an integral shield for one of the PC-based detector-analyzer systems. All of these improvements should increase laboratory throughput while enabling laboratory workers to address experiment design, student training and other areas with better results and less effort.

With the continued support of the DOE Reactor Sharing Program in the 1990-1991 reporting year (though at the same reduced level of the 1989-1990 grant year), there has been 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. 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, with the research area showing several relatively large projects with proposals awaiting funding.

The plasma kinetics research has been an active area in the past; though relatively inactive in the previous reporting last year, it saw renewed activity in this last year as a doctoral student performed most 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 70 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 two(2) NRC inspections during the reporting year in the areas of Security and Safeguards, it was cited for no violations. The inspection in October, 1990 also cleared the facility from a security-related allegation claiming lax security procedures as well as providing final approval of Revision 4 of the UFSA SNM-1050 license per the changes in storage and security implemented late in the last reporting year. The second safeguards/SNM inspection in March, 1991 was equally uneventful. In addition to the two inspections, the NRC also held an NRC/UFTR Management Meeting at the UFTR facility on January 29, 1991 with a number of NRC personnel from Region II in Atlanta and NRC Headquarters in attendance along with a resident inspector from the Crystal River site plus various personnel in the UFTR administration. The summary of this meeting shows it addressed various activities authorized for the UFTR facility including usage, licensee performance and current issues of interest to NRC and/or the UFTR licensee representatives. The summary of this meeting including the list of attendees is included in Appendix A of this report.

Activities in response to this management meeting as well as past NRC inspections and efforts to maintain facility compliance occupied significant facility management and staff time during the reporting year. Nevertheless, despite two NRC inspections and the Management Meeting during the year, less time was spent in responding to NRC inspections than in any recent year. Of course, considerable additional time had been spent in the last reporting year independent of inspections and responses to inspections in developing the facility's official submittal of a decommissioning funding plan dated July 19, 1990 to meet the new requirements of 10 CFR 50.33 and 50.75 estimating UFTR decommissioning costs and delineating how funding would be obtained should a decision to decommission the UFTR be made at some future time. As required, the updated estimate of decommissioning costs was produced and documented in a memorandum dated July 30, 1991 to the UFTR Decommissioning Information File. The original submittal and the update are contained in Appendix H.

During the 1989-1990 year, considerable effort was also spent in following up the decision made two 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.

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 has been further delayed, real progress was made this year in essentially completing the static neutronics calculations based on efforts last year to assure the computational methodology is adequate to analyze the existing core as a benchmark for further calculations. With the completion of static neutronics calculations and production of a masters project, efforts at years' end are being directed toward thermal hydraulics analysis as a 14-plate fuel bundle of standard silicide fuel plates is the most likely design for the LEU core. It is expected that considerable facility management effort will again be devoted to the analysis and then to preparing the license amendment package for the HEU-to-LEU conversion during the upcoming year with another extension for the submittal of the safety analysis to NRC likely to be needed.

Shown in Table III-1 is a summary breakdown of reactor utilization for this reporting period. The list delineates UFTR utilization divided into fifty-eight (58) different educational, research, training, tests, surveillances and facility enhancement operations and general tour/demonstration and educational activities. The total reactor run-time was over 333.6 hours while various experiments, surveillances, maintenance and other projects used over 1904 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 decrease of nearly 32% from last year due primarily to loss of licensed personnel including the loss of the SRO/Acting Reactor Manager in October, 1990 and the loss of another SRO midway through the year for all except non-licensed consultant-type activities as the Acting Reactor Manager. The large decrease in run time is despite an increase from the relatively low availability for last year (67.2%) to a closer-to-normal level of availability this year (74%).

With the efforts to train two new senior reactor operators plus administrative activities and the usual large educational component of facility usage not requiring or involving only minimal reactor operation, this decrease in run time was to be expected. In contrast, the experiment time represents a slight increase of over 3.1% without accounting for over 571 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 increase in experiment time is primarily attributed to the relatively high reactor availability (74.0%) for the year, plus all the training efforts that have been expended. Although two operator candidates dropped out, one new one was picked up in mid-year so that two new SRO candidates are scheduled to take SRO license examinations early in the next reporting year.

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 nearly 60 hours for project work with the LEU SPERT fuel for checks at the Nuclear Research Building. Despite the lack of any single large outage during this year, the total time spent on maintenance activities is significant, with corrective and preventive maintenance on the nuclear instrumentation circuits as part of the annual nuclear instrumentation calibration check, on the reactor vent system including the stack radiation monitor, on the area radiation monitoring system and on leaking seals and connections for the primary coolant system dominating corrective maintenance activities and forced outage times due to multiple maintenance efforts.

The large decrease in run time along with a small increase in experiment time are directly attributable to the combination of reasonably good reactor availability (74.0%) for the year coupled with continued high interest in the usage of the UFTR for education, training, research and service activities. In contrast, the loss of the Acting Reactor Managers/SRO early in the year and then the effective loss of a second SRO from licensed activities after mid-year contributed strongly to decreased run time. The outlook is reasonably good for increased run time in the next year as two SRO candidates are expected to be licensed early in the new year. In addition advertisement is continuing 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 some areas despite the loss of two licensed staff members and availability at 74%. 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 and has been upgraded to facilitate usage as it is now nearing optimization to provide a strong base for continued gr wth 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. 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 again been renewed but with an increased level after the decreased budget levels in the 1989-1990 reporting year and this past year following the peak level in the 1988-1989 reporting year. This increase is small but well-deserved considering that the past three years have seen the most diverse facility usage in the last fifteen years, primarily due to the synergistic effects of the Reactor Sharing Program. 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. Unfortunately these latter usages are frequently delayed due to unavailability of sufficient support personnel or f· ·lities.

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 (10) years ago; efforts continue to schedule some utility usages 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 three 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 training costs at the UFTR in their budgets.

College course utilization involved 16 different courses, some many times to account for nearly 30 hours of actual run time, a decrease of over 70% over the previous year, which had shown a significant decrease from the high point in the 1987-1988 reporting year. The research utilization consisted of some 19 projects using over 196 hours of actual reactor run time exclusive of internal research into reactor characteristics. This number of usage hours is also decreased by nearly 38% from the previous year, primarily because of decreased availability of the reactor and facility personnel to meet diverse operational needs while also addressing other activities including training activities for two new senior reactor operators 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 increases in several areas from the last reporting year, especially in the UFTR operator training area with two operator trainees who resigned receiving most of their training in this year, with another SRO-candidate receiving training for the entire year and a second SRO candidate receiving training from being hired at the end of March. These latter two SRO candidates are scheduled to take SRO license examinations early in the next reporting year. As indicated earlier there was also a significant increase 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. Other maintenance efforts requiring large commitments of resources and extensive outage commitments included the usual maintenance efforts on the area radiation monitoring system as well as a series of efforts to repair small primary coolant system leaks and related problems including replacing the demineralizer pump seals, the PC pump motor bearings and the PC pump seals. Though the only maintenance effort that involved more than a week or so was the work associated with the annual nuclear instrumentation calibration the other projects did involve considerable unavailability because of recurring failures. The remaining surveillance and maintenance time for the year was at a reasonable level. The HEU-to-LEU fuel conversion related efforts involved relatively low 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 a 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 has slowed. With many educational and several large research projects (including several sponsored by reactor sharing and several deriving from the University of Florida Nuclear Engineering Sciences

Department) already scheduled for the upcoming year, this next year promises to produce facility utilization at a higher level than that experienced during the 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 including replacement of the two-pen recorder last year plus significant maintenance this year on the nuclear instrumentation circuits, the Reactor Vent System, and the primary coolant system connections and with plans to replace several key systems dominating maintenance activities during the upcoming year, this expected high usage in the 1991-1992 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 21 schools and their 90 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 17 hours of run time in Categories 1 and 6 in Table III-2 with another 6 hours of concurrent run time and over 95 hours of run time in Category 2 with over 19 additional hours of concurrent run time related to research, exclusive of the even larger quantities of non-run, facility usage experiment time involved. 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 nearly 310 hours; this is excellent considering the reactor availability of ~74% 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 90 usages represent a drop from last year although the diversity and length of individual usages with the total of 32 participating faculty continues at an all time high level. The 179 students involved also represent a decrease from the large number generated last year but with the diversity of groups involved again demonstrating the broad based role of the Reactor Sharing Program as a key factor in UFTR utilization.

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 third 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 (1067) 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 and tours, many of which occupied a half day or more. By maintaining 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 software in the NAA Laboratory, the redesigned rabbit system capsule, the drying ovens, 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 be formulated to investigate the feasibility of implementing a prompt gamma analysis facility at the UFTR with continuing design and analysis begun at the end of the last reporting year. Interest has been expressed in such a facility by one researcher at the University of South Florida (Tampa) and by one industry user, both of whom would use such a facility. It would clearly complement the normal NAA capabilities and facilitate further growth and diversification of usage.

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 17.52 Mw-hrs during this twelve month reporting period, down nearly 29% from last year and 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 22-year period for which the UFTR has been licensed to operate at 100 kW, and considering the lack of facility licensed operators and only 74% 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 not required. 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 74% availability factor for the year, the real limitation on usage has been a combination of 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.) for which time commitments continue to increase.

Described in Table III-5 is a monthly breakdown of usage and availability data. As noted in Section I of this report, there was one relatively large individual outage for the Annual Nuclear Instrumentation Calibration (A-2 surveillance) and associated activities such as repair of the failed circuits during the 1990-1991 reporting year in contrast to the previous year so the overall availability is up considerably to 74% from 67.18% but with no single month at 100%. For the year the availability is far below the historically high level of 91.5% recorded in the 1987-1988 reporting year. Nevertheless, a significant part of the 26.00% unavailability is attributed to personnel vacations and leave as well as the administrative shutdowns undertaken for scheduled maintenance, not malfunctions. 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 74.00 is somewhat below the average of about 82% over the last five years; therefore, improvement is expected in the upcoming year as several outages were utilized to perform corrective and preventive maintenance projects on various components in the nuclear instrumentation channels, the reactor vent system including the diluting fan bearing and the stack radiation monitoring system as well as the area radiation monitoring system plus replacement of seals on the primary coolant pump and the PC demineralizer pump as well as the quick disconnects on the demineralizer and the bearings on the PC pump as the primary contributors to forced unavailability during the reporting year. 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 area and stack radiation monitoring systems as they continued to be a primary contributor of unavailability.

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 no trips during the 1990-1991 reporting year and no trips since the trips on 7 and 15 September 1989 and the trip on 29 November 1989 which was attributed to erratic operation of the bistable trip circuit for Safety 2 high voltage. Since there have been no further trips for the remainder of the year, the corrective and preventive maintenance performed for these trips in 1989 has continued to be demonstrated to be effective.

Table III-7B contains no entries for unscheduled 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 may be included in the Reactor Operators Laboratory course for the upcoming year as well as for some of the operations demonstrations for other advanced classes in nuclear engineering.

Several incidents (one reportable) 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 twelve(12) unusual occurrences with relatively brief descriptive evaluations of each. Only one of these occurrences, as the more significant entry, was promptly reportable or otherwise directed to be promptly reported to include

Entry 2. Entry 1 carried over from the 1989-1990 reporting year addresses two breaks of the primary coolant system rupture disk, the first due to operator error during the daily checkout, the second due to use of a replacement disk of too low break pressure. Both breaks necessitated cleanup of the equipment pit, survey and analysis of liquid dumped to the holdup tank and decontamination of the pit. There were no releases from this unusual occurrence although approximately 80 gallons of coolant were released to the holdup tanks with no radiological consequences during the last reporting year. To begin this reporting year the reactor was down awaiting location in stock or arrival from ordering of a replacement rupture disk which was finally installed on September 4, 1990 to close out this event.

Entry 2 addresses the discovery of a potential violation of technical specifications in the failure to follow a procedure requiring control blade interlock checks prior to each of a series of startups late in the day. Although Tech Spec requirements on the restarts were met, the last three startups failed to meet the additional requirement that the control blade interlocks be checked. UFTR Management and the Reactor Safety Review Subcommittee concluded this was a potential violation of Section 6.3 of the Tech Specs pertaining to the requirement that the facility be operated in accordance with written procedures. This occurrence was evaluated to have no safety or health-related impact.

Prior to restart, all operators received retraining on the requirements for performing daily checkouts contained in UFTR SOP-A.2, "Reactor Startup" in Paragraphs 4.4.2, 4.4.4 and 4.4.6 with special emphasis on the SOP A.2 requirements for the operator involved in the occurrence. All operators were made cognizant of this problem to assure the oversight and failure to perform blade interlocks checks per UFTR SOP-A.2, "Reactor Startup" would not recur. In the meantime a change recommended by the NRC Region II inspector was developed to allow deletion of this unnecessary interlock check per the Tech Specs; this change was subsequently reviewed and approved by the RSRS at its next regular meeting with the change implemented throughout the remainder of the reporting year with no further problems encountered. The final 14 day report submitted to NRC via a letter dated October 29, 1990 closed out this potential violation and is contained in **Appendix C** of this report.

Entry 3 addresses failure of the check source function in both the East and South Area Radiation Monitors. Though considerable maintenance efforts were required to implement repairs, the event is only included here because of the simultaneous failure of the check source functions in two detectors.

Entries 4 and 5 are listed because they involve small leaks in the primary coolant system while Entry 6 involves maintenance that required opening the primary coolant system; all three were discovered during shutdown periods. Entry 4 addresses a small leak from the coolant purification(demineralizer) pump seal discovered due to a pit alarm signal. The leak rate was reduced by securing the pump and then a replacement pump seal was obtained after some delay and installed to terminate the leak. Similarly, a seepage leak was discovered along the primary coolant pump shaft during the weekly checkout. Again replacement seals were special ordered and then installed to terminate the leak. Entry 6 addresses discovering failed bearings in the primary coolant pump motor. To replace the bearings the motor had to be removed which necessitated removing the pump/motor combination from the primary coolant system loop. After repair of the motor, the motor was reattached to the pump and reinstalled in the loop with no further problems. Both seal leaks and the bearing failure were promptly discovered and the replacement projects involved negligible radiation dose; the failures had negligible impact on facility operations or the health and safety of the public. All three projects were controlled under Radiation Work Permits.

Entries 7, 8, 9 and 10 are all associated with performance of the Annual Nuclear Instrumentation Calibration Checks(A-2 Surveillance) and modification and corrective actions necessitated primarily by aging of components. These four(4) entries include one for a procedure change as a facility modification, one for an unscheduled shutdown to adjust Safety Channel meter 1 further to assure proper output plus two entries(9 and 10) to address circuit changes necessitated by failed and/or aging components in order to assure proper calibration of the safety channels and the meter adjustment circuits. All modifications were referenced under 10 CFR 50.59 Evaluations to assure that no unreviewed safety questions were involved.

Entry 11 is included because a smoke detector in the reactor building fire alarm system was failed due to being sprayed with cleaning fluid by a maintenance person and resulted in the necessity to bypass one zone of the fire alarm system over a weekend. This event was compensated by frequent facility visits(fire watch) to the Zone 3 office areas until a new detector was located and installed. Because of compensation, this event was evaluated and determined under 10 CFR 50.59 not to involve any unreviewed safety questions.

Finally, Entry 12 is included because it involves a break in the primary coolant system similar to those described in Entries 4, 5 and 6. In this case, a staff technician broke the brittle disconnect fitting on one side of the primary coolant demineralizer system as he was leaving the equipment pit following completion of maintenance work. Again an RWP was used to control response to this spill which included a temporary replacement of the broken disconnect under a 10 CFR 50.59 Evaluation with subsequent removal of both the temporary disconnect and the other brittle disconnect and replacement of both with identical spares which had to be ordered. Although primary coolant resistivity decreased considerably upon reaching full power to test the system, normal values were quickly restored by the properly functioning demineralizer system with no further problems noted.

Although unusual occurrence Entries 7, 8, 9 and 10 are probably the most significant, as a group only Entry 2 was promptly reported although some other entries such as those associated with the seal failures and other PC system breaks were also effectively promptly reported. None of these occurrences would be strictly required to be promptly reported but some were 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 1990-1991 have been maintained at a relatively low yearly level primarily because there was no need to inspect fuel or unstack shielding to access the core during the reporting year. 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" is in progress. It is also expected that the remainder of the LEU SPERT fuel will be transferred for shipment in the upcoming year under the SNM-1050 license after 1200 SPERT fuel pins were transferred for shipment on May 17, 1990. 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 remains available for this transfer to assure meeting all shipping requirements (see **Appendix G**) but it expires on October 31, 1992 so the transfer should be completed in the next reporting year to avoid the need to renew the 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 1990 - August 1991)

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, P.M. Whaley and Reactor Staff	Independent Reactor Operations Laboratory Course for Undergraduate and Graduate Nuclear Engineering Sciences Students	12.23 (5.95)	26.17 (9.75)
**CFCC Radiation Protection Technology Co-op Work Program - Mrs. R. Rawls/Mr. S. MacKenzie - Reactor Sharing	Two Semester Long Reactor Operations-Based Radiological Control and Protection Training Programs of Cooperative Work Exercises	7.18 (2.68)	134.83 (39.75)
SPERT Low-Enriched Fuel Conversion Related Efforts - Dr. W.G. Vernetson, P.M. Whaley 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 Alarms.	0.00	64.00 (5.00)
*ENU-4905 - NAA Research on Foil Standards -Dr. W.G. Vernetson/C. Leipner-Gomes	Special Senior Project on Identification of Applicable Foil Standards and Determination of Energy-Dependent Neutron Spectra in Certain UFTR Experimental Ports to Support Design of Prompt Gamma Analysis Facility	6.90 (4.25)	12.92 (4.67)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

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	35.54 (9.28)	42.24 (11.41)
Plasma Kinetics Parameter Determinations - Partial Seed Project - Dr. W. H. Ellis, Dr. N.J. Diaz Dr. I. Maya, W.Y Choi, Q.He, Innovative Nuclear Space Power Institute and NES Department	Pulsed Ionization Chamber Plasma Kinetics Diagnostic System Operational Tests to Include Design of Experiments for Temperature Dependent Plasma Kinetics Analysis of He and UF_6-He Plasmas Within Small Externally Heated Detectors in UFTR Thermal Column Area and Conducting Experiments on Helium Plasmas.	15.24	52.88 (6.38)
Research on Properties of Materials - Dr. S. Turner, Mr. J. Wallis, NUSURTECH, Inc.	Use of Neutron Radiography, Transmission and Scattering Experiments and Other Analytical Techniques to Examine and Characterize Used and Unused Boraflex Absorber Liner Samples and Coupons For Use in Utility Spent Fuel Pools	44.85	71.59 (3.13)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**EGN-1002 - Dr. R. Pagano, Dr. W.G. Vernetson, University of Florida	Lecture and Demonstration of Reactor Operations For Introductory Level Engineering Students	0.00	0.33
*** Florida Regional Junior Science, Engineering and Humanities Symposium - Dr. W.G. Vernetson/B. Abbott/Mr. Ellis Lanquist, Bolles High School, Reactor Staff	Series of Lectures, Tours and Demonstrations of Facility Operations and Capabilities for High School Students, Teachers and Other Professional Participants in 28th Annual Florida Science, Engineering and Humanities Symposium Including Mr. Ellis Lanquist and his Students From Bolles High School Under Reactor Sharing	0.00	3.50 (0.50)
**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	0.00	2.25 (0.67)
*ENU-4505L - Dr. W. H. Ellis, Dr. G. R. Dalton 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	2.37	10.66 (1.00)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**Hillsborough Community College Nuclear Medicine and Radiation Therapy Technology Program - Dr. M. Lombardi/Ms. Camille Vernesse - 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	0.00	3.25
**Hawthorne Middle School Science Class - Mrs. Barbara Dalton/Dr. G.R. Dalton-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 and Previously Irradiated Samples	0.00	1.75
**Santa Fe Community College Medical Radiological Technology Program - Mr. S. Marchionno/Ms. Michelle 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	0.00	3.67
**Crystal River High School Chemistry Class - Mrs. A. Butler - 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	1.50	5.00

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**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	0.65	4.58
*NAA Research To Perform Trace Element Analysis of Meteorite Samples - Mr. Steve Buell, St. Augustine High School - Reactor Sharing	NAA Evaluation For Trace Element Analysis of Metal Content of Meteorite Samples for Science Fair Project	7.95 (2.00)	9.08 (2.00)
*NAA Research To Check Elemental Volatility of Standards - Dr. W.G. Vernetson - Dr. W.H. Ellis, R. Ratner, NES Department	NAA Evaluation with Determination and Implementation of Irradiation Schemes to Determine Volatility of Certain Elements In Various NIST and USGS Standards	6.08	7.00
***Florida Foundation of Future Scientists - Dr. W.G. Vernetson, Mrs. Renae Allen (UCHS) Mr. Brad Dugan(CHS), Mr. R. Davidson(Wildwood High School) - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Facility Operations and Experimental Capabilities Plus Summer Research Project Selection for Two FFFS High School Students (Russell Wade of Union County High School and Jeremy Thompson of Charlotte High School) Plus Various Visits and Followup For Previous Summer Science Program Research Students	2.42 (2.17)	14.00 (5.67)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*NAA Research To Evaluate SiC Fiber Samples For Constituents and Trace Elements - Dr. W. Toreki, Materials Science and Engineering Department, University of Florida	NAA Evaluation of Special Silicon Carbide (SiC) Fiber Samples For Macro Constituents As Well As Trace Elements Of Interest For Various Baseline Material Data Tests	1.13	1.75
*NAA Research To Perform Isotopic Analysis of Atmospheric Particulates - Dr. R. Llewellyn, S. Yager, University of Central Florida - Reactor Sharing	NAA Evaluation For Isotopic Analysis of Atmospheric Particulate Samples Collected From Elevated Heights Around Metropolitan Orlando, Florida	17.93	25.83
*ENU-4905 Special Senior Research in Nuclear Engineering Sciences on NAA Research - W.G. Vernetson, Lisa Vickers, R. Ratner, NES Department	Special Senior Project On NAA Evaluation and Quantification of Trace Elements in Pine Needles Taken From the Pollard, Alabama Oil Field Area	8.55 (4.68)	12.83 (5.58)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*ENU-4905 Special Senior Research Project in Nuclear Engineering Sciences On NAA Research - W.G. Vernetson, Linda Vickers, R. Ratner, NES Department	NAA Laboratory Senior Research Project to Support Computer Generation and Verification of Standard Reference Material Table Files To Facilitate Standard Selection and Analysis For Trace Element Identification	0.00	3.00 (0.25)
*NAA Research To Identify and Certify Non-Certified Trace Elements In NIST Standards - W.G. Vernetson, Xin Wang, R. Ratner, NES Department	NAA Laboratory Research Support Project To Develop Standards By Identifying and In-House-Certifying Non-Certified Trace Elements In Various NIST and USGS Standards	12.60 (0.93)	15.75 (2.42)
*ENU-6905 NAA Research To Characterize Oyster Shells At the Atomic Level - Dr. D.E. Hintenlang, 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	9.27 (4.70)	11.83 (5.33)
CHS-2050 - Honors General Chemistry Course - Dr. Martin Vala	Lecture, Tours and Demonstrations of UFTR Operations and NAA Training Exercises Demonstrating Trace Element Analysis Techniques Using the Rabbit System and PC Based Analyzers	4.58 (1.00)	10.83 (1.08)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**ENV-6211 Health Physics - Dr. W.E. Bolch, Environmental Engineering Science Department	Lecture, Tour and Demonstration of Reactor Operations Emphasizing Radiation Monitoring and Protection Features of the Facility Plus Sample Preparation and Use of NAA To Perform Trace Element Determinations Using Previously Irradiated Samples	0.00	2.42
**ENV-6932 - Special Problems In Environmental Engineering - Dr. W.S. Properzio, D.L. Munroe	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 Effluents	1.37	7.00 (0.17)
**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	2.75 (0.40)	241.31 (23.75)
**St. Augustine High School Physics Class - Mr. S. Buell - Reactor Sharing	Lecture, Tour and Demonstrations of Reactor Facility Operations and Use of Rabbit System and PC Based Analyzers For Trace Element Analysis	0.53	5.25

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**UFTR Reactor Operator Candidate Training - Dr. W.G. Vernetson/Reactor Staff/Rad Con Staff	Individual Reactor Operator License Training for UFTR Reactor Operator Candidates G. R. Wheeler(resigned), D. Simpkins(now SRO), V. Singleton (resigned), and D. Cronin(now SRO)	108.37 (81.49)	400.42 (197.66)
NRC, ANI and Other Inspections - W.G. Vernetson	Regular NRC Safeguards and Security Inspection, Special NRC Security Inspection to Check On Allegation, NRC Region II/UFTR Management Meeting, ANI Nuclear Safety and Property Inspection, Reactor Safety Review Subcommittee Annual Audit Plus Fire Marshall Inspections and University Environmental Health and Safety Division Laboratory Safety Survey	0.74 (0.67)	22.00 (4.00)
**Heritage Christian High School Science Department (Gainesville) - Dr. G. Featherston - Reactor Sharing	Two 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 and Preirradiated Samples	0.00	7.00
**Chiefland High School Science Dept. - Mr. Paul Jost - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations with Radiation Surveys and NAA Laboratory Facility Operations Using the Rabbit System for Trace Element Analysis of Hair and Other Samples	6.26 (1.00)	10.58 (1.33)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**Stetson University Energy and the Environment Class - Dr. Bruce Dubendorff, Mr. N. Sargent -Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Laboratory Facility Operations Using Rabbit System and PC Based Analyzers For Trace Element Analysis of Several Samples and Demonstration of Basic Radiation Detection and Mitigation Techniques	0.85	4.00
**ENU-5005- Dr. R. Pagano, NES Department	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 Use of UFTR for Trace Element Analysis Using the Rabbit System and PC Based Analyzers For Neutron Activation Analysis	0.92	3.83
*Physics of Materials Properties Research - Dr. Hans Plendl, Physics Dept., Florida State University and Dr. Peter Gielisse - Mechanical Engineering Dept., 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	40.26 (7.20)	53.83 (8.75)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**CHS-5110/5110L - Dr. K. Williams, Dr. L. Muga, UF Chemistry Department	Radiochemistry Course and Laboratory Exercises Including Lecture and Demonstration of Reactor and NAA Laboratory Operations, Half-Life Experiments and Trace Element Analysis of Hair, Milk and Other Items Using UFTR and PC-Based Spectrum Analyzers	6.02 (1.05)	12.83 (1.08)
***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 1991 College of Engineering/Benton Engineering Council Engineer's Fair	0.00	3.33
***American Nuclear Society Eastern Regional Student Conference - W.G. Vernetson/Reactor Staff	Lecture and Tours of Reactor and NAA Laboratory Facilities For Various Faculty, Industry and Student Participants in the American Nuclear Society 1991 Eastern Regional Student Conference	0.00	3.75
*** Tau Beta Pi Honor Society-Sponsored College of Engineering Open House - W.G. Vernetson/Reactor Staff	Lecture and Tours of Reactor and NAA Laboratory Facilities For Tau Beta Pi Honor Society Sponsored High School Students Visiting the UF College of Engineering	0.00	1.33
*NAA Research To Evaluate Concrete Samples For Low Level Sources of High Energy Gamma Rays - Dr. A.M. Jacobs, J.Monroe, NES Department	NAA Evaluation of Irradiated Concrete Samples To Verify The Lack of Naturally Occurring Radioactive Nuclides Emitting High Energy Gamma Rays Causing Interference In Compton Scattering Detection Equipment	2.40 (1.20)	3.83 (1.83)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**University of Central Florida Society of Physics Students - Dr. W. G. Vernetson, Dr. Ian Littlewood - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations with Use of the Rabbit System for NAA of Samples For Trace Element Analysis and Evaluation of Experimental Features of the Neutron Radiography Facility	1.22	4.25
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	0.00	19.92 (1.75)
Florida Institute of Technology Society of Physics Students - Dr. W.G. Vernetson, Dr. S. Cahall - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations with Radiation Surveys and NAA Training Exercises, Demonstrations of Trace Element Analysis Techniques Using the Rabbit System and PC Based Analyzers	1.10	4.92
*Florida Foundation of Future Scientists - (Charlotte High School) NAA Research To Support Use of the Neutron Radiography Experimental Facility - Mr. B. Dugan and J. Thompson, Dr. W.G. Vernetson - Reactor Sharing	Summer 1991 Student Research Program: Evaluation of the Magnitude and Spectral Quality of the Neutron Flux Available From the Radiography Facility For Neutron Radiograph Production	2.78	14.92 (1.00)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*NAA Research Service To Identify Trace Elements In Steel Samples - Dr. J. Cox, Futuretech, Inc.	NAA Evaluative Research To Determine Trace and Other Elemental Concentrations in Various Steel Samples To Identify Origins In Failed Systems	5.60 (1.75)	7.33 (2.75)
*NAA Research For Determination of Trace Elements In Lake Sediments - Mr. Paul Jost, Chiefland High School - Reactor Sharing	NAA Evaluative Research For Trace Element Analysis of Various North Central Florida Lake Sediments For Possible Identification and Quantification of Anomalous Heavy Element Concentrations	7.57	9.58
***Citrus County High School Videotaping of Reactor Operations - Mrs. Sandy Lingaard, Science Department - Reactor Sharing	Videotaping of Walkthrough Lecture/Tour of Reactor and NAA Laboratory Facilities For Several Students and For Subsequent Use In Assisting Students In Selecting a College Major and To Support Science Teaching In General	0.00	2.00
*Irradiation of Nitrogeneous Compounds For Nuclear Quadrupole Dosimetry Measurements - Dr. David Hintenlang, K. Jamil	Investigation of Effects of Neutron Dose on Nitrogeneous Compounds Using Nuclear Quadrupole Resonance Spectroscopy To Correlate Dose and NQR Spectroscopic Response	5.88	8.17

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*Florida Foundation of Future Scientists(Union County High School) - NAA Research on fertilizer samples - Mrs. R. Allen, R. Wade, Dr. W.G. Vernetson - Reactor Sharing	Summer 1991 Student Research Program: NAA for Trace Element Analysis For Quantification of Heavy Metal Buildup From Continued Application of Commercial Synthetic Fertilizers To Crop and Pasture Lands	2.10 (0.58)	3.83 (1.17)
***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	4.17 (4.17)	69.39 (18.00)
Maintenance Activities To Preserve and Refurbish The Reactor Cell Appearance and Maintain Good Housekeeping - W.G. Vernetson/Reactor Staff	Maintenance Efforts To Scrape, Clean, Paint and/or Coat Various Reactor Cell Surfaces Including Primary Equipment Pit, Shield Blocks and Other Areas To Preserve and Refurbish Appearances Plus Various Housekeeping Efforts in the Cell and Control Room Including Updating Status Boards and Operations Logs,	0.00	165.49 (31.92)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
	Performance of Special Surveys and Other Non-Operations Facility Activities		
Emergency System Surveillances - W. G. Vernetson, Reactor Staff, Physical Plant Division Personnel, UPD Personnel	Scheduled Surveillances of Facility Fire Protection Equipment, Quarterly Checks of Fire Alarm System and Inspections By Physical Plan Representatives and State Fire Marshall Plus Periodic Responses to Security and Fire Alarm Actuations	0.08 (0.08)	15.73 (0.75)
**ENU-4612L/5615L Nuclear Instrumentation Systems Laboratory -Dr. W.H. Ellis, University of Florida	Demonstration of UFTR Nuclear Instrumentation Detector Responses for Startup, Operation and Shutdown Operation Plus Sample Preparation and Use of Rabbit System for Trace Element Analysis of Various Samples Using Gamma Spectrometers	0.88	6.58
**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 Emergency Response and Security for UPD and Other Personnel Plus Training on Emergency Response for Gainesville Fire Department Personnel As Well As	3.69 (3.69)	44.84 (11.16)

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
	Briefing for NES Chairman on Physical Security Status.		
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	76.64 (13.98)	281.52 (65.38)
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	7.84	480.97 (95.33)
	TOTAL	**489.59 (155.99)**	**2475.17 (571.17)**
	TOTAL ACTUAL	**333.60**	**1904.00**

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 1990-1991 reporting year is 333.60 hours, a decrease of nearly 32% over the previous year. In contrast, the actual experiment time for the 1990-1991 reporting year is increased slightly at 1904.00 hours, an increase of about 3% indicating increased utilization of staff time this year for reactor usage and other projects including better record keeping of project times and other activities using the facility but not the reactor especially maintenance and support related efforts. Indeed, over 60 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 the loss of the SRO Reactor Manager in October, 1990 and the much reduced effort and unavailability of another SRO after February, 1991. Of course, the experiment

TABLE III-1(CONTINUED)

SUMMARY OF FACILITY UTILIZATION

(September 1990 - August 1991)

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)

time continues to include considerable reactor usage for corrective mainte::ance 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 reactor operator training to replace the personnel who left the facility with two new SROs licensed soon after the end of the reporting year.

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, 1990 - August, 1991)

	Utilization Categories	Run Time (hours)	Experiment Time (hours)
1.	College Courses and Laboratories (16)	41.33(11.77)	240.32(52.30)
2.	Research Activities (19)	232.63(36.57)	368.19(56.67)
3.	UFTR Operator Training and Requalification for Recertification Plus Support Staff and Other Training (3)	114.81(85.58)	686.57(232.57)
4.	UFTR Maintenance, Testing and Surveillance Activities, Plus Various Extended Inspection Activities (6)	85.30(14.73)	985.63(199.13)
5.	HEU-to-LEU Fuel Conversion Related Efforts (1)	0.00	64.00(5.00)
6.	Reactor Tours and Demonstrations Including High School Classes (13)	15.52(7.34)	130.46(25.50)
	TOTAL	489.59(155.99)	2475.17(571.17)

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-one(21) schools to have 90 usages of the UFTR facilities as delineated in Table III-3. This usage by 21 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 OF USAGE OF UFTR FACILITIES
(September, 1990 - August, 1991)

School		Users	
	Usages[1]	Faculty	Students
Bolles High School (BHS)	1	2	10
Chamberlain High School (CHS)	1	1	7
Central Florida Community College (CFCC)	30	2	11
Charlotte High School (CHS)	4	1	1
Chiefland High School (CHS)	4	1	7
Citrus County High School (CCHS)	1	1	3
Crystal River High School (CRHS)	1	2	22
Florida A&M University (FAMU)	7	1	1
Florida Institute of Technology (FIT)	1	[illegible]	9
Florida State University (FSU)	7	2	3
Heritage Christian High School (HCHS)	2	1	24
Hillsborough Community College (HCC)	1	2	16
Hawthorne Middle School(HMS)	1	1	12
Santa Fe Community College (SFCC)	2	3	8
Southeast Missouri State University (SEMSU)	5	1	1
St. Augustine High School (SAHS)	3	2	13
Stetson University (SU)	1	2	20
Union County High School (UCHS)	5	1	4
University of Central Florida (UCF)	6	2	5
University of Wisconsin, Eau Claire (UWEC)	6	2	1
Wildwood High School (WHS)	1	1	1
TOTAL	90	32	179

1. 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 five(5) hours. In many cases, a school can have multiple usages but all related to the same research project or training program such as one project for Florida State University that involved long term irradiations as did others such as for the University of Central Florida, Chiefland High School and St. Augustine High School or the multiple usage training programs conducted for Central Florida Community College students and Union County High School students.

TABLE III-4

MONTHLY REACTOR ENERGY GENERATION[1]
(September, 1990 - August, 1991)

Monthly Totals	Energy Generation Monthly Ranking[2]	KW-Hrs	Hours at Full Power
September, 1990	8	1260.598	11.701
October, 1990	7	1282.927	12.317
November, 1990	2	2086.151	20.650
December, 1990	11	705.640	6.799
January, 1991	5	1618.047	14.317
February, 1991	12	404.769	3.766
March, 1991	9	1214.056	11.983
April, 1991	3	2041.735	20.134
May, 1991	4	1886.152	18.399
June, 1991	6	1406.762	13.967
July, 1991	1	2416.454	23.482
August, 1991	10	1195.827	11.699
YEARLY TOTAL		17,519.118[3]	196.214

1. The yearly total energy generation of 17.52 Megawatt-hours for the 1990-1991 reporting year represents 29% decrease over the last year's total of 24.7 Megawatt-hours, while the 196.2 hours at full power represent a similar 18.2% decrease over the previous yearly total of 240.06 hours. These values for the 1990-1991 reporting year are the lowest in several years. Nevertheless, with availability at only 74% plus the loss of 3 operators for all or part of the year from the previous year, this year's energy generation is quite impressive. There were large time commitments for training efforts to prepare additional operators to be licensed and much of this effort did not involve running the reactor at all or only at low power. Several outages due to failures in the nuclear instrumentation, in the area and stack radiation monitoring systems and in the stack diluting fan caused some lost facility usage and hence affected energy generation negatively, though not excessively during the year. However, the decrease in energy generation from last year was primarily due to the unavailability of operating personnel and the need to devote time to training new operators two of whom have been licensed as SROs early in this new reporting year. Two other trainees resigned from the training program but were the subject of considerable training time. The total run time for the facility was decreased considerably below the previous year at 333.61 hours (see Table III-5) for this reporting year; nevertheless, there was considerable low power run time for neutron radiography, interrogation of spent fuel pool absorber coupons, plasma kinetics research, 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 expected licensing of two new SROs early in the next reporting year, the availability of operating personnel will be improved. 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, much 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 17,519 kW-hrs energy generation is the lowest value for the past decade, ranking tenth for this period.

TABLE III-5

MONTHLY REACTOR USAGE/AVAILABILITY DATA
(September, 1990 - August, 1991)

Monthly Totals	Key-On Time	Exp. Time[1]	Run Time	Availability
September, 1990	33.40 hrs.	162.00 hrs.	27.28 hrs.	59.17%
October, 1990	31.20 hrs.	159.75 hrs.	27.27 hrs.	54.84%
November, 1990	34.50 hrs.	131.83 hrs.	29.42 hrs.	82.50%
December, 1990	28.30 hrs.	113.08 hrs.	19.98 hrs.	95.16%
January, 1991	33.90 hrs.	163.25 hrs.	29.65 hrs.	70.16%
February, 1991	12.70 hrs.	140.17 hrs.	8.67 hrs.	67.86%
March, 1991	21.60 hrs.	177.75 hrs.	16.97 hrs.	64.52%
April, 1991	31.50 hrs.	204.25 hrs.	25.77 hrs.	15.83%
May, 1991	52.20 hrs.	143.42 hrs.	48.27 hrs.	96.77%
June, 1991	32.80 hrs.	125.17 hrs.	29.17 hrs.	92.50%
July, 1991	58.00 hrs.	196.25 hrs.	53.13 hrs.	99.19%
August, 1991	21.30 hrs.	185.08 hrs.	18.03 hrs.	89.52%
TOTALS:	391.40 hrs.	1904.00 hrs.	333.61 hrs.	74.00%

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 significant decreases over the previous year, especially those related to reactor operations. Key-on time is down over 28% while run time is down nearly 32%, primarily due to reduced availability of the reactor and the loss of one licensed senior reactor operator in October, 1990 and the loss of another for licensed activity in February, 1991; experiment time is actually increased by nearly 3.16% over the previous year, primarily because unlicensed personnel working in the facility were used to support many activities including trainig operations.

3. Monthly Average availability is 74.00%; on the basis of days of forced outage for the year, the availability is similarly 74.18% as indicated in Table III-6. The yearly availability is somewhat increased from the low value of 67.18% in the last year which was the lowest since the 52.3% recorded in the 1985-1986 reporting year; it represents a good increase over the 67.18% average availability recorded for the last reporting year. This increase is due to avoiding any long outages though the one period of unavailability in April for the annual nuclear instrumentation calibration check was significant in length and the longest for the year at over 16 days. Other than this outage, the remainder of the year saw the usual variety of maintenance activities and equipment failures in several systems including the area and stack radiation monitoring system with a number of outages and four(4) exceeding a week each, the stack dilution fan system with over two weeks of outages and repairs for several small primary coolant system leaks including seal replacement on both the primary coolant and demineralizer pumps. Nevertheless, the large value of experiment time especially shows continued high utilization of the UFTR facility as does the reasonably high availability of 74%.

TABLE III-6

UFTR AVAILABILITY SUMMARY
(September, 1990 - August, 1991)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
September, 1990	59.17%	12.25 days	Maintenance following breakage of a primary system rupture disk to locate and then install a proper spare(4 days). Maintenance to replace a failed resistor and high voltage power supply in the stack radiation monitoring system and perform system checks and then again later to check and verify the two calibration points on the stack monitor(8-1/4 days).
October, 1990	54.84%	14.00 days	Maintenance to install the new source alarm on the two-pen recorder(0 extra days). Maintenance to pull the dilute fan motor and replace failed dilute fan motor bearings and dilute fan shaft pillow block bearings to correct excessive shaft vibration to include assuring proper tachometer operation(3-1/4 days). Maintenance to replace three failed capacitors in the preamplifier circuit of the South Area Radiation Monitor and to repair a lifted lead and replace a failed transistor in the HV Section of the East Area Radiation Monitor(8-1/2 days - 3-1/4 concurrent). Maintenance to repair a small primary coolant leak by replacing the seals on the PC purification (demineralizer) pump (5-1/4 days).

TABLE III-6(CONTINUED)

UFTR AVAILABILITY SUMMARY
(September, 1990 - August, 1991)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
			Maintenance to shim and tighten the set screw on the stack dilute fan tach-generator to restore proper RPM indication(1/4 day).
November, 1990	82.50%	5.25 days	Maintenance to replace a failed nixie tube and two resistors on the Safety-2 Control Blade Position Indicator(1-1/4 days).
			Maintenance following breakage of a primary system rupture disk to clean up the equipment pit and install a proper spare(1/2 day).
			Maintenance following bearing failure to replace the tachometer-generator on the stack dilute fan(3-1/2 days).
			Administrative shutdown for Thanksgiving Holiday (2 days).
December, 1990	95.16%	1.50 days	Maintenance to check response and recalibrate the stack radiation monitor following anomalous behavior(1 day).
			Maintenance to replace a worn and failed gear train on the stack radiation monitor recorder chart drive with an on-hand spare to restore proper movement(1/2-day).
			Administrative shutdown for Christmas Holidays (4 days).

TABLE III-6(CONTINUED)

UFTR AVAILABILITY SUMMARY
(September, 1990 - August, 1991)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
January, 1991	70.16%	9.25 days	Maintenance to replace the sticking secondary cooling 1 kW relay in the Wide Range Drawer as well as replace the ink pads on the 12-point temperature recorder(1/4-day).
			Maintenance to repair a small primary coolant leak by replacing the worn seals on the primary coolant pump(9 days).
			Maintenance to replace primary coolant demineralizer resins with equivalent resins due to unavailability of replacement resins(5 days - all concurrent).
			Administrative shutdown for holidays due to lack of staff for personnel leave (3/4-day).
February, 1991	67.86%	9.00 days	Maintenance to tighten a loose tach-generator coupling on the stack diluting fan shaft, to better align the pulley and then finally to install a new tach-generator to restore diluting fan RPM indication in the control room (7-3/4 days).
			Maintenance to erect scaffolding, to install a personnel safety platform on the bridge crane, to service the overhead crane and then to remove the scaffolding to assure safety and continued proper operation(1-1/2 days - 1 day concurrent).

TABLE III-6(CONTINUED)

UFTR AVAILABILITY SUMMARY
(September, 1990 - August, 1991)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
			Maintenance to replace clutch current bulbs and perform requisite control blade drop and drive ...me checks plus maintenance to replace the worn print wheel on the 12-point temperature ...corder (3/4 days).
March, 1991	64.52%	11.00 days	Preventive maintenance relamp the reactor cell and change the ballast on one lamp(1/4-day).
			Maintenance to remove a noisy PC pump, detach the motor for bearing replacement and overhaul and then reinstall the motor and PC pump in the primary coolant system plus performance of the void coefficient surveillance prior to return to normal operations(6-1/2 days).
			Maintenance to replace the PC coolant ceramic filter(0 extra days) and refill the PC storage tank(1/4-day).
			Maintenance to repair the north area radiation monitor circuit whose function was covered for 10 days by using a portable instrument(0-days).
			Maintenance to check out the WR drawer discriminator and driver output voltage connected with the annual nuclear instrumentation calibration check(4-days).

TABLE III-6(CONTINUED)

UFTR AVAILABILITY SUMMARY
(September, 1990 - August, 1991)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
April, 1991	15.83%	25.25 days	Maintenance to continue checkout of the discriminator and driver output voltage and verify acceptable operation plus adjust settings on Safety Channel 1 to assure proper power response (4-days). Maintenance to clean worn and corroded contacts on the chopper for the auto flux controller to restore proper control function (4-days). Maintenance to check the circuit and repair several connectors in the S-3 control blade circuit to restore proper removal response(2-1/4 days). Maintenance to drill access holes to allow adjustment of the linear range for calibration at power with subsequent performance of the calibration checks(1-day). Maintenance to verify circuits and replace failed electronic components, analyze modifications and replace a resistor with a higher resistance to set the coarse adjust on Safety Channel 2 calibration circuit to allow both fine and coarse adjustments to be effective in setting the calibration on the Safety Channel(2-1/2 days).

TABLE III-6(CONTINUED)

UFTR AVAILABILITY SUMMARY
(September, 1990 - August, 1991)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
			Maintenance to analyze and modify the resistance in both the Safety Channel 1 and 2 meter adjustment circuits to allow proper meter adjustment(2-1/4 days).
			Maintenance to perform retests and final checks to conclude the annual nuclear instrumentation calibration checks(1-1/2 days).
			Maintenance to repair printed circuits, replace a faulty GM tube and tube junction and recalibrate the stack monitor to correct gradual degradation and increase in stack monitor background count rate(7-1/2 days).
			Maintenance to replace the torn stack diluting fan canvas flex coupling(1/4-day).
May, 1991	96.77%	1.00 days	Planned maintenance to replace the signal cable plug junction connector for the stack radiation monitoring system detector and recalibrate the system(1/2-day).
			Maintenance to replace the noisy chopper on the auto flux controller with a reburnished chopper with operation checked at power (1/2-day).

TABLE III-6(CONTINUED)

UFTR AVAILABILITY SUMMARY
(September, 1990 - August, 1991)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
June, 1991	92.50%	2.25 days	Maintenance to repair and replace the failed -24 volt emergency backup battery power supply system and to verify proper operation of +24 volt system(2 days) Preventive maintenance checks and service of the overhead crane plus preventive maintenance to relamp the cell, replace one ballast and replace two lamp sockets(1/4-day). Administrative shutdown due to unavailability of Facility Director/SRO to attend a meeting(5-3/4 days).
July, 1991	99.19%	0.25 days	Planned Maintenance to clean contacts on the overhead crane control box to restore proper response and maintenance to repair a seepage leak in the shield tank sample line(1/4-day). Administrative shutdown due to unavailability of Facility Director/SRO to attend a meeting(3/4-days).
August, 1991	89.52%	3.25 days	Maintenance to refill the Primary Coolant Storage Tank(1/4-day). Maintenance to repair a broken secondary heat exchanger sample line(1-1/2 days).

TABLE III-6(CONTINUED)

UFTR AVAILABILITY SUMMARY
(September, 1990 - August, 1991)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
			Maintenance following breakage of the PC demineralizer inlet quick disconnect fitting to decontaminate the equipment pit, locate a temporary replacement fitting and to repair the inlet quick-disconnect fitting(1 day).
			Maintenance to replace the temporary quick-disconnect fitting on the PC demineralizer inlet line and the brittle fitting on the outlet line with exact duplicates(1/2 day).

TOTAL ANNUAL FORCED UNAVAILABILITY: 94.25 days = 25.82%
TOTAL ANNUAL AVAILABILITY: 270.75 days = 74.18%

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 af... preoperational checkout. This availability summary also neglects unavailability for scheduled tests and surveillances except where noted.

NOTE 2. The 94.25 days unavailability, were basically for forced (93 days) and planned (1.25 days) outages due to maintenance for repairs, delay awaiting parts arrival, trip evaluations, etc. An additional 23.25 days of administrative shutdown delineated in this table were 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. Primarily, these days occurred after Mr. Piciullo's SRO license certification lapsed due to training requirements so that the Director's absence at a meeting or on vacation prevented facility operation due to lack of a certified SRO.

TABLE III-7A

UNSCHEDULED TRIPS

During this reporting year, the UFTR experienced no unscheduled trips which would normally be described below. There were three unscheduled trips reported in the first three months of the previous reporting year. These trips were 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 last year are the only trips for the last reporting year. There have been no unscheduled trips for over 21 months. Although a number of failed components were replaced to complement replacement of degraded components along with preventive cleaning and repair of circuit connections, the effort clearly represented time well spent with no further spurious trips for the 21 months following the last trip on November 29, 1989.

Number	Date	Description of Occurrence
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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 1991-1992 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, 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 was the potential tech spec violation failure to follow a procedure requiring interlock checks (#2); however, this occurrence had no safety or health related impact. The most significant occurrences actually were those associated with the annual nuclear instrumentation calibration checks(#7, #8, #9, and #10) and the related modifications and corrective actions necessitated by aging of system components. Other relatively significant occurrences would be the two failures of seals resulting in small amounts of primary coolant leakage to the equipment pit(#4 and #5 plus) breakage of a quick disconnect on the demineralizer also resulting in leakage to the pit(#12). Overall, none of these twelve(12) unusual 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.

Number	Date	Description of Occurrence
1.	20 August 1990	During performance of the daily checkout, the primary coolant rupture disk was broken due to operator error necessitating cleanup of the equipment pit, survey and analysis of liquid dumped to the holdup tank and decontamination of the pit. After a replacement disk of two low break pressure was tried under MLP #90-34 and resulted in another breakage and repetition of the analysis and cleanup, proper rupture disks were ordered with the reactor put on administrative shutdown until [illegible] and awaiting delivery of the rupture disks. There were no releases from this unusual occurrence although approximately 80 gallons of coolant were released to the holdup tanks with radiological consequences considered to be negligible. At the end of the 1989-1990 reporting year the reactor was down awaiting location or arrival of replacement rupture disks. A replacement rupture disk was finally located in stock and installed in the primary system on September 4, 1990 with no further problems noted.

Number	Date	Description of Occurrence
2.	2 October 1990	In reviewing the October operations log entries on Wednesday, October 24, 1990, it was noted that an apparent violation of the UFTR Standard Operating Procedures had occurred on 2 October 1990 when a daily checkout was started at 0810 hours and completed at 0825 hours. The reactor was then run several times with a shutdown concluded at 1539 hours. At 1705 hours 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 this startup at 1705 hours, 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 for training begun at 1733, 1804 and 1826 hours respectively.

Chapter 4 of the UFTR Technical Specifications on Surveillance Requirements in Section 4.2 on Surveillance Pertaining to Limiting Conditions for Operation in Paragraph 4.4.2 entitled, "Reactor Control and Safety Systems Surveillance" contains two applicable paragraphs (6) and (7) quoted as follows:

4.2.2(6) 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 hrs. prior to startup, and (c) no known condition exists that would prevent successful completion of a weekly or daily checkout.

4.2.2(7) The limitations established under Paragraph 4.2.2(6) (a) and (b) can be deleted if a reactor startup is made within 6 hrs. of a normal reactor shutdown on any one calendar day.

Although Tech Spec requirements on the restarts were met in all four startups after 1705 hours, the last three(3) startups on the afternoon of 2 October 1990 failed to meet the additional requirement delineated in UFTR SOP-A.2, "Reactor Startup" in Paragraph 4.4.6 requiring that the control blade interlocks be checked prior to the restart when the daily checkout is omitted as allowed under Tech Specs 4.2.2(7), since the previous normal reactor shutdown had occurred within 6 hours. Therefore, the last

TABLE III-8(CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		three(3) UFTR startups on 2 October 1990 represented a potential violation of Section 6.3 of the UFTR Tech Specs requiring that the facility be operated in accordance with written procedures. UFTR Management reviewed this occurrence on October 24-25, 1990 following its discovery on October 24, 1990 and in consultation with several members of the Reactor Safety Review Subcommittee(RSRS) concluded that it represented a potential violation of the UFTR Tech Specs, Section 6.3 pertaining to the requirement that the facility be operated in accordance with written procedures. NRC Notification was made per Section 6.6.2 of the UFTR Tech Specs and reactor restart was approved following the performance of retraining on the applicable SOP section for reactor operators. The NRC notification was carried out by telephone to Mr. Craig Bassett on Thursday October 25, 1990 with a following telecopy on October 25, 1990 as required. The reactor staff and administration agreed there was no compromise to reactor safety in this event, nor was there danger of personnel receiving excessive radiation doses. Members of the RSRS consulted in this matter, including all members of the Executive Committee, also concurred. The problem was administrative in nature and did involve a potential violation of the UFTR Tech Specs through omission of a procedural step. Note that this event is similar to the November, 1988 event where the interlock checks were overlooked entirely. Here however, the operator was reminded to perform the interlock checks the first time and simply assumed the one check was sufficient. It is worth noting that, had a new daily checkout been performed prior to the first startup at 1705 hours instead of just checking the control blade interlocks, the subsequent interlock checks would not be required. In this case there would be no violation of SOP-A.2 and hence the Tech Specs; however, for the blade withdrawal interlock checks, the exact same checks are done in the daily checkout as when the daily is omitted per Tech Spec Paragraph 4.2.2(7). For this reason the reactor administration considered deleting the requirement that the blade interlock checks be performed prior to every startup after the 8 hour limit on the daily checkout is exceeded. A conversation with Mr. Craig Bassett of Region II on October 25, 1990 indicated this to be probably the best thing to do.

TABLE III-8(CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		Prior to restart, all operators received retraining on the requirements for performing daily checkouts contained in UFTR SOP-A.2, "Reactor Startup" in Paragraphs 4.4.2, 4.4.4 and 4.4.6 with special emphasis on the SOP A.2 requirements for the operator involved in the occurrence. All operators were made cognizant of this problem to assure the oversight and failure to perform blade interlock checks per UFTR SOP-A.2, "Reactor Startup" would not recur. In the meantime, the change was developed to allow deletion of this interlock check per the Tech Specs; this change was subsequently reviewed and approved by the RSRS at its next regular meeting with the change implemented throughout the remainder of the reporting year with no further problems encountered. The final 14 day report submitted to NRC via letter dated October 29, 1990 on this potential violation is contained in **Appendix C** of this report.
3.	8 October 1990	During the weekly checkout, the East and South Area Radiation Monitors were discovered to be not responding to the check source due to instrument failure. Under MLP #90-41, considerable effort was expended to isolate and to replace failed components on the South Area Radiation Monitor and a failed component in the high voltage power supply of the East Area Radiation Monitor as well as to repair a lifted lead on the rectifier for the high voltage power supply on the East Monitor considered to be a possible cause of a transient causing the multiple failures. These repairs were completed on 12 October 1990. With successful performance of the calibration check of the area and stack radiation monitors(Q-2 surveillance) on 16 October 1990, the system was returned to normal operation with no further problems noted.
4.	11 October 1990	While performing maintenance to restore operation of the area radiation monitoring system, the pit alarm sounded. Immediate investigation by the Acting Reactor Manager/SRO R. Piciullo revealed an apparent leak from the coolant purification (demineralizer) pump seal(about 40 drops/minute). The Radiation Control Officer and Facility Director were informed and the Demineralizer Pump was secured to reduce the leak rate substantially. Visual inspection on 12 October confirmed the apparent pump seal failures. Because neither a replacement pump nor replacement pump seals were in stock, a few days delay was

TABLE III-8(CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		needed to obtain a replacement pump seal. Under MLP #90-42 and RWP 90--9-II, the purification loop was isolated and drained, the pump was electrically disconnected on 17 October 1990, the seals were replaced and the system reassembled and operated with occasional checks to assure no leakage. This occurrence involved negligible radiation dose, was promptly discovered and had negligible impact on safety of facility operations or the health and safety of the public. Following completion of decontamination verification and water sample analysis on 21 October 1990, MLP #90-42 was closed on 22 October 1990 with subsequent operation at power on 22 October 1990 verifying proper operation of the system at full power conditions of temperature with no further problems noted.
5.	14 January 1991	During the weekly checkout on January 14, 1991 a small(few drops per week) seepage leak was discovered along the primary coolant pump shaft. Because replacement seals had to be special ordered, replacement of the seals was delayed until January 21, 1991 with a subsequent pair of reactor operations on January 22, 1991 used to verify proper completion of seal replacement and reassembly of the primary coolant loop with all work completed under MLP #91-03 and RWP 91-2-I. This occurrence involved negligible radiation dose, was promptly discovered and had negligible impact on the safety of facility operations or the health and safety of the public. Following return to normal operations on January 22, 1991, there were no further leakage problems.
6.	12 March 1991	During the weekly checkout the primary coolant pump was noted to be making excessive noise. Under MLP #91-16, various non-intrusive checks were inconclusive. After checking to assure the PC ceramic filter was not the source of the problem by replacing it under MLP #91-17, the PC pump including motor was removed from the primary coolant system under controls of MLP #91-16 and RWP 91-3-I and the pump and motor were checked. After verifying the pump was in good shape but the motor had bad bearings, the motor only was transferred to Electric Motor Repair Company of Gainesville, Inc. for bearing replacement and general overhaul. Upon its return, the motor was reattached to the pump and the assembly was reinstalled in the primary coolant system and checked at zero power up to 1 watt for leaks. After completing the

TABLE III-8(CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		overdue negative void coefficient check(B-1 Surveillance) prior to returning to normal operations, the reactor was run at power to assure no pump leakage at elevated coolant temperatures. MLP #91-16 and RWP-91-03-I were then closed out and the reactor returned to normal operation with no further problems noted.
7.	28 March 1991	During performance of the Annual Nuclear Instrumentation Calibration Check (A-2 Surveillance), a discrepancy was noted between the indicated discriminator and driver circuit output voltage and the value required by UFTR SOP-E.4. Under MLP #91-19 extensive circuit checks were accomplished. It was finally determined that the indicated voltage was the value called for in the technical manual. Under 10 CFR 50.59 Evaluation No. 91-02 the indicated required voltage was evaluated to be acceptable and UFTR SOP-E.4 was changed in April to so indicate with the annual nuclear instrumentation calibration then continued to the next phase.
8.	4 April 1991	As several adjustments and voltage checks were conducted for the Annual Nuclear Instrumentation Calibration Check (A-2 Surveillance), a power run was conducted to check nuclear instrumentation indications with the Safety Channel 1 meter reading found to be indicating low at ~ 65% after an hour operation. As a result an unscheduled shutdown was conducted to adjust settings further with a subsequent restart showing proper response with no further problems noted in this area.
9.	12 April 91	During the post-calorimetric procedure (A-2 Surveillance on April 12, 1991), the calibration function on Safety Channel 2 was found to be not responding. The calibrate circuit had previously been removed from its card and installed on the box behind Safety Channel 2 with both a coarse and a fine adjust capability. When the UFTR console originally arrived, the safety channels had a full scale, 10 volt deflection to show 100% on the meter. To assure calibration over the full range, the channels were changed to have a full scale 10 volt deflection to 150% which is the current UFTR Technical Specification requirement. This change did not alter any of the electronics involved, particularly the variable potentiometers and resistors. However, the variable resistances, instead of being set to mid-range in the range of travel, were near the end of their

TABLE III-8(CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		upper limits. This was fine as long as no further adjustment was necessary. However, during troubleshooting under MLP #91-23, a 22.4 KΩ resistor was found jumpering out the coarse adjust and the fixed resistor in series with it (See UFTR Diagram EL D206-4110 D). This was a modification previously installed to make the circuit work until an adjustment was needed. When the jumpering 22.4 KΩ resistor was removed, the 100% to 150% 10 volt deflection caused the coarse and fine adjusts to be ineffective (inoperative). This is probably why the jumper resistor was originally installed. The coarse adjust potentiometer was also found to be open and was replaced with a duplicate spare. Under 10 CFR 50.59 Evaluation No. 91-04, the fixed 10 KΩ resistor was replaced with a 15 KΩ resistor which set the coarse adjust in the mid-range of travel and then allowed proper adjustment as necessary. This modification and the potentiometer replacement were implemented per MLP #91-23 to facilitate proper calibration of the Safety Channel 2 circuit and evaluated not to involve any unreviewed safety question per 10 CFR 50.59 Evaluation No. 91-04.
10.	12 April 1991	When the UFTR console originally arrived, the safety channels had a full scale, 20 volt deflection to show 100% on the meter. To assure calibration over the full range, the channels were changed to have a full scale 10 volt deflection to 150%. This change did not change all of the electronics involved, particularly the variable potentiometers and resistors. However, the variable resistances, instead of being mid-range in the range of travel, were near the end of their upper stops which was fine as long as no further adjustment was necessary. For Safety Channel 1, the meter adjustment circuit had 2 resistors in series, one fixed and one adjustable. When the amplifier which precedes the circuit was adjusted by the calorimetric, the meter circuit needed adjustment in the calorimetric on 12 April 1991; however, since it was at its end stop, proper adjustment per the calorimetric was not possible. Two options were possible -either replace the variable resistor, which would entail drilling on the card to set the new one in place, or replace the fixed resistor with one of a lower resistance. This latter option was selected and would allow more current to flow to the meter and allow the variable resistor to be effective in adjustments around mid-scale. Therefore,

TABLE III-8(CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		the R30 7.5 KΩ resistor was replaced with a 2.2 KΩ resistor (See UFTR Drawing No. EL D206-9511 A). Since the amplifier (whose voltage setting is determined by the calorimetric) was not adjusted for this modification, the only subsequent retest necessary was to verify the voltage at the output to be identical after the modification as that determined in the calorimetric. This final check was successfully completed assuring the voltage was unchanged per MLP #91-24 with no further retest needed since nothing else was affected. This change on the Safety Channel 1 meter adjustment was evaluated not to involve any unreviewed safety questions per 10 CFR 50.59 Evaluation No. 91-05.
		The same situation was present for the meter adjustment for Safety Channel 2 as for Safety Channel 1. The same modification, checks and retests were performed with all results again satisfactory per MLP #91-25 and evaluated not to involve any unreviewed safety questions per 10 CFR 50.59 Evaluation No. 91-06.
11.	21 June 1991	In the early afternoon on June 21, 1991, the Zone 3 smoke detector was set off by a maintenance person spraying a protective coating on the ceiling tiles. Under MLP #91-36 fire alarm service personnel cleaned the alarmed smoke detector, checked and reset the alarm system. Subsequently several hours later the system re-alarmed and could not be reset. Since a spare smoke detector was not immediately available, Zone 3 was bypassed temporarily with agreement of the Executive Committee of the RSRS per 10 CFR 50.59 Evaluation and Determination #91-07 "Temporary Bypass of Fire Alarm System Zone 3 (Upstairs Hallway Smoke Detector and 2 Pull Stations) Due to Smoke Detector Failure" and with all occupants and UPD notified of the outage and regular visits set up around-the-clock.
		The fact that Zone 3 would be bypassed only for the weekend and that it contains no radioactive material was discussed in addition to the fact that all air from Zone 3 is circulated by the air handler in Zone 2. Since the reactor cell is separate, this temporary bypass was not considered to create any additional hazard for the reactor provided Zone 3 would be periodically checked at no more than four(4) hour intervals. This requirement was communicated to the University Police Department so they could assure Zone 3 would

TABLE III-8(CONTINUED)

LOG OF UNUSUAL OCCURRENCES

Number	Date	Description of Occurrence
		be physically checked at intervals not to exceed four(4) hours with building occupation by weekend workers expected to act for redundancy. Subsequently the area was occupied for more than half the weekend and was regularly visited by UPD officers until the morning of June 24, 1991 when a replacement smoke detector was located. Under MLP #91-36 the new smoke detector was installed in Zone 3 and a loose supporting conduit on a pull station in Zone 2 was re-anchored; after checkout, the system was returned to normal operation with no further problems noted.
12.	21 August 91 -	As the rest of the tools and equipment used for cleaning and painting the primary equipment pit were being removed from the pit, staff technician T. Becker bumped the inlet line to the primary coolant demineralizer system, breaking the brittle quick disconnect fitting and spilling approximately 4 liters of PC coolant in the pit with no personnel contamination. The spill was promptly reported to the Radiation Control Office and the Reactor Manager as required. Under MLP #91-46 and RWP 91-5-II the spill was cleaned up and the inlet quick disconnect fitting was replaced with an equivalent temporary spare per 10 CFR 50.59 Evaluation No. 91-08. Subsequent running at power on 28 August 1991 showed the inlet resistivity dropping to ~0.12 megohm-cm at the end of the one hour operation. Subsequently, resistivity levels were back to normal levels above 1.0 megohm-cm within several hours following shutdown. Analysis of a primary coolant sample following shutdown showed the only significant radionuclide to be sodium-24, probably due to opening the loop and contaminating the reassembled parts. On 28 August 1991 under MLP #91-49 both the brittle disconnect fittings on the demineralizer outlet line and the temporary replacement on the inlet line were replaced with identical spares with no drop in resistivity during the subsequent run at power and no further problems noted to close out this event.

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 1990-1991 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)
(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)

Carried over from the 1989-1990 Reporting year:

(Modification 90-04: UFTR Console Two-Pen Recorder Replacement See item (1) below.)

1. <u>UFTR Console Two-Pen Recorder Replacement</u> (Permanent - Closed Item)

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

This 10 CFR 50.59 Evaluation and Determination was used to document selection, installation and operation of the new Linseis two-pen recorder to replace the original two-pen recorder which failed (log channel) at the end of fuel inspection activities on May 8, 1990 and was no longer able to be repaired due to lack of replacement parts and general recorder degradation. Basic features of the new two-pen recorder are compatible with the old recorder with modifications though the source alarm was not originally available because the alarm relay module was not in stock at the time of purchase. Therefore, a temporary source alarm circuit was installed (See **Figure 1**) with the two-pen recorder until the alarm relay module was obtained and made ready for installation which was begun on 30 August 1990 at the end of the previous reporting year. There was also a potential need for mounting holes to be drilled in the console which were approved but later determined not to be necessary. Installation of the new equivalent two-pen recorder along with the temporary source alarm circuit were evaluated and determined not to involve any unreviewed safety question. Maintenance under MLP #90-35 was finally completed to remove the temporary source alarm circuit and to complete installation and checkout of the permanent source alarm module designed for the new recorder.

Controlling Documents: Maintenance Log Page #90-21 (Closed: 29 May 1990)
Maintenance Log Page #90-35 (Closed: 5 September 1990)
10 CFR 50.59 Evaluation/Determination No. 90-04.

2. <u>Changes In Stack Monitor Background Count Levels</u> (Permanent - Closed Item)

(Modification 90-07: Evaluation completed 14 December 1990)

This 10 CFR 50.59 Evaluation was generated to address increased background count rates on the stack radiation monitoring system. The background levels on the stack radiation monitor had gradually increased in late November and early December until during low power operation on 3 December 1990 the monitor was noted to be reading about 20 cps versus 1-2 cps as is usually indicated at low power. Under MLP #90-48 the monitor was checked and the detector subsequently recalibrated(Q-2 Surveillance) with no change in indication and still in calibration; a 10 CFR 50.59 Evaluation No. 90-7 of the elevated stack count rate at low power levels was performed and evaluated not to impact operation as the high end indication was unchanged. Therefore, the degraded condition was evaluated not to involve any unreviewed safety question. With the successful calibration of the monitoring channel, the reactor was returned to normal operation with operators reminded to track the low end indication to assure proper response should the situation so dictate.

On 17 April 1991, the gradually increasing background count rate on the stack monitor was noted to be becoming significant so it was taken out of service. Under MLP #91-26, the printed circuit foil on the stack readout module power supply board, the printed circuit foil on the stack readout module counter/amplifier board and the printed circuit foil on the detector/preamplifier board were all repaired. In addition the degraded GM detector was replaced followed by successful completion of a calibration check of the area and stack radiation monitors (Q-2 Surveillance). After closing MLP #91-26, it was reopened due to intermittent erratic spikes in stack counts from full downscale to full upscale with the problem traced to a burned cable-detector junction which was repaired pending acquisition of a replacement junction. Following recalibration of the stack radiation monitor the system was returned to service with no further problems noted relative to elevated stack counts. Subsequently, on 20 May 1991 the new signal cable plug junction connector for the stack monitor detector assembly was installed and tested under MLP #91-30.

Controlling Documents: Maintenance Log Page #90-48 (Closed: 4 December 1990)
Maintenance Log Page #91-26 (Closed: 25 April 1991)

Maintenance Log Page #91-30 (Closed: 20 May 1990)
10 CFR 50.59 Evaluation/Determination No. 90-07.

3. Demineralizer Resin Substitution (Permanent - Closed Item)

(Modification 91-01: Evaluation and Determination Completed 18 January 1991)

This 10 CFR 50.59 Evaluation was generated to address the substitution of Purolite NRW-37 resins for the Amberlite nuclear-grade type resins specified for the demineralizers in the primary coolant makeup water system (Section 9.2.3 in the UFTR Safety Analysis Report) and in the primary coolant purification system(Section 9.2.4 in the UFTR Safety Analysis Report). The reason for the substitution was unavailability of the Amberlite resins. Because the resins were considered equivalent per material data specification sheets and water quality consultants with acceptable water flow levels and quality provided when installed, this substitution was considered a safe condition and was evaluated and determined not to involve any unreviewed safety question.

Controlling Documents: Maintenance Log Page #91-04(Closed: 21 January 1991)
10 CFR 50.59 Evaluation/Determination No. 91-01.

4. Standard Operating Procedure E.4 Corrections (Permanent - Closed Item)

(Modification 91-02: Evaluation completed 11 January 1991)

This 10 CFR 50.59 Evaluation was generated to address changes made to UFTR SOP-E.4 during performance of the annual nuclear instrumentation calibration checks when various voltages were found to be out of tolerance and were adjusted. The discriminator and driver output voltage was found to disagree with the procedural requirement. Under 10 CFR 50.59 Evaluation No. 91-02 and MLP #91-19, the actual reading was noted to agree with the technical manual and to be acceptable so the procedure was changed. However, several voltage adjustments were then made as a startup and unscheduled shutdown were used to control adjustments of settings on Safety Channel 1 with a subsequent restart showing proper response on Safety Channel 1 with no further problems noted. Therefore these procedural changes were considered to be adequately reviewed and were evaluated not to involve any unreviewed safety question.

Controlling Documents: Maintenance Log Page #91-19(Closed: 4 April 1991)
UFTR SOP-E.4, Revision 1 (4/90)(TCN: 4/91, Pp 7,20)
10 CFR 50.59 Evaluation/Determination No. 91-02

5. Drilling Linear Range Panel Access Holes To Facilitate Channel Calibration Adjustments (Permanent - Closed Item)

(Modification 91-03: Evaluation completed 16 May 1991)

This 10 CFR 50.59 Evaluation was generated to address the drilling of holes in the console panel to allow access to the linear range adjustment screws without opening the panel. At the end of the extended power run for the annual calorimetric calibration check on 11 April 1991, it was discovered that the console had no ready access to allow the linear range to be adjusted during operation so the reactor was shut down and secured without making any adjustments. Because there had been no recent previous need for adjustment, this had not presented a problem previously. However, without these holes, such adjustments as would be necessary at power for the Annual Nuclear Instrumentation Calibration Check would necessitate pulling the control panel out and would not be an optimal way to proceed for such adjustments as hitting the scram bar would be a distinct possibility. Such adjustments had not previously been necessary; hence, the failure to note the need for such access holes. Under MLP #91-22, the necessary access holes were drilled in the console under 10 CFR 50.59 Evaluation No. 91-03 with no further problems noted as the linear channel calibration setting was set at 93.9% at the end of a subsequent power run completed on 12 April 1991. The decision was also made to label the holes and to keep the holes covered with tape to prevent temperature changes or dust from affecting the instrumentation. Therefore, the drilling of these holes was considered to be adequately reviewed and evaluated not to involve any unreviewed safety question.

Controlling Documents: Maintenance Log Page #91-22 (Closed: 12 April 1991)
10 CFR 50.59 Evaluation/Determination No. 91-03

6. Resistor Change In Safety Channel 2 Calibration Circuit (Permanent - Closed Item)

(Modification 91-04: Evaluation completed 16 May 1991)

This 10 CFR 50.59 Evaluation was generated to address the change of a resistor in the calibration circuit of Safety Channel 2 to facilitate proper calibration of the circuit. During the post-calorimetric procedure (A-2 Surveillance) on April 12, 1991, the calibration function on Safety Channel 2 was found to be not responding. The calibrate circuit had previously been removed from its card and installed on the box behind Safety Channel 2 with both a course and a fine adjust capability. When the UFTR console originally arrived, the safety channels had a full scale, 10 volt deflection to show 100% on the meter. To assure calibration over the full range, the channels were changed to have a full scale 10 volt deflection to 150%. This change did not alter all of the electronics involved, particularly the variable potentiometers and resistors. However, the variable resistances, instead of being mid-range in the range of travel, were near the end of their top range. This was fine as long as no further adjustment was necessary. However, during troubleshooting under MLP #91-23, a 22.4 KΩ resistor was found jumpering out the course adjust and the fixed resistor in series with it (See UFTR Diagram EL D206-4110D in **Figure 2**). This was a modification previously installed to make the circuit work until an adjustment was needed. When the jumpering 22.4 KΩ resistor was removed, the 100% to 150% 10 volt deflection caused the course and fine adjusts to be ineffective(inoperative). This is probably why the jumper resistor was installed. The course adjust potentiometer was also found to be open and was replaced with a duplicate spare. Under 10 CFR 50.59 Evaluation No. 91-04, the fixed 10 KΩ resistor was replaced with a 15 KΩ resistor which set the course adjust in the mid-range of travel and then allowed proper adjustment as necessary. This modification and the potentiometer replacement were implemented per MLP #91-23 to facilitate proper calibration of the Safety Channel 2 circuit and evaluated not to involve any unreviewed safety question per 10 CFR 50.59 Evaluation No. 91-04.

Controlling Documents: Maintenance Log Page #91-23 (Closed: 16 April 1991)
UFTR Diagram EL D206-4110D
10 CFR 50.59 Evaluation/Determination No. 91-04

7. Resistor Change For Safety Channel 1 Meter Adjustment (Permanent - Closed Item)

(Modification 91-05: Evaluation completed 16 May 1991)

This 10 CFR 50.59 Evaluation was generated to address the change of Safety Channel 1 meter circuit necessary to allow adjustment to conclude the annual instrumentation calibration check (A-2 Surveillance). When the UFTR console originally arrived, the safety channels had a full scale, 20 volt deflection to show 100% on the meter. To assure calibration over the full range, the channels were changed to have a full scale 10 volt deflection to 150%. This change did not change all of the electronics involved, particularly the variable potentiometers and resistors. However, the variable resistances, instead of being mid-range in the range of travel, were near the end of their top range which was fine as long as no further adjustment was necessary.

During the post-calorimetric for the A-2 Surveillance, it was also discovered that the Safety Channel 1 meter could not be properly adjusted after adjustment of the amplifier in the circuit. For Safety Channel 1, the meter adjustment circuit had 2 resistors in series, one fixed and one adjustable. When the amplifier which precedes the circuit was adjusted by the calorimetric, the meter circuit needed adjustment in the calorimetric on 12 April 1991; however, since it was at its end stop, proper adjustment per the calorimetric was not possible. Two options were possible - either replace the variable resistor, which would entail drilling on the card to set the new one in place, or replace the fixed resistor with one of a lower resistance. Under MLP #91-24 this latter option was selected to allow more current to flow to the meter and allow the variable resistor to be effective in adjustments around mid-scale.

Therefore, the R30 7.5 KΩ resistor was replaced with a 2.2 KΩ resistor (See UFTR Drawing No. EL D206-9511A per **Figure** 3). Since the amplifier (whose voltage setting is determined by the calorimetric) was not adjusted for this modification, the only subsequent retest necessary was to verify the voltage at the output to be identical after the modification as that determined in the calorimetric. This final check was successfully completed assuring the voltage was unchanged per MLP #91-24 with no further retest needed since nothing else was affected. This change on the Safety Channel 1 meter adjustment was evaluated not to involve any unreviewed safety questions per 10 CFR 50.59 Evaluation No. 91-05.

Controlling Documents: Maintenance Log Page #91-24 (Closed: 16 April 1991)
UFTR Drawing No. EL D206-9511A
10 CFR 50.59 Evaluation/Determination No. 91-05

8. Resistor Change For Safety Channel 2 Meter Adjustment (Permanent - Closed Item)

(Modification #91-06: Evaluation completed 16 May 1991)

This 10 CFR 50.59 Evaluation was generated to address the change of Safety Channel 2 meter circuit necessary to allow adjustment to conclude the annual nuclear instrumentation calibration check(A-2 Surveillance). During the post-calorimetric for the A-2 Surveillance, the same inability to adjust the Safety Channel 2 meter after adjustment of the amplifier in the circuit was noted as for the Safety Channel 1 meter. Under MLP #91-25 and per 10 CFR 50.59 Evaluation No. 91-06, a similar change was made to replace a 7.5 KΩ resistor with a 2.2 KΩ affecting the meter adjust circuit only(same drawing applies - UFTR Drawing No. EL D206-9511A per **Figure** 3). Since the same situation was present for the meter adjustment for Safety Channel 2 as for Safety Channel 1, the exact same modification and checks were performed with all results again satisfactory per MLP #91-25 so no further retest was needed. For the same reasons this change on the Safety Channel 2 meter adjustment was also evaluated not to involve any unreviewed safety questions per 10 CFR 50.59 Evaluation No. 91-06.

Controlling Documents: Maintenance Log Page #91-25 (Closed: 17 April 1991)
UFTR Drawing No. EL D206-9511A
10 CFR 50.59 Evaluation/Determination No. 91-06

9. Temporary Bypass of Fire Alarm System Zone 3 (Upstairs Hallway Smoke Detector and Two Pull Stations) Due to Smoke Detector Failure(Temporary - Closed Item).

(Modification: 91-07: Evaluation and Determination Completed: 21 June 1991)

This 10 CFR 50.59 Evaluation and Determination was generated to address the failure of a smoke detector and the subsequent temporary(several days) bypass of

Zone 3 in the fire alarm system for the reactor building described in Section 9.5.1 (Fire Protection System). Initially early in the afternoon on 21 June 1991, a Physical Plant Division technician spraying a fungicide to clean the ceiling tiles in the upstairs reactor building hall had alarmed the smoke detector which was cleaned, checked out and reset under MLP #91-36 and the system returned to normal monitoring status. Late in the afternoon, a second alarm from the smoke detector was not able to be reset as the smoke detector was evaluated to be failed. Under 10 CFR 50.59 Evaluation and Determination No. 91-07 and MLP #91-36, temporary bypass of the fire alarm system (Upstairs Offices and Laboratories) was approved and controlled until a replacement smoke detector could be obtained and installed. The evaluation and determination considered the fact that Zone 3 would be bypassed only for the weekend and that it contains no radioactive material; in addition, all air from Zone 3 is circulated by the air handler in Zone 2 which was monitored. Since the reactor cell is separate, this temporary bypass was not considered to create any additional hazard for the reactor provided Zone 3 would be periodically checked at no more than four(4) hour intervals which was communicated to the University Police Department so they could assure Zone 3 would be physically checked at intervals not to exceed four(4) hours with weekend workers supplying redundancy so Zone 3 could be expected to be directly monitored for over 50% of the elapsed time(65 hours) of the Zone 3 outage. In addition all laboratory equipment in Zone 3 was required to be secured unless under direct observation in this period. Actual direct monitoring by occupants was over 67% of the bypass time until the new smoke detector was installed under MLP#91-36 and the system returned to normal monitoring status on the morning of 24 June 1991. Because of the compensation provided, this outage was evaluated and determined not to involve any unreviewed safety question with the system subsequently returned to normal with no further problems noted.

Controlling Documents: Maintenance Log Page #91-36 (Closed: 24 June 1991)
10 CFR 50.59 Evaluation/Determination No. 91-07

10. Replacement of Quick Disconnect Fitting on Primary Coolant Demineralizer Inlet(Temporary-Closed Item).

(Modification 91-08: Evaluation completed 28 August 1991).

This 10 CFR 50.59 Evaluation was generated to address the failure of a quick disconnect fitting on the inlet to the primary coolant demineralizer and the substitution of another type of quick disconnect to assure retention of system integrity and quick disconnect capability while minimizing possibility of crud buildup or hideout in the connection. Following failure of the quick-disconnect, then under MLP #91-46 and RWP #91-5-II, the pit was decontaminated and a replacement fitting located. Following 10 CFR 50.59 Evaluation No. 91-08 the replacement quick disconnect was temporarily installed on the demineralizer inlet line to restore proper operation. Following location of identical replacement quick disconnect fittings for the primary coolant demineralizer, MLP #91-49 and RWP #91-6-II were used to replace the temporary fitting installed on the inlet side and to replace the existing brittle fitting on the outlet as well. Following replacement and full power operation, the system was verified to be leaktight with no further problems noted with 10 CFR 50.59 Evaluation No. 91-07 used to document the evaluation that the temporary replacement of the demineralizer inlet quick disconnect fitting with a non-duplicate spare was evaluated not to involve any unreviewed safety questions.

Controlling Documents:
Maintenance Log Page #91-46 (Closed: 22 August 1991)
Maintenance Log Page #91-49 (Closed: 28 August 1991)
Radiation Work Permit #91-5-II
Radiation Work Permit #91-6-II
10 CFR 50.59 Evaluation/Determination No. 91-08

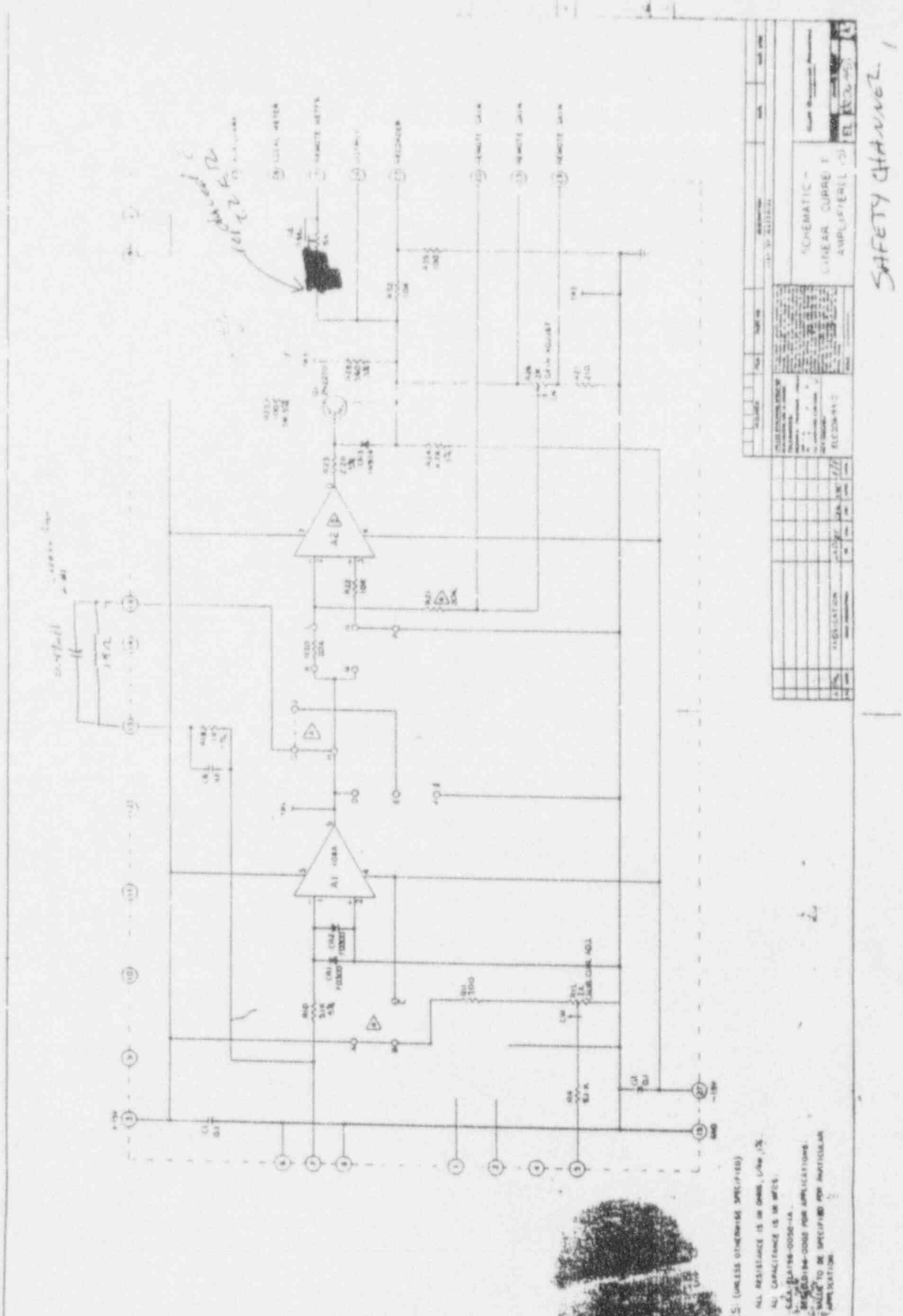


Figure 3. Safety Channel 1 - Schematic For Linear Current Amplifier

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 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) is 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 is 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. 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 year is much higher than normal but again, this is 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 will be much improved with the expected licensing of two new senior reactor operators early in the next reporting year.

Although there were no large maintenance projects for the year, several projects are noted to contribute to major portions of forced unavailability. First, various instrument and component failures in the area and stack radiation monitoring system were responsible for nearly forty(40) days forced unavailability with outages ranging for less than one day to over a week on several occasions. Various failures on the stack diluting fan to include the fan shaft and the tach-generator RPM indicator accounted for over ten(10) days forced unavailability. Similarly various seal and connector failures on the primary coolant system including the demineralizer connections as well as the demineralizer pump seals and the PC pump seals resulting in about twenty(20) days forced unavailability. Finally, maintenance related to proper completion of the annual nuclear instrumentation calibration check resulted in about fifteen(15) days forced unavailability. As is indicated, these four areas account for most of the forced unavailability for the year with the area and stack radiation monitoring system clearly meriting top consideration for replacement. The replacement of seals and connectors on the PC system and the maintenance performance to complete the nuclear instrumentation calibration should assure these areas will not be significant causes of outages in the next reporting year when it is expected that the UFTR should be able to return to high availability.

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 #91-44 on August 20, 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 three entries in Table V-2 all of which involved maintenance in progress at the end of the 1989-1990 reporting year and then closed out at various times in the current 1990-1991 reporting year. Similarly, one maintenance log page remains open at the end of the current reporting year - MLP #91-43 opened on August 7, 1991 to control cell appearance preservation activities; this page will remain open for some time as efforts continue to improve reactor cell appearance and preserve service life.

TABLE V-1

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

Date		Surveillance/Check/Test Description
5 September 90	S-8	Semi-annual Leak Check of Neutron Sources
17 September 90	Q-1	Quarterly Check of Scram Functions
19 September 90	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 3 - Upstairs Offices and Laboratories)
19/20 September 90	Q-4	Quarterly Radiological Survey of Unrestricted Areas
20/21 September 90	Q-5	Quarterly Radiological Survey of Restricted Areas
3 October 90	S-3	Semi-annual Inventory of Special Nuclear Material
3 October 90	Q-8	Quarterly Report of Safeguards Events
5/8 October 90	S-6	UFTR and UFSA Semi-annual Security Plan Key Inventory
15 October 90	Q-6	Quarterly Check of Posting Requirements
16 October 90	Q-2	Quarterly Calibration Check of Area and Stack Radiation Monitors
25 October 90	Q-3	Quarterly Radiological Emergency Drill
5 November 90	A-3	Annual Measurement of UFTR Temperature Coefficient of Reactivity
30 November 90	Q-9	Quarterly Calibration Check of Air Particulate Detector
6 December 90	S-7	Semi-annual Check(Replacement) of Security System Batteries
10 December 90	Q-5	Quarterly Radiological Survey of Restricted Areas
10/17 December 90	Q-4	Quarterly Radiological Survey of Unrestricted Areas
11/13 December 90	Q-1	Quarterly Check of Scram Functions
20 December 90	Q-3	Quarterly Radiological Emergency Evacuation Drill As Large Annual Drill Involving all Outside Agencies
2 January 91	Q-7	Quarterly Check of UFTR Building Fire Alarm System(Zone 4 - Annex)
4/7 January 91	S-10	Emergency Call List Check
7 January 91	Q-6	Quarterly Check of Posting Requirements
25 January 91	Q-2	Quarterly Calibration Check of Area and Stack Radiation Monitors
25 January 91	S-9	Semi-Annual Replacement of Well Pump Fuses
31 January 91	S-4	Measurement of Argon-41 Stack Concentration(Includes Measurement of Dilution Air Flow-Rate - Previously A-1 Surveillance)(Partial)
1-7 February 91	S-4	Measurement of Argon-41 Stack Concentration(Includes Measurement of Dilution Air Flow-Rate - Previously A-1 Surveillance)(Completion)
[illegible] February 91	S-1	Measurement of Control Blade Drop Times
[illegible] February 91	S-5	Measurement of Control Blade Controlled Insertion Times

TABLE V-1 (Continued)
CHRONOLOGICAL TABULATION AND DESCRIPTION OF SCHEDULED UFTR SURVEILLANCES, CHECKS AND TESTS

Date		Surveillance/Check/Test Description
11/12 February 91	S-11	Semi-Annual Replacement of Control Blade Clutch Current Light Bulbs
25 February 91	S-8	Semi-Annual Leak Check of PuBe and SbBe Neutron Sources
27 February 91	Q-9	Quarterly Calibration Check of Air Particulate Detector
28 February 91	Q-5	Quarterly Radiological Survey of Restricted Areas
4 March 91	Q-1	Quarterly Check of Scram Functions
4/7 March 91	Q-5	Quarterly Radiological Survey of Restricted Areas
5 March 91	Q-6	Quarterly Check of Posting Requirements
8 March 91	Q-4	Quarterly Radiological Survey of Unrestricted Areas
13 March 91	Q-2	Quarterly Calibration Check of Area and Stack Radiation Monitors
15 March 91	B-1	Biennial Check To Assure Negative UFTR Void Coefficient of Reactivity
19/21 March 91	A-1	Instrument and Test Equipment Calibration(Beckman-4410 Voltmeter)
20 March 91	Q-7	Quarterly Check of UFTR Building Fire Alarm System(Zone 1 - Reactor Cell and Control Room)
26 March-25 April 91	A-2*	UFTR Nuclear Instrumentation Calibration Check and Calorimetric Heat Balance
3 April 91	S-3	Semi-annual Inventory of Special Nuclear Material
3-5 April 91	S-6	UFTR Semi-annual Security Plan Key Inventory
10 April 91	S-1	Measurement of Control Blade Drop Times
10 April 91	S-5	Measurement of Control Blade Controlled Insertion Time
10 April 91	S-11	Semi-Annual Replacement of Control Blade Clutch Current Lights
18 April 91	Q-3	Quarterly Radiological Emergency Evacuation Drill
23 April 91	Q-2	Quarterly Calibration Check of Area and Stack Radiation Monitors
24 April 91	Q-2	Quarterly Calibration Check of Stack Monitor
6 May 91	S-8	Semi-Annual Leak Check of PuBe and SbBe Neutron Sources
24 May 91	Q-9	Quarterly Calibration Check of Air Particulate Detector
5 June 91	S-7	Semi-Annual Check (Replacement) of Security System Batteries
10 June 91	Q-1	Quarterly Check of Scram Functions
12 June 91	Q-4	Quarterly Radiological Survey of Unrestricted Areas
12 June 91	Q-5	Quarterly Radiological Survey of Restricted Areas
13 June 91	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 2 - Downstairs Offices and Labs)

TABLE V-1 (Continued)
CHRONOLOGICAL TABULATION AND DESCRIPTION OF SCHEDULED UFTR SURVEILLANCES, CHECKS AND TESTS

Date		Surveillance/Check/Test Description
18 June 91	S-9	Semi-Annual Replacement of Well Pump
18/19 June 91	S-4	Measurement of Argon-41 Stack Concentration(Includes Measurement of Dilution Air Flow-Rate - Previously A-1 Surveillance)
24/28 June 91	S-2	Annual Reactivity Measurements(Worth of control Blades, Total Excess Reactivity, Reactivity Insertion Rate and Shutdown Margin - Completed Worth of Blades Measurements Only)
26/29 June 91	S-10	Emergency Call List Check
29 June 91	Q-6	Quarterly Check of Posting Requirements
1-30 July 91	S-2	Annual Reactivity Measurements(Worth of Control Blades, Total Excess Reactivity, Reactivity Insertion Rate and Shutdown Margin - Data Reduction and Evaluation Completed)
1-31 July 91	B-4	Biennial Evaluation of UFTR Standard Operating Procedures(Evaluation Complete/Changes Being Generated)
17 July 91	Q-3	Quarterly Radiological Emergency Evacuation Drill
18 July 91	Q-2	Calibration Check of Area and Stack Radiation Monitors
8 August 91	Q-5	Quarterly Radiological Survey of Restricted Areas
20 August 91	Q-9	Quarterly Calibration Check of Air Particulate Detector
22 August 91	Q-4	Quarterly Radiological Survey of Unrestricted Areas
23/30 August 91	B-3	Biennial Evaluation of UFTR Standard Operating Procedures Manuals for Completeness(Review Standard In Progress)

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.

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 and July, 1991 respectively, and are carried over to the new year, they are both within the allowable interval:

Q-1 - Quarterly Check of Scram Functions (Carried over from 31 August 1991).
B-3 - Biennial Evaluation of UFTR Standard Operating Procedures Manuals For Completeness (Carried over from 11 July 1991).

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
31 July 1989	As part of the planned implementation of an improved method for measuring the control blade drop times(S-1 surveillance), it was necessary to check the voltage signals provided on the test rig leads. Under MLP #89-44, the blade drop test rig was hooked up and the power leads were located and measurements taken for future reference with the system then restored to normal with no problems noted in July, 1989. The decision was finally made on January 3, 1991 that the existing method would continue to be used with the recorder continuing to be borrowed until a permanent recorder is obtained for recording drop times based on the July, 1989 voltage measurements(3 Jan 91, MLP #89-44).
20 August 1990	During performance of the daily checkout, the rupture disk was broken. Under MLP #90-34, the water was removed to the holdup tanks, the pit was decontaminated and the water analyzed and a replacement disk of too low break pressure was tried resulting in another rupture disk breaking with all cleanup activities repeated. A total of approximately 80 gallons of primary coolant was sent to the holdup tanks. Subsequently, an on-hand spare was finally located and installed; the system was then leak checked with no further problems noted(4 Sep 90, MLP #90-34).
30 August 1990	When the new two-pen recorder was installed, an external source alarm was installed temporarily under 10 CFR 50.59 Evaluation and Determination No. 90-4 because the source alarm circuit was not available at the time. This source alarm finally arrived in August. Under MLP #90-35, the external source alarm was removed and the new alarm designed for the new recorder installed and checked out with all instrument checks completed satisfactorily (5 Sep 90 MLP #90-35).
4 September 1990	The makeup water system demineralizer resin had been noted to need replacement in August. After the requisite resins were obtained, the makeup water system demineralizer resins were replaced and the system verified to provide the high resistivity water needed to support reactor systems with no further problems noted(5 Sep 90, MLP #90-36).

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
4 September 1990	During the weekly and daily preoperational checkout, the stack radiation monitor was noted to have a failed instrument indication. Under MLP #90-37 extensive checks were performed resulting in replacement of a failed 10 megohm resistor and the high voltage power supply. Following successful retest of the stack monitor system, the reactor was returned to normal operation with no further problems noted(12 Sep 90, MLP #90-37).
14 September 1990	Following operation at power, stack monitor indications resulted in a decision to check and verify the low and high level calibration points on the stack monitor. Under MLP #90-38, the check and verification were completed with no further problems noted(14 Sep 90, MLP #90-38).
20 September 1990	Following completion of the day's operations, the door control position indicating switch on the first floor door to the controlled access area was discovered to be failed. The position indicating switch was replaced with no further problems noted(20 Sep 90, MLP #90-39).
8 October 1990	During the weekly checkout, the dilute fan motor and shaft were discovered to be vibrating excessively due to failure of the dilute fan motor bearings and the dilute fan shaft pillow block bearings. Under MLP #90-40(MWO 7336-90) the fan motor was pulled by Physical Plant Division personnel and the bearings replaced under UFTR staff observation to include assuring the tachometer was operational and unaffected so that new Argon-41 stack concentration measurements were not needed. The system was restored to normal operation with no further problems noted (11 Oct 90, MLP #90-40).
8 October 1990	During the weekly preoperational checkout, instrument failure was noted for the south and the east area radiation monitors. Three failed capacitors were replaced with on-hand spares in the preamplifier circuit of the south area monitor to restore its operability. Similarly, a bad component (transistor) was replaced with an on-hand spare in the high voltage section of the east area monitor as well as repair accomplished on a lifted lead in the rectifier for the high voltage power supply(possible

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	cause of failure). The system was returned to normal operation following a successful calibration check(Q-2 surveillance) of all area and stack radiation monitors with no further problems noted(16 Oct 90, MLP #90-41).
17 October 1990	While performing maintenance with the reactor shutdown, the SRO noted the pit alarm sounding at 1400 hours on 11 October 1990. Immediate investigation by the Acting Reactor Manager revealed an apparent leak from the primary coolant purification (demineralizer) pump seal (about 40 drops/minute). The Radiation Control Officer and the Facility Director were notified and the demineralizer pump secured to minimize the leak rate. Visual inspection of 12 October 1990 confirmed the apparent pump seal failure but there were no seals in inventory. Under MLP #90-42 opened on 17 October 1990 and RWP 90-9-II, the purification loop was isolated and drained and the pump was electrically disconnected. The seals were then replaced on 18 October 1990 and the system reassembled and operated with occasional visual checks to assure no leakage. Following verification of decontamination and water sample analysis on 21 October 1990, maintenance was concluded on 22 October 1990 with a subsequent operation at power to verify proper operation of the system with no further problems noted (22 Oct 90, MLP #90-42).
29 October 1990	During a preoperational checkout, the RPM indicator on the stack dilute fan was noted to be malfunctioning and moving downscale due to a loose set screw on the tach-generator. Under MLP #90-43, the set screw was shimmed and tightened to restore the proper RPM indication in the control room with no further problems noted(29 Oct 90, MLP #90-43).
5 November 1990	During the weekly checkout, the heat exchanger sample valve on the secondary side was noted to be showing signs of intermittent dripping. Under MLP #90-44 the packing nut on the valve was tightened to tighten the packing gland with no radiological problems. The system was then restored to normal operation with no further problems noted(5 Nov 90, MLP #90-44).

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
19 November 1990	During the daily checkout, the Safety-2 Control Blade Position Indicator(BPI) was noted to have the nixie tube in the tens digit burned out. The failed nixie tube was replaced with an on-hand spare for which all checks and calibrations were satisfactory so that MLP #90-45 was closed out. After installation overnight, the middle digit nixie tube on the S-2 BPI was noted to be burning brighter than normal. As a result MLP #90-45 was reopened and two failed resistors were replaced to restore the S-2 Blade Position Indicator to proper operation(20 Nov 90, MLP #90-45).
21 November 1990	During the daily checkout, the rupture disk was broken by RO trainee error resulting in dumping about 54 gallons of primary water to the equipment pit. The water was analyzed and removed to the holdup tanks, the pit was decontaminated and the rupture disk replaced with an on-hand spare. After refilling the primary coolant storage tank with 90 gallons of demineralized water and checking for leaks, the daily checkout was successfully completed with no further problems noted(21 Nov 90, MLP #90-46).
26 November 1990	During a preoperational checkout on November 24, the stack dilute fan RPM indication was noted to be low and the tach-generator bearings noisy. Under MLP #90-47 the tach-generator was removed and a spare ordered. After installing the new tach-generator, the RPM calibration was checked and the pulley rebalanced on the dilute fan shaft to restore system operation to normal(27 Nov 90, MLP #90-47).
3 December 1990	During operation of the UFTR to determine an updated critical position, the stack radiation monitor was noted to be reading about 20 cps versus 1-2 cps as is usually indicated at low power. Under MLP #90-48 the monitor was checked and the detector subsequently recalibrated with no change in indication and still in calibration; a 10 CFR 50.59 Evaluation No. 90-7 of the elevated stack count rate at low power levels was performed and evaluated not to impact operation as the high end indication was unchanged. With the successful calibration of the monitoring channel, the reactor was returned to normal operation with operators reminded to track the low end

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	indication to assure proper response should the situation so dictate(4 Dec 90, MLP #90-48).
18 December 1990	During a routine control room check, the stack monitor recorder chart drive paper was noted not to be moving on 17 December 1990. Under MLP #90-49, a worn and fail gear train was removed from the stack monitor recorder chart drive and replaced with a spare to restore proper paper movement with no further problems noted(18 Dec 90, MLP #90-49).
1 January 1991	On at least one occasion the secondary cooling 1 k y in the wide range drawer had been noted to be sticking at the trip on loss of secondary water remained effective at power levels below 1 kW. This condition was noted to meet Technical Specification requirements but to be restrictive. Under MLP #91-01 this relay was replaced and verified to be operating properly with no further problems noted(1 Jan 91, MLP #91-01).
10 January 1991	As part of routine preventive maintenance, the ink pads in the 12-point temperature recorder were replaced to restore acceptable legibility for the indications on the chart paper in the recorder. It was also noted that worn numbers on the temperature recorder print wheel would necessitate printwheel replacement in the near future. Following replacement of the ink pads, the temperature recorder was restored to normal operation with no further problems noted (10 Jan 91, MLP #91-02).
14 January 1991	During the weekly checkout a small leak along the primary cool pump shaft(few drops per week) was discovered. The Facility Director/Reactor Manager and the Radiation Control Officer were promptly notified. Under MLP #91-03 and RWP #91-02-I, the leak was evaluated to involve worn pump seals and to involve negligible radiation/radioactivity safety considerations. After replacement seals were obtained(not kept in stock), the system was opened, the lines were drained as necessary, the seals were replaced, the system was reassembled and checked for leak tightness at room temperature. The system was then run at temp are(full power) two times, first

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	to locate a small leak around the pump air vent and then to assure there were no further leaks(22 Jan 91, MLP #91-03).
17 January 1991	To make use of the down time associated with the primary coolant pump shaft leak, preparations were begun on January 16, 1991 to replace the primary coolant demineralizer resins which were near the end of useful life. Under MLP #91-04 and RWP #91-1-I, the resins were replaced with an equivalent mixed bed resin since the original resins specified in the Safety Analysis Report are no longer available. The use of these equivalent resins was determined not to involve any unreviewed safety question under 10 CFR 50.59 Evaluation and Determination No. 91-01. With completion of this work the demineralizer system was returned to service with no further problems noted (21 Jan 91, MLP #91-04).
30 January 1991	After the diluting fan was noted to be running rough, C. Moore and D. Sprague of Physical Plant Division straightened the pulley on the fan to smooth fan and tach-generator operation but with a request in with Physical Plant Division to replace the pulley and install shives to align the shaft properly with no further problems noted immediately(30 Jan, MLP #91-05).
4 February 1991	During the weekly checkout, the diluting fan RPM indication in the control room was discovered to be lost due to failure of the tach-generator probably caused by excessive vibration of the diluting fan shaft. Under MLP #91-06, the pulley on the shaft was realigned and a new tach-generator ordered. Subsequently a new, properly-sized pulley and shives were installed to align the diluting fan shaft. Finally, a new tach-generator was installed and proper shaft operation and RPM indication were checked to restore the diluting fan system and its control room RPM indication to normal(11 Feb 91, MLP #91-06).
7 February 1991	Under MLP #91-07, scaffolding was erected and checked in the reactor cell by five(5) technicians from Crom Equipment Rental to facilitate planned work to install a platform on the overhead crane to provide personnel protection for those working on the overhead lighting system(7 Feb 91, MLP #91-07).

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR
PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
8 February 1991	Under MLP #91-08, a platform was installed on the overhead crane bridge by three PPD steamfitters and a welder to provide personnel protection for those working on the overhead lighting system (8 Feb 91 MLP #91-08).
11 February 1991	Under MLP #91-09, advantage was taken of the existing scaffolding for UFTR personnel to service the overhead crane to include greasing, oiling and providing a general checkout of the crane system with no problems noted(11 Feb 91, MLP #91-09).
11 February 1991	Under MLP #91-10 the control blade clutch current replacement (S-11 surveillance) was implemented with timing of control blade drop times(S-1 surveillance) and control blade controlled insertion times(S-5 surveillance) also performed as required with no problems noted(12 Feb 91, MLP #91-10).
12 February 1991	Under MLP #91-11, the scaffolding provided to work on the overhead crane was removed by two technicians from Crom Equipment Rental and checked out by UFTR personnel with no problems noted(12 Feb 91, MLP #91-11).
15 February 1991	As a followup to MLP #91-02 when worn numbers were noted on the temperature recorder printwheel, under MLP #91-12, the printwheel on the 12-point temperature recorder was replaced to restore proper printing function with no further problems noted(15 Feb 91, MLP #91-12).
27 February 1991	When radiation control personnel returned to complete the APD Calibration Check (Q-9 Surveillance) begun on February 25, 1991 with the last of three check sources, the APD GM detector was noted to be failed. Under MLP #91-13 the failed GM detector was removed and replaced with an on-hand spare and the APD Calibration Check(Q-9 Surveillance) was satisfactorily completed to return the APD to normal operation with no further problems noted(27 FEb 91, MLP #91-13).
4 March 1991	Under MLP #91-14, overhead lights in the reactor cell were replaced by Physical Plant Division personnel using the new safety platform installed on the overhead crane. Subsequently

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	the same crew replaced a burned out ballast in one overhead lamp to restore normal overhead lighting levels in the reactor cell with no further problems noted(4 Mar 91, MLP #91-14).
4 March 1991	During the daily checkout on March 4, 1991, the North Area Radiation Monitor was noted to be failed with the recorder working. Under MLP #91-15 two fuses, an amplifier, the Geiger-Mueller detector and two transistors were replaced in the detector circuit. After satisfactory completion of the area monitor calibration check, the North Area Radiation Monitor was returned to normal operation (13 Mar 91, MLP # 91-15).
12 March 1991	During the weekly checkout, the primary coolant pump was noted to be excessively noisy. Under MLP #91-16 and RWP 91-I-02, the pump and motor were removed from the PC system and the problem was isolated to bad bearings in the pump motor. After having the pump motor overhauled and the bearings replaced at Electric Motor Repair Company of Gainesville, the motor was reattached to the pump and reinstalled into the primary coolant system. After considerable running at zero power, the system was also run at power to check for leaks and then returned to normal operations with no further problems noted(18 Mar 91, MLP #91-16).
14 March 1991	Prior to removal of the PC pump from the primary system(See MLP #91-16), it was thought that a failed ceramic filter could have passed demineralizer material to the pump intake resulting in distortion of the impeller. Under MLP #91-17, the primary coolant ceramic filter was removed and replaced with a spare with no problems noted(14 Mar 91, MLP #91-17).
25 March 1991	During the weekly preoperational checkout, the water level in the primary coolant storage tank was noted to be low at the 21-3/8 inch level. Under MLP #91-18, 50 gallons of demineralized water were added to the PC storage tank to restore the water level to the 27-inch level(25 Mar 91, MLP #91-18).
28 March 1991	During performance of the Annual Nuclear Instrumentation Calibration Checks(A-2 Surveillance), various voltages were

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	found out of tolerance and were adjusted. In addition, the discriminator and driver output voltage were found to disagree with the procedural requirement. Under 10 CFR 50.59 Evaluation No. 91-02 and MLP #91-19, the actual reading was noted to agree with the technical manual and to be acceptable. However, several voltage adjustments were then made as a startup and unscheduled shutdown were used to control adjustments of settings on Safety Channel 1 with a subsequent restart showing proper response on Safety Channel 1 with no further problems noted(4 April 91, MLP #91-19).
5 April 1991	During a restart to verify proper indication on Safety Channel 1, the auto flux controller was noted to be excessively noisy with a small decrease in power setting at one point. Under MLP #91-20, the problem was isolated to worn contacts on the chopper which was cleaned to restore proper operation with no further problems noted but another chopper to be obtained as a permanent replacement(9 Apr 91, MLP #91-20).
8 April 1991	During a preoperational checkout, the S-3 control blade was noted to withdraw only a few units on demand. Under MLP #91-21, the S-3 control blade circuit including limit switches was checked and several connectors repaired to restore proper operational response of the S-3 control blade with subsequent successful completion of surveillances on all blades to include replacement of the control blade clutch current bulbs (S-11 Surveillance) as well as measurement of control blade controlled removal times, control blade controlled insertion times(S-5 Surveillance), and control blade drop times (S-1 Surveillance) with no further problems noted(11 Apr 91, MLP #91-21).
12 April 1991	At the end of the extended power run for the annual calorimetric calibration check on 11 April 1991, it was discovered that the console had no ready access to allow the linear range to be adjusted during operation as required by the calibration procedure. Because there had been no previous need for adjustment, this had not presented a problem previously. Under MLP #91-22, the necessary access holes were drilled in the console under 10 CFR 50.59 Evaluation No.

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	91-03 with no further problems noted as the linear channel calibration setting was set at 93.9% at the end of a subsequent power run completed on 12 April 1991(12 Apr 91, MLP #91-22).
12 April 1991	During the post-calorimetric procedure for the A-2 Surveillance, the calibration function on Safety Channel 2 was found not to be responding. Under MLP #91-23, a failed potentiometer was replaced and a loose wire reterminated but the calibration circuit could not be brought in range. Under 10 CFR 50.59 Evaluation No. 91-04, a change was made to replace a 10 KΩ circuit resistor with a higher resistance (15 kΩ) to set the coarse adjust in the Safety Channel 2 calibration circuit to allow both the fine and coarse adjust potentiometers to be effective in setting the calibration. Such circuit adjustment had not been needed previously. Since the calorimetric involved changing the amplifier bias, the meter did need adjustment of the A-2 Surveillance. After reinstallation of the modified calibration circuit, the coarse and fine adjust calibration circuits were adjusted for a proper 100% reading when placed in calibrate with no further problems noted(15 Apr 91, MLP #91-23).
12 April 1991	During the post-calorimetric for the A-2 Surveillance it was also discovered that the Safety Channel 1 meter could not be properly adjusted after adjustment of the amplifier in the circuit. Under MLP #91-24 and 10 CFR 50.59 Evaluation No. 91-05, a change was made to replace a 7.5 KΩ resistor with a 2.2 KΩ resistor affecting the meter circuit only(UFTR Drawing No. EL D206 9511 A). Since the amplifier (whose voltage setting is determined by the calorimetric) was not adjusted for this modification, the only subsequent retest necessary was to verify the voltage at the output to be identical after the modification as that determined in the calorimetric. This final check was successfully completed assuring the voltage was unchanged per MLP #91-24 so no further retest was needed(16 Apr 91, MLP #91-24).
12 April 1991	During the post-calorimetric for the A-2 Surveillance, the same inability to adjust the Safety Channel 2 meter after adjustment of the amplifier in the circuit was noted as for the Safety

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	Channel 1 meter. Under MLP #91-25 and per 10 CFR 50.59 Evaluation No. 91-06, a similar change was made to replace a 7.5 KΩ resistor with a 2.2 KΩ resistor affecting the meter adjust circuit only(UFTR Drawing No. EL D206-9511 A). Since the same situation was present for the meter adjustment for Safety Channel 2 as for Safety Channel 1, the exact same modification and checks were performed with all results again satisfactory per MLP #91-25 so no further retest was needed (17 Apr 91, MLP #91-25).
17 April 1991	During the post-calorimetric for the A-2 Surveillance, the gradually increasing background count rate on the stack monitor was noted. Under MLP #91-26, the printed circuit foil on the stack readout module power supply board, the printed circuit foil on the stack readout module counter/amplifier board and the printed circuit foil on the detector/preamplifier board were all repaired. In addition, the degraded GM detector was replaced followed by successful completion of a calibration check of the area and stack radiation monitors(Q-2 Surveillance). After closing MLP #91-26, it was reopened due to intermittent erratic spikes in stack counts from full downscale to full upscale with the problem traced to a burned cable-detector junction which was repaired pending acquisition of a replacement junction. Following recalibration of the stack radiation monitor, the system was returned to service with no further problems noted (25 Apr 91, MLP #91-26).
22 April 1991	During performance of the weekly checkout, low flow was noted at the filter in the shield tank demineralizer system. Under MLP #91-27, the filter was replaced with an on-hand spare to restore system flow at the filter(22 Apr 91, MLP #91-27).
29 April 1991	During a previous weekly checkout on 22 April 1991, the flex coupling on the stack diluting fan system was noted to have several holes and to be in need of repair. Under MLP #91-28, the torn canvas coupling was replaced with new canvas by Physical Plant Division personnel to restore system integrity(29 Apr 91, MLP #91-28).

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
29 April 1991	During the weekly preoperational checkout, the stack monitor alarm was noted not to alarm when the switch was placed in trip adjust. Under MLP #91-29, the trip adjust circuit was reset and the stack monitor calibration performed to adjust the slope for 4000 cps high level alarm to restore proper response(29 Apr 91, MLP #91-29).
20 May 1991	Previously under MLP #91-26, a burned stack monitor cable-detector junction had been repaired and a new junction had been ordered. Under MLP #91-30, a new signal cable plug junction connector for the stack radiation monitoring system detector assembly was installed and tested for baseline activity. The stack monitor was then recalibrated and returned to service with no further problems noted(20 May 91, MLP #91-30).
20 May 1991	Previously under MLP #91-20, the contacts on the chopper for the auto flux controller were cleaned and the chopper returned to the circuit while a replacement chopper was being obtained. Under MLP #91-31, a used reburnished chopper was installed and checked out for proper operation with significant reduction in noise level. After checkout and return of the auto flux control system to normal operation, no further problems were noted (20 May 91, MLP #91-31).
10 June 1991	Physical Plant Division Maintenance Engineer Gordon Frederick had previously evaluated requirements for regular preventive and special maintenance on the overhead crane. Under MLP #91-32 two PPD technicians performed regular preventive maintenance checks and service on the overhead crane to assure its continued reliable operation with no problems noted(10 June 19, MLP #91-32).
17 June 1991	Under MLP #91-33 PPD electricians replaced all burned out overhead lamps in the cell plus one ballast and two lamp sockets to restore proper cell lighting levels(17 Jun 91, MLP #91-33).
19 June 1991	During the weekly checkout the makeup system demineralizers were noted to be losing effectiveness. Under MLP #91-34, the resins in the two makeup system demineralizers were replaced

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	to restore the source of high resistivity water(20 Jun 91, MLP #91-34).
20 June 1991	In a routine tour of the reactor building to explain evacuation routes to SRO trainee D. Cronin, the deep well pump header was noted not to be locked in place. Under MLP #91-35, a lock was installed on the breaker at the well to assure service in not interrupted when required(20 Jun 91, MLP #91-35).
21 June 1991	In the early afternoon on June 21, 1991, the Zone 3 smoke detector was set off by a maintenance person spraying a protective coating on the ceiling tiles. Under MLP #91-36 fire alarm service personnel cleaned the alarmed smoke detector, checked and reset the alarm system. Subsequently several hours later the system re-alarmed and could not be reset. Since a spare smoke detector was not immediately available, Zone 3 was bypassed temporarily with agreement of the Executive Committee of the RSRS per 10 CFR 50.59 Evaluation and Determination No. 91-07 "Temporary Bypass of Fire Alarm System Zone 3 (Upstairs Hallway Smoke Detector and 2 Pull Stations) Due to Smoke Detector Failure" and with all occupants and UPD notified of the outage and regular round-the-clock periodic visits set up. Under MLP #91-36 on the morning of June 24, 1991 a new smoke detector was installed in Zone 3 and a loose supporting conduit on a pull station in Zone 2 was re-anchored; after checkout, the system was returned to normal operation with no further problems noted(24 Jun 91, MLP #91-36).
24 June 1991	During the weekly checkout the E-140 GM Detector (Serial No. 1048) was noted to have a bad switch, low battery power and a bad audible clicker. Under MLP #91-37, the detector was repaired, checked out and returned to service with no further problems noted(24 Jun 91, MLP #91-37).
24 June 1991	About 40 minutes after completion of reactor operations on June 24, 1991, a burning circuit was noted to have resulted in failure of the -24 volt emergency backup battery power supply and charging system for the radiation monitoring system. Under MLP #91-38 the -24 volt battery power supply and

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	charging circuit were removed; the circuit was repaired and new batteries installed in the power supply unit. After checking to assure the +24 volt system was operating properly, the repaired -24 volt system was reinstalled, the charging circuit set at 100 milliamperes and the system returned to service with no further problems noted(26 Jun 91, MLP #91-38).
29 July 1991	During preparation to remove the shield blocks from the equipment pit for entry to perform the weekly preoperational checks, the crane controls were found to be responding erratically and periodically giving no response. Under MLP #91-39, the crane control box was opened and all six sets of directional contacts were cleaned to restore proper crane response(29 Jul 91, MLP #91-39).
29 July 1991	During the weekly checkout the shield tank sample line was discovered to have a small seepage leak. Under MLP #91-40, a swipe showed no contamination present. The sample line was then resealed with teflon tape and returned to service with no further problems noted(29 Jul 91, MLP #91-40).
6 August 1991	Following a request made during the ANI/MAELU Nuclear Insurance Inspection conducted on June 10 1991 per the ANI inspection report dated July 10, 1991 and received on July 13, 1991 concerning a sampling system on the air cooler condensate discharge pipe for the reactor cell, MLP #91-42 was used to evaluate the request and finally to install a sample connection/collection capability on the UFTR cell air conditioner condensate discharge pipe with the first sample indicating no radiological contamination as expected per air sampling performed weekly in the reactor cell. This sampling system provides a backup means of quantifying releases with no problems noted(22 Aug 91, MLP #91-42).
7 August 1991	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 as well as cleaning and painting

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	of many floor surfaces was completed during this reporting year with various other efforts in progress(MLP #91-43 remains open at the end of the reporting year).
20 August 1991	During scraping and cleaning efforts in the PC equipment pit following completion of surveys in the pit, the secondary heat exchanger sample line connection was noted to be corroded through and failed to the touch on 12 August 1991. After verification of no contamination in the water and considerable delay, a replacement connection was located and installed to restore system operability(20 Aug 91, MLP #91-44).
20 August 1991	During a routine check of the reactor control room, the recorder needle on the South Area Radiation Monitor was noted to be detached. Under MLP #91-45 the needle was reattached to restore proper functioning to the South Area Radiation Monitor with no further problems noted(20 Aug 91, MLP #91-45).
21 August 1991	In leaving the primary equipment pit, the inlet quick-disconnect fitting on the primary coolant demineralizer was bumped and broken releasing about 4 liters of primary coolant to the pit with no contamination of personnel(2 liters released to holdup tanks, 2 liters to absorbent paper). Under MLP #91-46 and RWP #91-5-II, the pit was decontaminated and a replacement fitting located. Following 10 CFR 50.59 Evaluation No. 91-08, this replacement quick-disconnect fitting was temporarily installed on the demineralizer inlet line to restore proper operation(22 Aug 91, MLP #91-46).
27 August 1991	Following several spurious security alarms including one period when the alarm would not reset with the problem isolated to the control box, MLP #91-47 was utilized to check out the box, clean connections and better secure components with the system checked to be properly operating(27 Aug 91, MLP #91-47).
28 August 1991	Following the location of identical replacement quick-disconnect fittings for the primary coolant demineralizer, MLP #91-49 and RWP #91-6-II were used to replace the temporary

TABLE V-2 (Continued)

CHRONOLOGICAL TABULATION OF UFTR
PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	fitting installed on the inlet side and to replace the existing brittle fitting on the outlet as well. In replacing the two fittings about 1/10 liter of primary coolant was released to the holdup tanks. Following replacement and full power operation, the system was verified to be leaktight with no further problems noted(28 Aug 91, MLP #91-49).

MLP #91-43 Remains Open from 7 August 1991.

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 1990-1991 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 Training Requalification and Recertification 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. 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 current reporting year neutronics analysis of the existing HEU core and the proposed LEU core were nearing completion as various thermal hydraulic analysis are also 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 1990-1991 reporting year there were no further revisions of the UFTR SAR as a result of internal reviews. Nevertheless, neutronics and thermal-hydraulics analyses to support the HEU-to-LEU conversion have continued throughout the reporting year. Therefore, 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 the first time in recent years, no new Standard Operating Procedures were generated during the 1990-1991 reporting year. This condition marks the maturity of the UFTR Standard Operating Procedures as great efforts have been undertaken to meet 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 (1989-1990) 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(1990-1991) 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 were three(3) revisions to SOPs generated during this reporting year with no new procedures per the discussion in Section C of this Chapter. Although the total of three(3) revisions 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 decrease in future years. It is noteworthy that for the second 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 many previous years. The basic reason(s) for all three revisions are explained in the following paragraphs with a copy of each contained in **Appendix E** of this report.

First, Revision 2 for UFTR SOP-0.1, "Operating Document Controls" dated July, 1991 was generated to clarify what is meant by document control files to include what documents constitute "document control files," where the various files are kept to include assignment of controlled copies to individuals and/or locations and who is to update them. Finally, the revision contains an updated listing of the contents of the document control files as well as the locations for the various parts of the "document control files". All of these changes could have been treated under the temporary change notice(TCN) category; however Revision 2 of this procedure was also used to collect and incorporate five(5) previous TCNs into the one revision along with regenerating and reformatting the forms used to document control of the Operating Document Manuals.

Second, Revision 2 for UFTR SOP-0.5, "UFTR Quality Assurance Program" dated July, 1991 was generated to allow Auxiliary Operating Instructions to be maintained but not necessarily on the reactor console, to have the procedure text match all the audit areas listed on UFTR Form SOP-0.5E(Annual QA Audit Checklist), to delete the note on the Emergency Drill card(Q-3 Surveillance) prohibiting reactor operation at power prior to emergency drills because of the elevated stack count rate which now agrees with the allowed conditions per Technical Specification/License Amendment 17(See Section A), to update the specification of the recorder used for the control blade drop times(S-1 surveillance) as a generic versus specific recorder requirement, to delete the surveillance data sheets for the Annual Nuclear Instrumentation Calibration Check(A-2 Surveillance) since UFTR SOP-E.4, "UFTR Nuclear Instrumentation Calibration Check" now controls this surveillance, and to update the surveillance data sheets for the Biennial Evaluation of UFTR SOP Manuals For Completeness(B-3 Surveillance) in updating specifications for manual locations/holders and including the new SOP-E.4 generated in early 1990. This Revision also numbers the pages uniformly for all previously numbered multipage surveillance data sheets and lists changes in surveillance data sheets prior to Revision 2 of the SOP on the Appendix V coversheet. Again, all of these changes could have been treated under the TCN category; however, Revision 2 of this procedure was also used most profitably to collect and incorporate twenty-two(22) previous TCNs generated since Revision 1 dated February, 1986 into the one revision in a single format.

Third, Revision 4 for UFTR SOP-D.1, "UFTR Radiation Protection and Control" dated July, 1991 was generated to implement changes in the new University of Florida Radiation Control Guide(Revision: 10/89) and to make several other minor changes to facilitate SOP usage. Specifically, changes include incorporating and specifying monthly limits on radiation exposure versus the now optional weekly exposure limits, updating the volume requirement on the weekly air samples, specifically referencing minors and pregnant women as 10% of the occupational limit and quoting the limits and recommending broader use of Radiation Work Permits if units could be expected to be exceeded on a "weekly" basis to assure proper monitoring and ALARA conditions. This revision also adds two sections requiring instruction to fertile females for 10 CFR Part 19 Radiation Worker Instructions and a section referencing where to find limits on radioactivity in air or water as well as updating the Table in Appendix I to reflect the 10% limit for all types of non-occupational exposure. Again all of these changes could have been treated under the TCN category; however, Revision 4 of this procedure was also used to collect and incorporate five(5) previous TCNs generated since Revision 3 dated January, 1983 into the one revision in a single format.

During the 1990-1991 reporting year, a number of minor changes were also incorporated into the UFTR Standard Operating Procedures as needs and/or errors were identified especially as part of the biennial evaluation of the Standard Operating Procedures. Twenty-four(24) "Temporary Change Notices" were issued to correct minor discrepancies or better express the unchanged intent of fourteen (14) different procedures, some, especially SOP-0.5 (QA Program), several times to include SOP-0.1, SOP-O.2, SOP-O.5, SOP-A.1, SOP-A.2, SOP-A.3, SOP-A.7, SOP-A.8, SOP-C.2, SOP-D.1, SOP-D.2, SOP-E.1, SOP-E.4, and SOP-F.8. It should be noted that the four(4) temporary change notices for SOP-O.5 implemented, among other things, improvements for several surveillances to add the quarterly calibration check of the air particulate detector(Q-9) to the list of surveillances, to assure the proper company is contacted to calibrate the voltmeter for the annual nuclear instrument checks (A-1), to expand and update the surveillance data sheets for documenting the biennial evaluation of SOPs(B-4) and also to expand the annual QA Audit Checklist to meet RSRS audit requests. Similarly, the four(4) TCNs for SOP-E.4 (Annual Nuclear Instrumentation Calibration Check) correct the title to a section, add an omitted symbol to the reactor power equation on Form SOP-E.4H, corrects an incorrect voltage contact reference point and relaxes the tolerance on the discriminator and driver voltages per the console tech manual and updates the procedure to reference the new Linseis two-pen recorder, makes proper reference to the temperature recorder manual, deletes the warmup requirement when interrupting power to the temperature recorder and specifies an analog DC voltmeter and stopwatch may be used in making the wide range alignment check if a recorder is unavailable.

The remaining Temporary Change Notices all involve relatively minor changes affecting one or a few sections of the respective SOPs. 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; 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 13, 1990, Revision 6 was submitted to the NRC. Revision 6 has affected three pages and is considered a minor revision.

First, Revision 6 consists of changes to Figure 1.2 on Page 1-4 to document the location of the rapid sample insertion pneumatic(rabbit) system in the northwest corner of the radiochemistry laboratory as well as the conversion of the NAA Laboratory(southwest corner) into a separate room with removal of the two hoods in the center of the room. Other changes documented on the updated Figure 1.2 are the room numbers which were changed by the University of Florida in mid-1990. Revision 6 also changes Page 10-5 to correct a typographical error for the location of the Emergency Equipment Cart to be in Room 106 of the Nuclear Sciences Center, Not Room 109 as previously indicated. Finally, Revision 6 consists of an updated Emergency Equipment Inventory at the Emergency Support Center in Table 10.3 on Page 10-6. The change consists of correcting the stated location of the equipment required to be in Rooms 106 and 108 of the Nuclear Science Center, not just 108. In addition, several typographical errors and omissions in Table 10.3 were corrected.

All these changes were reviewed by UFTR management and the RSRS to assure no decrease in effectiveness of the Plan at its meeting and Revision 6 was supplied to all Plan holders with an explanatory memorandum dated December 27, 1990. In a letter dated April 17, 1991 in followup to an earlier telephone conversation, Ted Michaels, the NRC's UFTR Project Manager requested that the room numbers on Figure 1.2 be clarified. In a subsequent letter dated May 22, 1991, NRC was updated to note that the circled numbers on the floor plan are the room numbers as they were changed from the previous 3-digit numbers. Since these numbers also appear on the doors in the UFTR facility, there was no need to change Figure 1.2 further. In a letter dated April 17, 1991, the NRC notified the facility of their evaluation that the changes do not decrease the effectiveness of the Plan and the Plan maintains compliance with 10 CFR 50 Appendix E. Therefore, the proposed changes were approved and could be incorporated into the current Emergency Plan. Revision 6 documentation is contained in **Appendix D** 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 7 is being prepared to update a number of operations-related sections in the Emergency Plan. Revision 7 will update typical facility annual energy generation values, the listing of assessment facilities presented in Section 8.2 of the plan and methods of transporting contaminated victims. Some references to specific assessment equipment will be changed to allow use of equivalent equipment as well.

F. Biennial Reactor Operator Requalification and Recertification Program

The previously approved biennial reactor operator Requalification and Recertification Program expired at the end of June, 1989. Therefore, a new program was submitted to NRC with a letter dated May 30, 1989, to cover the July, 1989 through June, 1991 period. The new program had only minor changes (additions) from the previous program submitted in May 26, 1987 and then updated by a submittal in August 19, 1988 to reflect the new requirements (and NRC's interpretation of these) in 10 CFR 55 for a comprehensive examination once every two years and an operations test every year as well as the requirement that all licensed personnel exercise the RO/SRO license for a minimum of 4 hours of licensed activities during each calendar quarter which is now being tracked on training forms. This program incorporated several minor changes to include annual special equipment training on the rabbit system and the overhead crane as well as explicit biennial requirements for a separate lecture and examination on the Security Plan and the Emergency Plan. Otherwise the Plan was unchanged. Changes were reviewed by the Reactor Safety and Review Subcommittee were not considered to require NRC approval since they clearly upgraded the Program. Otherwise the Program remained essentially the same as that previously submitted. Since no response was ever received to the May 30, 1989 submittal, the facility continued to follow the Program Plan as upgraded until time for renewal. This current operator requalification and recertification program training cycle for the UFTR was scheduled to end in June, 1991. Therefore, renewal of the current 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 is contained in **Appendix F** to this report and covers the training program from July 1, 1991 to June 30, 1993 and is 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 has been ongoing throughout the 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 prior to SRO P.M. Whaley's departure on October 5, 1990. These exams were all passed and seem to be working well. The upgraded Annual Operations Tests were scheduled to be applied in December, 1990 and were administered later in the reporting year with similar success. In conducting license training for the two new SRO candidates, banks of objective questions and answers were generated for all segments of the lectures in the training program and these too seem to be working well with much less effort expected to be required in generating and administering examinations in future years.

G. <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.

Since receiving funding, work has been proceeding as quickly as possible though a shortage of graduate students to perform the neutronic and other analyses have 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 has been lagging.

The required visual inspection and identification of SPERT fuel pins was completed in the previous reporting year 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. A letter dated March 20, 1989 acknowledging receipt of the application was received on April 4, 1989. 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, a 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 Room 6 an allowed storage location was approved per a letter and license amendment dated June 14, 1990. Following decontamination operations, both Room 5 and Room 6 were put on the security system and the wall between Rooms 5 and 6 in Building #554 was broken through under proper radiological controls on July 30. 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. At the end of the last reporting year Room 5 was still on the security system as final decontamination checks were in progress by the Radiation Control Office to assure acceptable levels would be documented for release of Room 5 to other researchers for unrestricted use. A draft of Revision 4 to the UFSA SNM-1050 Physical Security Plan was reviewed at the August 30, 1990 RSRS meeting with the final Revision 4 reviewed and approved for submittal at the September 13, 1990 RSRS meeting. In addition, the issue of alleged inadequate security practices at the SNM-1050 facility per an NRC letter dated August 22, 1990 and received on August 29, 1990 was also considered with the facility response also finalized at the September 13, 1990 meeting. Revision 4 of the SNM-1050 Physical Security Plan was submitted to NRC with a letter dated September 13, 1990 while the response to the 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. Her inspection included a detailed security-oriented walkthrough tour of the UFTR facility(the allegation was filed under the R-56 license), UPD dispatch and the SNM-1050 storage facility in Room #6 of Building

#554. At the exit interview, the inspector indicated the allegation would be closed out and final approval of the Revision 4 would be initiated. In NRC Inspection Report No. 50-83/90-02 dated November 23, 1990 and received on November 28, 1990, NRC Region II did close out the allegation and accept implementation of Revision 4 of the UFSA Security Plan. See Appendix B for Documentation of Inspection Report No. 50-83/90-02 results.

When their storage racks are licensed, Rensselaer Polytechnic Institute would also like 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.

The latest 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. At the end of the reporting year, no further information had been received on the no-cost extension making some plans and efforts difficult to implement.

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 reporting year and will have to be completed before the package can be assembled for submission to NRC in early 1992. At the end of the reporting year, a graduate assistant is currently working on the thermal hydraulics area as the 14 plate fuel bundle arrangement has been selected for the conversion. The lack of official grant extension is making the financial support of this effort more difficult. The latest updated proposal 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. NRC Project Manager Ted Michaels was updated on progress in a telephone conversation on May 29, 1991 as was NRC Region II inspector Craig Bassett in August, 1991 at the end of the reporting year as the schedule is likely to slip a few more months before submittal of the safety analysis package. This further delay is because the basic thermal-hydraulics analysis is proceeding 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.

H. Quality Assurance Program Approval For Radioactive Material Package

During the middle of the 1987-1988 reporting year, plans were being 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 will 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 remains in effect (**See Appendix G**).

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 G of this Chapter, these 1200 fuel pins were finally transferred to the Oak Ridge National Laboratory on May 17, 1990 of the last reporting year under the existing QA Program approval. Efforts are underway to transfer the remainder of the pins but no specific acceptance has been sent us. Even if some of the 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 was 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 expires on October 31, 1992. UFTR management is still hopeful these pins can be transferred before the end of the next reporting year but their presence in the more confining North Quonset Hut(Room 6) of the Nuclear Research Field Building will make the transfer more difficult, time consuming and costly.

I. 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 assumes most work will 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 will 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. 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 this report as it was in last year's (1989-1990) report along with the internal memorandum dated July 30, 1991 updating the cost estimate from $2.02 to $2.115 million.

TABLE VI-1

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(August 31, 1990)

O. ADMINISTRATIVE CONTROL PROCEDURES

- O.1 Operating Document Controls (REV 1, 5/87)
- 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 1, 2/86)
- O.6 Reactor Trip and Unscheduled Shutdown Revi . 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 0, 8/87)

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 10, 12/88)
- A.5 Experiments (REV 4, 12/88)
- A.6 Operation of Secondary Cooling Water (REV 1, 10/83)
- A.7 Determination of Control Blade Integral or Differential Reactivity Worth (REV 1, 6/85)
- A.8 Penumatic 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 (Superceded 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, 1990)

D. RADIATION CONTROL PROCEDURES

- D.1 UFTR Radiation Protection and Control (REV 3, 1/83)
- 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 4, 12/88)
- 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 Superceded
- E.5 Superceded
- 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 1, 9/84)
- F.8 UFTR Safeguards Reporting Requirements (REV 0, 9/87)

TABLE VI-2

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 (Superceded 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-2 (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 Superceded
- 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 1990-1991 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
0.1	12/90	15	Information Copies assigned to trainees but not by name.
0.2	7/91	10	Updates listing of minor maintenance to list area and stack monitor recorders, to allow pen replacement on the 2-pen recorder and adds routine preventive maintenance on the overhead crane and the fire alarm system.
0.5	12/90	26	Adds Q-9 Quarterly Calibration Check of Air Particulate Detector to list of surveillances.
	3/91	A-1	Changes company recommended to perform calibration of electronic test equipment.
	4/91	24	Expands items in Annual QA Audit Checklist(UFTR Form SOP-0.5E).
	6/91	B-4 pp 1-3 →pp 1-5	Expands and updates B-4 surveillance data sheets for documenting biennial evaluation of SOPs.
A.1	1/91	32	Adds asterisk to weekly check sheet to require value for stack dilute fan RPM.
	7/91	8,13	Allows range on PC flow rate and use of analog or digital resistivity meter.
A.2	11/90	5	Removes unnecessary restrictions on performing daily checkout or interlock checks on second and subsequent startups.
	7/91	9	Updates reactivity worth of Regulating Blade for 30 second period.

TABLE VI-3(continued)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES TEMPORARY CHANGE NOTICES ISSUED FOR 1990-1991 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
A.3	7/91	4	Updates current regulating blade reactivity worth and movement for 30 second period and specifically allows safety blade insertion to control positive period.
A.7	6/91	7	Clarifies misleading directions on UFTR Form SOP-A.7B on calculating shutdown margin.
	7/91	12	Allows changes one position at a time in linear channel range switch during control blade worth measurements.
A.8	12/90	19	Corrects typographical errors in dose rate equivalence to count rate on the rabbit system glove box monitor.
	7/91	10,11,17	Removes unnecessary references to use of side entrance to rabbit system glove box and changes Form SOP-A.8A to allow Section III certifying rabbit system operating to be completed by a certified rabbit system operator and an RO who is not necessarily a certified rabbit system operator.
C.2	7/91	3,4	Clarifies type of plate(load bearing) placed atop the core during fuel removal.
D.1	10/90	11	Specifies anti-C coveralls(not necessarily white) in the Emergency Support Center.
D.2	12/90	16	Updates For D.2C to provide a space for recording the power level at which surveys are taken.

TABLE VI-3(continued)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES ISSUED
FOR 1990-1991 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
E.1	7/91	2	Corrects several minor typographical errors.
E.4	12/90	3	Corrects Section 5.0 Title to be "References".
	3/91	25	Adds omitted symbol in equation for Reactor Power on Form SOP-E.4H
	4/91	7,20	Corrects reference to incorrect voltage contact point and corrects tolerance on discriminator and driver voltages to agree with tech manual and not affect current instrument calibration.
	7/91	3,4,6,23	Update references to temperature recorder manual, corrects specification to new 2-pen chart recorder(LINSEIS), deletes unnecessary warmup requirement when power to temperature recorder is turned off, specifies an analog DC voltmeter is allowed if a recorder is not present and increases the upper range of high voltage settings on Form SOP-E.4G used for plateau measurements on the wide range detectors.
F.8	7/91	6	Corrects UFTR Form SOP-F.8B when filed for safeguards events to be a Q-8 surveillance, not Q-7.

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

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)	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

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)	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 [illegible] 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	Ocotber, 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

3/91

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 were several low level liquid releases 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, 1990	5.4065×10^{6} μCi/Month	1.4805×10^{-9} μCi/ml
October, 1990	5.5023×10^{6} μCi/Month	1.5067×10^{-9} μCi/ml
November, 1990	8.9471×10^{6} μCi/Month	2.4500×10^{-9} μCi/ml
December, 1990	3.0264×10^{6} μCi/Month	8.2872×10^{-9} μCi/ml
January, 1991	6.5733×10^{6} μCi/Month	2.1489×10^{-9} μCi/ml
February, 1991	1.6444×10^{6} μCi/Month	0.5376×10^{-9} μCi/ml
March, 1991	4.9322×10^{6} μCi/Month	1.6124×10^{-9} μCi/ml
April, 1991	8.2947×10^{6} μCi/Month	2.7116×10^{-9} μCi/ml
May, 1991	7.6626×10^{6} μCi/Month	2.5050×10^{-9} μCi/ml
June, 1991	4.7894×10^{6} μCi/Month	1.7037×10^{-9} μCi/ml
July, 1991	8.2270×10^{6} μCi/Month	2.9265×10^{-9} μCi/ml
August, 1991	4.0713×10^{6} μCi/Month	1.4482×10^{-9} μCi/ml

TOTAL ARGON-41 Releases for the Reporting Year: 69.0771 Ci

YEARLY AVERAGE ARGON-41 Release Concentration: 2.443×10^{-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 2.443×10^{-9} μCi/ml is more than an order of magnitude below the limiting value.

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. 1990 - Dec. 1990	4288.81 μCi/kW-hr	8.456×10^{-8} μCi/ml
Jan. 1991 - May 1991	4062.48 μCi/kW-hr	9.562×10^{-8} μCi/ml
Jun. 1991 - Aug. 1991	3404.59 μCi/kW-hr	8.720×10^{-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 320,000 liters discharged from the liquid waste holdup tanks to the campus sanitary sewage system during this reporting period. For this period there were batch discharges 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 52 weekly samples were taken during this reporting year; the average activity for these coolant samples was 1.29×10^{-7} μCi/ml (β-γ) and 2.10×10^{-8} μCi/ml (α) for this 1990-1991 reporting period.

The only other primary coolant samples released to the holding tanks during the reporting year are listed in Table VII-3A. All of the releases were due to mechanical failure of components with subsequent repair, with the exception of a broken rupture disk on November 21, 1990 due to operator error and replacement of demineralizer resins on January 17, 1991.

TABLE VII-3A

LIQUID WASTE RELEASES FROM HOLDUP TANKS

Date	Volume (liters)	Concentration[1] (μCi/ml)	Total Release Activity (μCi)
1. October 11, 1990	2	NDA	NDA
2. October 17, 1990	10	NDA	NDA
3. November 21, 1990	216	2.92×10^{-7}	5.68×10^{-2}
4. January 14, 1991	1	2.00×10^{-7}	2.00×10^{-4}
5. January 17, 1991	20	NDA	NDA
6. March 12, 1991	0.1	2.30×10^{-8}	2.30×10^{-6}
7. August 21, 1991	2	8.04×10^{-8}	3.22×10^{-4}
8. August 28, 1991	0.1	NDA	NDA

There were no other primary coolant samples removed for analysis or as a result of maintenance during the 1990-1991 reporting period.

1. The reported activity concentrations are based on gross beta activity determinations. Activity levels for tritium and carbon-14 are not included in the gross beta values; however, these concentrations were determined separately to be less than 0.2% of the allowable MPC for release to the sanitary sewer system for all releases.

TABLE VII-3B

LIQUID WASTE RELEASES FROM HOLDUP TANKS

Date	Volume (liters)	Concentration[2] (μCi/ml)	Total Release Activity (μCi)
1. November 5, 1990	64,000	4.32×10^{-9}	0.277
2. December 14, 1990	64,000	3.83×10^{-9}	0.245
3. April 23, 1991	64,000	<LLD(1.76×10^{-9}	0.113[2]
4. July 17, 1991	64,000	2.80×10^{-9}	0.180
5. July 29, 1991	64,000	<LLD(1.92×10^{-9})	0.120[2]

2. The activity was determined for these entires using the LLD. Actual activity released in these 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 reporting year 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" generated in the 1986-1987 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, 1990 through August, 1991 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. One non-minimal TLD exposure was recorded as 30 mR. 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 and October, 1990 and from April, May, June, July and August, 1991. The accummulation 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 August, 1991 with 1195.83 kW-hrs generated at the low end (tenth for the year) to July, 1991 with 2416.45 kW-hrs generated on the high end (first for the year) with the third, fourth, sixth, seventh and eighth highest values of energy generation being recorded in April, May, and June 1991 and October and September, 1990, respectively. Clearly the occasional exposures registered above minimal are not correlated with UFTR energy generation.

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 repl[illegible] film badges previously referenced in the Safety Analysis Report. No action has b[illegible] 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 1990-1991 REPORTING YEAR

Film Badge Designation	Total Yearly Exposure (mrem)[1]	TLDs[2]	Total Yearly Exposure (mrem)[3]	Months of Exposure
A1	120	1	30[4]	--
A2	110	2	30[4]	--
A3	10	3	M	--
A4	M	4	30[4]	--
A5	10	5	M	--
A6	30	6	M	--
A7	90	7	30[4]	--
		8	M	--
		9	60[4]	Mar., 1991
		10	30[4]	--
		11	M	--
		12	M	--

1. Film badge yearly exposures include contributions from September and October, 1990 as well as April, May, June, July and August, 1991 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.

4. Includes 30 mRem assigned for September, 1990 by Radiation Control Officer as a conservative effort to account for TLDs damaged in processing.

TABLE VII-5

ENVIRONMENTAL BADGE EXPOSURE RECORD BY MONTH OF EXPOSURE

Film Badge Designation[1]	Total Expos.	Sept. 1990 Expos.	Oct. 1990 Expos.	Apr. 1991 Expos.	May, 1991 Expos.	June, 1991 Expos.	July 1991 Expos.	Aug. 1991 Expos.
A1	120	30	20	20	20	M	M	30
A2	110	20	10	10	30	M	10	30
A3	10	M	M	M	M	M	10	M
A4	M	M	M	M	M	M	M	M
A5	10	10	M	M	M	M	M	10
A6	30	10	M	M	M	M	10	20
A7	90	10	20	20	M	20	M	20
Total	**370**	**80**	**50**	**50**	**30**	**20**	**30**	**110**

1. TLD #9 recorded 30 mR for the year in March, 1991. All other TLD's recorded nominal for the year though six(6) TLD's were damaged in processing in September, 1990 and were assigned 30 mRem on a conservative basis.

E. Personal Radiation Exposure

Maintenance and experimental work requiring significant exposure commitment was minimized during this 1990-1991 reporting year as in the 1987-1989 reporting years following previous years when major maintenance in the core area involved relatively large dose commitments. 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 are well below 100 mrem.

TABLE VII-6

ANNUAL UFTR PERSONNEL EXPOSURE[1]

Name	Position	Permanent Film Badge Exposure (mrem) 2,3
W.G. Vernetson	Director of Nuclear Facilities	M
P.M. Whaley	Senior Reactor Operator/Acting Reactor Manager	M
G.W. Fogle	Reactor Operator	30
R. Piciullo	Senior Reactor Operator	M
R. Goddard	Student Reactor Operator Trainee/Technician	M
G.R. Wheeler	Student Reactor Operator Trainee/Technician	10
J. Guy	Student Radiation Control/Facility Technician	M
D. Simpkins	Senior Reactor Operator Trainee/Technician	20
D. Cronin	Senior Reactor Operator Trainee/Technician	M
V. Singleton	Senior Reactor Operator Trainee/Technician	M
Cheryl Wheeler	Administrative Assistant	20

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.

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 in excess of 12 mrem whole body dose for normal work activities. Several 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 Table VII-7 tabulated from the self reading dosimeter log. This exposure for several individuals from the Radiation Control Office is due to involvement in supporting UFTR-related activities but all are at a very low dose level.

TABLE VII-7

EXPOSURE RECORDS FOR RADIATION CONTROL PERSONNEL

Personnel	Date	Exposure	Comments
Jaime Keeley	7/90	30 mR	Radiation Control Activity

For visitors, students, or other non-permanent UFTR personnel, a few individuals had a non-zero dosimeter exposure measurement not above 0.5% of the allowable quarterly limit for the entire reporting period as indicated on Table VII-9. In many cases, the values of one (1) up to seventy mrem exposures recorded for self-reading pocket dosimeters are attributed to uncertainty in reading the devices or having dropped the dosimeter. In some cases in Table VII-9, 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 did not involve any activities that would be expected to generate significant radiation exposure.

TABLE VII-8

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

Personnel[1]	Date	Exposure	Comments
H. Edwards	9/29/90	2	Evaluation as dose received during a restricted area radiation survey exercise for five(5) Cooperative Work student trainees from CFCC Radiation Technology Program.
D. Carr	9/25/90	2	
A. Laws	10/30/90	2	Evaluated as dose received by student participating in Rabbit system demonstration for NAA.
Gary Foster	4/18/91	2	Evaluated as dose received by four(4) Cooperative Work student trainees from CFCC Radiation Protection Technology Program.
Won Choi	5/6/91	4	Evaluated dose received by doctoral students working with temperature-Dependent Plasma Kinetics.
Q. He	5/6/91	2	
Stan Turner	5/16/91	2	Evaluated as dose received while performing NUSURTEC experiments.
Won Choi	7/15/91	5	Evaluated as dose received by doctoral students and Dr. Ellis while performing Temperature-Dependent Plasma Kinetics Experiments.
James Ellis	7/15/91	2	
Won Choi	7/17/91	3	
James Wallace	7/22/91	2	Evaluated as dose received while performing NUSURTEC experiments.

There was only one case of non-permanent UFTR personnel that received a non-zero reading on a film badge. Dan Ekdahl is an electrical engineer who works for the Nuclear Engineering Sciences Department and on occassion for the UFTR. It was noted for the month of March, 1991, when a dose of 10 mR was recorded, that several maintenance itmes 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 *. Other participants are faculty or staff members of the University of Florida, unless specifically designated otherwise. A ** 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, P.M. Whaley, R. Piciullo, J. Keeley, B. Reynolds, R. Ratner*, R. Rafford*, 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 Radiograph and Other Laboratory/ Demonstration Exercises - Dr. W.G. Vernetson, Dr. B. Abbott, P.M. Whaley, R. Piciullo, Mr. S. Cahall(FIT), Mrs. R. Allen(UCHS), R. Rawls/S. MacKenzie (CFCC), Dr. M. Lombardi/Ms. C. Vernesse (HCC), Mr. S. Marchionno/Ms. M. Sturm (SFCC), Mrs. A Butler(CRHS), Mr. S. Buell (SAHS), Dr. I. Littlewood (UCF), Dr. B. Dubendorff (SU), Mr. R. Davidson (WHS), Mrs. E. Glass (CHS), Mr. P. Jost (CHS), Mr. T. Jordan (CHS), Mrs. B. Dalton (HMS), Mr. E. Lunquist (BHS), Mr. B. Shupe(BHS), Mrs. S. Lingaard(CCHS), Dr. G. Featherston(HCS), R. Ratner*, R. Hanrahan*, M. Stanley**, X. Wang*, C. Leipner-Gomes*, R. Strubinger**, R. Wade**, S. Lingaard**, 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, the Hillsborough

Community College Nuclear Medicine/Allied Health Technology programs, a group of physics students from the University of Central Florida as well as a Stetson University class on Energy and the Enrollment, and a group of Physics Students from the Florida Institute of Technology. Other participants in all or part of such mini-courses this year include physics, chemistry, biology and/or science students from Bolles High School, Chiefland High School, Chamberlain High School, Crystal River High School, Citrus County High School, Hawthorne Middle School, Heritage Christian School, and St. Augustine High School as well as individual and groups of students from Union County High School, Charlotte County High School, and Wildwood High School.

Reactor Operations Laboratory (ENU-5176L) - Dr. W.G. Vernetson, P.M. Whaley, 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 the classroom lectures on various aspects of LWR operations. This stand alone lab course was offered one (1) time during the current reporting year as a separately approved course.

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, Dr. J. Appelbaum, 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 this reporting year utilizing Helium-3 filled detectors prior to using the UF_6-He mixtures.

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, R. Piciullo, R. Hanrahan*, R. Ratner*, R. Rafford*, 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, 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)
EGN-1002	Dr. R. Pagano
ENU-4505L	Dr. W.H. Ellis/Dr. G.R. Dalton/Dr. W.G. Vernetson
ENU-4612L	Dr. W.H. Ellis
ENU-4905	Dr. W.G. Vernetson, Dr. G.J. Schoessow
ENU-5005	Dr. G.R. Dalton
CHS-2050	Dr. M. Vala
CHS-5110	Dr. M.L. Muga
CHS-5110L	Dr. K. Williams
ENU 5615L	Dr. W.H. Ellis
ENU-6516L	Dr. R. Pagano, Dr. W.G. Vernetson
ENV-6211L	Dr. C.E. Roessler/Dr. W.E. Bolch
ENV-6932	Dr. W.S. Properzio/Dr. W.E. Bolch
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.H. Ellis
ENU-7979	Dr. D.E. Hintenlang/Dr. W.H. Ellis

Radiation Protection and Control Health Physics Practice (ENV-4932/6932) - Dr. W.E. Bolch, Dr. W.S. Properzio, Dr. W.G. Vernetson, D.L. Munroe, J. Keeley, R. Ratner*, Reactor Staff.

This course provides students in various disciplines with 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 of the activity occurred in this category during this reporting period.

Nuclear Engineering Laboratory I (ENU-4505L) - Dr. W.H. Ellis, Dr. G.R. Dalton, Dr. W.G. Vernetson, R. Piciullo, J. Monroe*, Q. He*, R. Ratner*, R. Hanrahan*, 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 10 Radiation Worker Instructions - Dr. W.G. Vernetson, D.L. Munroe, Reactor Staff.

In response to previous NRC inspections, a standardized set of training materials have been developed and are 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. 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, R. Piciullo, 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 Seashells - Dr. Guy Prentice, Dr. G.S. Roessler, R. Hanrahan*, UFTR Staff.

Neutron activation analysis is being applied to identify the trace element composition of environmental seashells from various locations in Florida. 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. The work continues as its purpose is being reevaluated and the work progresses on a time available basis with no irradiations performed during the current reporting year.

NAA Research - Neutron Activation Analysis of Estuary Sediments - Dr. R. Byrne (USF-St. Petersburg), Dr. G. Smith (USF-St. Petersburg), R. Hanrahan*, 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, Dr. W.G. Vernetson, J. Wallis, P.M. Whaley, R . Piciullo, G. LaTorre, R. Robinson*, R. Hanrahan*, R. Ratner*, G.R. Wheeler*, 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.

NAA Research - Neutron Activation Analysis of Volcanic Rock Samples - Dr. M. DeFant (USF-Tampa), Dr. W.G. Vernetson, R. Hanrahan*, R. Ratner*, UFTR Staff.

Under the DOE Reactor Sharing Program Neutron Activation Analysis is being applied to various volcanic rock samples from widely dispersed geographic locations ranging from Central America to both North and South America. The research is directed toward identifying the proper standards as well as effective irradiation and decay schemes to facilitate trace element identification of sufficient numbers of different rare earth nuclides including uranium and thorium in the volcanic rock samples. During the last reporting year this project involved expanded investigations of irradiation and decay schemes to provide a larger data base of identifiable rare earth nuclides to support a proposal for future funding. Eventually, information on geologic origins and rare earth mineral deposits is expected as NAA on such samples continues periodically. During the current reporting year this work has been in a hiatus awaiting further input with some evaluative analysis performed on standards for this work as efforts are underway to certify certain USGS Standards in-house to facilitate this work. Dr. Defant did inquire as to facility capabilities for prompt gamma analysis in one case this year, but UFTR facilities do not yet have this capability.

Optical Physics Research - Analysis of Radiation Induced Lattice Disturbances in Dielectric Materials - Dr. H. Plendl (FSU), Dr. P. Gielisse (FSU/FAMU), Dr. J. Rink* (FSU), R. Hanrahan*, 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 1990-1991 year with irradiation of other types of dielectrics including beryl for which extensive irradiations have been performed on one set of samples with a second in progress at year's end.

Cerenkov Noise Detector Development - Development of a Detector of Reactor Core Perturbations - Dr. E.E. Carroll, Prof. G.J. Schoessow, Reactor Staff.

A new design Cerenkov detector is being developed and tested using the prompt-gamma radiation deriving from the reactor core. The detector is being located in the thermal column entrance port with shielding plugs removed and substituted by lithiated paraffin plugs made for the purpose of reducing the neutron flux to acceptable values when the reactor is running at power. Samples of the lithiated paraffin plugs were irradiated to assure that no unexpected activation products would be formed were the plugs to see a large flux. Other work has involved spectroscopic analysis of the gamma energies emitted from the thermal column where the detector will be placed. The Cerenkov detector has been moved at various angles for various power levels with the ultimate objective to develop a detector system that is able to detect reactor perturbations at various power levels through large thicknesses of material by means of high-energy, penetrating, fission-produced gamma rays. The work to date has produced a doctoral dissertation and results are encouraging. This project has been in abeyance during the last four years but is expected to be restarted in the upcoming year as part of the design element in the graduate level nuclear engineering laboratory course.

UFTR Core Redesign (LEU Program) - Thermal-hydraulic Analysis for Core Redesign - Dr. W.G. Vernetson, Dr. E.T. Dugan, Professor G.J. Schoessow, P.M. Whaley, R. Piciullo, 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 has begun again at year's end to provide input to support the license amendment for the HEU-to-LEU conversion since neutronics analysis has now been completed to establish the basic 14-plate core fuel bundle configuration. It is expected that the thermal-hydraulics analysis will be completed during the next reporting year.

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 which may lead to its reactivation, particularly for modifications to the reactor safety and control systems.

NAA Research - Trace Elements in Coal Slurry Samples - Dr. R.A. Llewellyn (UCF, Dept. of Physics), R. Vargas* (UCF), R. Hanrahan*, Reactor Staff.

This project involves determining the concentrations of trace metals and uranium decay products taken from coal slurry settling ponds. The specific elements of interest are routinely mined from coal deposits; the potential for increased yields per energy used in recovery is being tested, with NAA providing an assessment of the trace element concentration for specified settling pond sites. The first stage of this project has been completed with the potential for future commercial studies well established. Reactor time for this work was supported under the DOE Reactor Sharing Program in the previous reporting year; it was hoped that external support would be available during this most recent year. Although it was not, there was some work on reanalysis of samples and generation of a paper.

NAA Research - Determination of Chlorine, Titanium and Fluorine Concentrations in Quartz - C.P. LaTorre (GelTech), Dr. C. Balaban (Advanced Materials Research Company), R. Hanrahan*, 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 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. Hanrahan*, R. Ratner*, 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 (JWEC), R. Hanrahan*, R. Ratner*, Lisa Vickers,** R. Strubinger(WHS)**, Reactor Staff.

The biogeochemical analysis of soil and vegetation samples is the . hase 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 past year.

NAA Research - Identification of Potential High Energy Gamma Ray Production Sources - Dr. A.M. Jacobs, J. Monroe**, R. Ratner, Reactor Staff.

This funded project involved activation of various concrete samples in an attempt to identify a low intensity, high energy source of gamma rays affecting the scattered gamma ray spectra from simulated land mines as part of a U.S. Army supported project to develop an efficient means of mine detection. The results from this work were negative with other sources of the interference needing to be identified as the source of the interference.

NAA Research - Evaluation of Elemental Volatility In Standards - Dr. W.G. Vernetson, Dr. W.H. Ellis, R. Ratner**, 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 demeL.aL or confirmed state. This work is ongoing.

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 might be continued in the future if a prompt gamma analysis facility can be implemented to support his work.

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, P.M. Whaley, W.Y. Choi*, A. Ferrari*, 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. J. Appelbaum, Dr. N.J. Diaz, Dr. W.G Vernetson, R. Ratner*, W.Y. Choi**, J. Monroe*, A. Ferrari**, J.S. Park*, 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 is expected to be concluded early in the next reporting year. 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, P.M. Whaley, 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. Therefore, at year's end, the decision has been tentatively made to select the 14 fuel plates per fuel bundle design with thermal hydraulics analysis begun and to be completed during the next reporting year. At year's end, the thermal hydraulics analysis is progressing but slowly as the calculational model is being developed and tested.

UFTR Operator Training and Requalification - Dr. W.G. Vernetson, D.L. Munroe, G.R. Wheeler, D. Simpkins, V. Singleton, D. Cronin, 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. One senior operator resigned his position this year in October, 1990 and another ceased to performed licensed activities after mid-year as he served as Acting Reactor Manager on a consultant basis. Therefore, three trainees were involved in the initial training from the beginning of the year with another added at mid year; after two dropped out to take a position elsewhere, or to work on studies full time, the other two are proceeding rapidly through the initial qualification training with both scheduled to take the senior reactor operator license examination early in the next reporting year.

Gaseous Release Determinations - Argon-41 Stack Measurements - Dr. W.G. Vernetson, Dr. W.E. Bolch, P.M. Whaley, D.L. Munroe, R. Hanrahan*, W. Wabbersen**, R. Reynolds*, 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, especially since other work to characterize the Argon-41 measurement methodology was concluded successfully at the end of the 1987-1988 reporting year.

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, P.M. Whaley, C. Janssen**, R. Hanrahan*, R. Ratner*, X. Wang**, Linda Vickers**, R. Rafford*, 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 last two ye[illegible]s part of a students' senior design project, the contents of various NIST [illegible]BS and USG[illegible]ards are being cross correlated and spread sheets being developed. This project is [illegible]d 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 present 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.

NAA Research - Implementation of Upgraded NAA Laboratory Facilities - Dr. W.G. Vernetson, Dr. W.H. Ellis, Dr. G.J. Schoessow, R. Ratner*, M. Wachtel**, P.M. Whaley.

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 counter 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 is mechanically complete and operable for one sample at a time but needs electronics work to sequence its switching circuits properly and interface it with the computer-based analyzer. This work has been progressing very slowly awaiting a student project and the hiring of a replacement electronics engineers. 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.

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, P.M. Whaley**, R. Ratner**, L. Morales, J. Thompson**(CHS), R. Rafford**, 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 comple[illegible] with certifiable Class I (ANSI Standard E545) neutron radiographs nearly possible. F[illegible]llowing 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 uti[illegible] 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 this 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 with his work to be the foundation for a later science fair exhibit.

Basic Physics Research - Neutron Irradiation of Geologic Quartz - Dr. A. Odom (FSU), Dr. W.G. Vernetson, J. Rink**, R. Hanrahan*, UFTR Staff.

The UFTR has bee[illegible] sed to provide a source for fission of uranium traces in geologic quartz to produce Frankel defects in the quartz crystal structure. This irradiation simulates the effects of exposure to cosmic radiation. The defects are then being analyzed to provide a calibration for dating techniques. Prior to this year NAA research was concluded to quantify U, Th and other rare earth constituents of the geologic quartz samples with emphasis on U, Th and Sm because of their long term radioactive effects. This geosynchronometry work has been quite successful with the awarding of a doctorate based on this work; work continued in this year in somewhat different areas with some samples analyzed at the UFTR transferred to Florida State University for shipment to Europe for corroborative work. There was also an inquiry concerning analysis of European samples though no experimental work was accomplished at the UFTR on this project in the current reporting year.

LEU Conversion - Special SNM-1050 SPERT Low Enriched Fuel Conversion Efforts - Dr. W.G. Vernetson, Dr. N.J. Diaz, P.M. Whaley, D.L. Munroe, J. Guy**, 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). 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; at the end of the 1989-1990 year and throughout the present year, efforts 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 have been without success, though one student report on the radiography effort to analyze the LEU pins was completed during this past reporting year.

Facility Characterization - Determination of UFTR Beam Ports/Thermal Column Neutron Spectra - Dr. W.G. Vernetson, Dr. W.H. Ellis, P.M. Whaley, R. Hanrahan*, 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 present year as part of a student's senior design project, various threshold detector foils have been 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. This project remains in progress at year's end, though one student project has been completed with some useful spectral measurements produced.

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

The potential for installation of a prompt gamma analysis facility at the UFTR is being evaluated. 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 this year but general considerations and requests for DOE support in this area are planned for the next reporting year.

CHS-5510/5510L - Dr. K. Williams, Dr. M.L. Muga, Dr. W.G. Vernetson, P.M. Whaley, R. Ratner*, R. Rafford*.

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.

NAA Research - Seed Project - NAA of Biological Samples (Fish Tissue, Human Hair and Teeth) for Mercury - Dr. W.H. Ellis, Dr. W.G. Vernetson, R. Ratner*, R. Rafford*, J. Monroe*, J. Nefflen**.

Mercury contamination of Florida fish populations at levels of significant concern have been noted in various areas, especially in and around Lake Okeechobee at the Northern end of the Everglades. This seed project was undertaken to determine the viability of instrumental NAA for determination of mercury content in human and fish tissue samples. Work to date has emphasized fish samples from Lake Okeechobee as well as various human hair and several teeth samples. Results to date have confirmed mercury contamination in fish samples and are favorable for further work, primarily in support of the graduate laboratory sessions in the Nuclear Engineering Sciences Department. This research is expected to continue as interest in quantifying mercury contamination in the Florida ecosystem continues, especially in the Suwanee River Basin in North Florida. A former high school student researcher has also indicated interest in this area and may continue this work as a high school honors project in association with the Florida Department of Environmental Regulation.

NAA Research - Rare Earth and Trace Element Geochemistry of Sedimentary Mineral Deposits - Dr. A. Dabous (FSU), Dr. A. Odom (FSU), Dr. W.G. Vernetson, R. Hanrahan*, R. Ratner*, R. Rafford*, 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 two reporting years.

NAA Research - Trace Metal Elemental Analysis of Meteorites - Mr. Steve Buell(St. Augustine High School), Dr. W.G. Vernetson, R. Ratner*, R. Rafford*.

This project involved analysis of meteorites to identify elemental metal content for a high school physics teacher. This project was initiated for a demonstration of the NAA methodology for the entire high school physics class. Subsequently detailed analysis of the metal content of several meteorite samples was supplied to the teacher and his students for use in subsequent classes and to support a science fair project and other courses as the research project is expected to continue for some time to support teaching high school students the rudiments of research, especially for use of the principles of nuclear physics for identifying elemental content of various material samples such as meteorites.

NAA Research - Trace Element Analysis of North Central Florida Lake Sediments - Mr. Paul Jost(Chiefland High School), Dr. W.G. Vernetson, R. Ratner*, R. Rafford*.

This project involved the acquisition of various lake sediment samples from around North Central Florida by a high school chemistry teacher and his students. The samples were then used for a demonstration of the NAA methodology for the entire class. Subsequently all of the samples were analyzed to identify trace elements to include a number of common elements as well as several less common heavy elements. These results were supplied for use in subsequent classes and other courses as this research project will continue for some time to support teaching high school students the rudiments of research, especially for environmental surveillance.

NAA Research - Isotopic Analysis of Atmospheric Particulates - Dr. Ralph Llewellyn(UCF), S. Yager**(UCF), Dr. W.G. Vernetson, R. Hanrahan*, R. Ratner*, Reactor Staff.

This project involved taking air samples to collect atmospheric particulates at various elevated points in the industrialized sections of Orlando for trace element analysis. The trace element analysis concentrated on attempting to identify key particulate pollutants, especially heavy metals which might be due to incineration, power plant operation, automobile and air traffic and other urban sources of pollution as part of a masters research project which was successfully concluded during this reporting year.

NAA Research - 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 is underway at years end and will continue into the next year.

NAA Research - Trace Element Analysis of Fertilizers - Mrs. R. Allen(UCHS), Dr. B. Abbott, Dr. W. G. Vernetson, R. Wade**(UCHS), 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 has been prepared with work to continue in the upcoming year to support a science fair project.

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.

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 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.

NAA Research - Neutron Activation Analysis of Lake Alice Sediments for Heavy Metal Contamination - Dr. W. G. Vernetson, Mrs. E. Glass (CHS), R. Hanrahan*, R. Ratner*, R. Rafford*, M. Sableski**(CHS).

This investigation is being performed to determine whether concentrations of heavy metals in the sediment in Lake Alice on the University of Florida campus are elevated or even exceed regulatory limits. This investigation is directed at Lake Alice Sediments because Lake Alice accumulates all the campus water runoff as well as the outflow from the sewage treatment plant. As a result, it is a good candidate for heavy metal pollution. To date, NAA has been performed on a number of samples taken from several locations around the lake's edge and from its tributaries including draining gullies and collecting pools around Shand's hospital with elevated levels of only some light and intermediate metals noted. This work has continued to support a science fair project during the current year but at a low level.

NAA Research - Investigation of Mercury Contamination in Union County Land and Well Water - Dr. W.G. Vernetson, Mrs. R. Allen (UCHS), R. Wade**(UCHS), R.M. Stanley**,(UCHS) R. Hanrahan*, R. Ratner*, M. Jara*, R. Rafford**, Reactor Staff.

Various dirt and water samples have been obtained from farmland and from individual wells used for drinking water in Union County. The purpose of this series of projects is to investigate the possible presence of mercury or other heavy metal poisons in the land used for farming or in the land used for farming or in the wells used for drinking water in several locations around Union County. This NAA research work is continuing to support several high school science fair projects and to support a University of Florida senior design project. To date, no excessive levels of heavy metals have been identified though detection limits have been specified in several cases and several positive indications have been identified for followup sampling and analysis using NAA. This area has been in abeyance during this past year.

NAA Research - Heavy Metal Assessment of Biogeochemical Samples from the Pollard Alabama Oil Field - Dr. W.G. Vernetson, Dr. G. Cwick (SEMSU), Dr. M. Bishop (UWEC), Mr. R. Davidson (WHS), R. Hanrahan*, R. Ratner*, R. Rafford*, L. Vickers*, R. Strubinger**(WHS).

As part of a summer science research activity, Pollard, Alabama Oil Field vegetable samples previously supplied for biogeochemical analysis were specially analyzed for heavy metal concentrations. To date, NAA has been performed on a number of vegetable matter samples taken from the Pollard, Alabama Oil Field with limited indications of heavy metal concentrations including mercury below levels of concern. This work is continuing to support a high school Science Fair research project with several science fair presentations made on this work during the current year.

NAA Research Service - Trace Element Analysis of Steel Samples - Dr. John Cox (Futuretech, Inc.), W.G. Vernetson, R. Ratner*, R. Rafford*, Reactor Staff.

This service project involved evaluation of various steel samples and particle scrapings to identify certain trace elements. The objective of this work was to allow Futuretech personnel to determine the source of metal samples and hence to trace the cause of failures in certain industrial facilities. Results of this work were successfully utilized by Futuretech to identify the parent sources of metal filings in various industrial flow loops.

Service Irradiation - 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). Although no samples were supplied this year, those supplied in the past 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 - W.G. Vernetson, E. Miller*, D. Simpkins*, V. Singleton*.

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 1991 and a letter requesting material for the newsletter, four newsletters totalling over 50 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, P.M. Whaley, R. Piciullo, R. Ratner, R. Rafford, Reactor Staff.

Various lectures, tours and demonstrations of reactor, NAA Laboratory and other facilities were conducted for hundreds of visitor 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 NUS Corporation personnel and Korean visitors, NES football weekend visiting executives, the Director of the Physical Plant Division and a group of managers, various University Police and Gainesville Fire Department personnel, the Director of the AFRRI reactor facility, several groups of 1991 Engineer's Fair visitors, a group of NASA/INSPI visitors, several groups from the Eastern Regional Student Conference, several groups of outstanding high school students sponsored by Tau Beta Pi Honor Society, various NRC and ANI visitors and inspectors plus many other groups and individuals too numerous to list.

Facilities Support - Facility Upgrade/Improvement Activities - G. Frederick, R. Cremer, P.M. Whaley, R. Piciullo, W.G. Vernetson, 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 addition of personnel safety platforms on the overhead crane, reduced height on the overhead lights above the rabbit system to provide for easier light changes and various cell preservation activities including scraping and painting the equipment pit, the control blade drive pedestals as well as various other wall, floor and reactor structure surfaces. Finally under the DOE instrumentation grant, the new two-pen reorder was fully implemented, a new continuous monitoring air particulate detector was obtained and made operational and a new replacement safety channel was obtained and prepared for replacement of a safety channel in the reactor console if needed. Other activities including reworking and relabelling all keys in the reactor lock box for easier identification as well as design and production of a better holding device for spent fuel pool absorber coupons during transmission measurements. Of course, various NAA Laboratory activities to prepare better libraries and to obtain and implement the new OMNIGAM gamma spectrum library/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 - W.G. Vernetson, D.L. Munroe, P.M. Whaley, R. Piciullo, 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, P.M. Whaley, R. Piciullo, 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 were no single large maintenance projects requiring significant effort as in the previous year; nevertheless, there were multiple failures and significant contributions to forced unavailability during this period for corrective and preventive maintenance performed on the nuclear instrumentation system circuits during the annual nuclear instrumentation calibration check(A-2 surveillance), on the various components of the Reactor Vent System including the stack radiation monitor, the diluting fan shaft and the diluting fan tach-generator, on the area radiation monitoring system and on various seals and other failed connections to the primary coolant system. 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 systems, on the seals and other connections to the primary coolant system and on the various components of the Reactor Vent System) to return to an even higher availability for the 1991-1992 reporting year.

IX. THESIS, PUBLICATIONS, REPORTS AND ORAL PRESENTATIONS OF WORK RELATED TO THE USE AND OPERATION OF THE UFTR

1. "Examination of Boraflex Surveillance Coupons For Florida Power and Light Company St. Lucie Plants," S.E. Turner, NUSURTEC, Inc., Palm Harbor, FL, February 20, 1990(Omitted for 1989-1990 Report).

2. "Precalibration Data on Surveillance Coupons For Hope Creek Plant", S.E. Turner, NUSURTEC, Inc., Palm Harbor, FL, March, 1990.(Omitted From 1989-1990 Report).

3. "Fall Semester Reactor Operations Laboratory Manual for ENU-5176L," W.G. Vernetson, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, September, 1990.

4. "Results of Trace Analysis Evaluation of Union County Well Water Particulate Samples For Long and Short Irradiations," W.G. Vernetson, R. Hanrahan and R. Ratner, Interim Report for Mrs. R. Allen and Russ Wade of Union County High School, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, September 12, 1990.

5. "Facies Control On the Distribution of Some Trace and Rare Earth Elements In Egyptian Phosphorites", M.A. El-Haddad and E.A. Ahmed, <u>Journal of African Earth Sciences, 12</u>, No. 3, 1991, pp. 429-435.

6. "Examination of Boral Surveillance Coupons For Monticello Plant," S.E. Turner, NUSURTEC, Inc., Palm Harbor, FL, September, 1990.

7. "Fostering High School Student Interest In Engineering and Science -The University of Florida Reactor Sharing Program", W. G. Vernetson, Abstract Submitted for Presentation In a Session at the 1991 Annual Conference of the American Society of Engineering Education to be held June 16 -19, 1991, New Orleans, LA, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, October 1, 1990.

8. "Research 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, October 1, 1990.

9. "Update on Results of Trace Element Analysis Using NAA For Biochemical Assessment of Samples from Pollard, Alabama Oil Field(Phase 2)", W.G. Vernetson, R. Hanrahan and R. Ratner, NAA Laboratory Progress Report to G. Cwick(SEMSU) and M. Bishop(UWEC), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, October 2, 1990.

10. "Report on Log of Security Events", W.G. Vernetson, Official Report Submittal To USNRC, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, October 3, 1990.

11. "The Regional Role of a Midsize University Reactor in Education and Research," W.G. Vernetson, Presentation on October 11, 1990 at the TRTR Annual Meeting held in State College, Pennsylvania, October 10-12, 1990.

12. "Completed and Pending SPERT Fuel Transfer For Shipment," W.G. Vernetson, Presentation on October 12, 1990 at the TRTR Annual Meeting held in State College, Pennsylvania, October 12, 1990.

13. "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 to be Submitted To University of Florida Division of Sponsored Research, Department of Nuclear Sciences, University of Florida, Gainesville, FL, October 15, 1990.

14. "Isotopic Analysis of Atmospheric Particulates In Orlando Air Samples", W.G. Vernetson, Interim Report of NAA Research Results to Dr. R. Llewellyn(UCF) and S. Yager(UCF), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, October 15, 1990.

15. "Multi-Probe Ionization Chamber System For Nuclear Generated-Plasma Diagnostics", W.Y. Choi and W.H. Ellis, In Volume 1, 1990 IEEE Nuclear Science Symposium Conference Record for meeting held in Arlington, Virginia, October 22-27, 1990, p404.

16. "Multi-Probe Ionization Chamber System For Nuclear Generated-Plasma Diagnostics", W.Y. Choi, Presentation at the 1990 IEEE Nuclear Science Symposium Including Session on Nuclear Power System and Medical Imaging Conference held in Arlington, Virginia, October 22-27, 1990.

17. "Update on Results of Trace Element Analysis Using NAA For Biochemical Assessment of Samples from Pollard, Alabama Oil Field(Phase 2)", W.G. Vernetson, R. Hanrahan, and R. Ratner, NAA Laboratory Progress Report to G. Cwick(SEMSU) and M. Bishop(UWEC), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, October 24, 1990.

18. "Funding Renewal Request For Production of the TRTR Community Newsletter," W.G. Vernetson, proposal submitted to EG&G Idaho, Inc., Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, October 25, 1990(funded effective January 1, 1991).

19. "Progress Report on UFTR Fuel Conversion Analysis" R.J. DeMartino, Internal Report of Progress on Neutronics Safety Analysis and Safety Analysis Report Changes Required For HEU To LEU Conversion, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, October 26, 1990.

20. "Failure To Check Control Blade Interlocks Per SOP-A.2," W.G. Vernetson, Final Report Submitted To USNRC, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, October 29, 1990.

21. "TRTR - National Organization of Test, Research and Training Reactors Newsletter," Volume 2, No. 3, W.G. Vernetson and E. Miller, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, November, 1990.

22. "University of Florida Training Reactor: Facilities Information and Description, For NES Football Weekend Visitors" W.G. Vernetson, presentation to Executive Visitors, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, November 3, 1990.

23. "University of Florida Training Reactor: Facilities Information and Description For Physical Plant Division Supervisory Personnel" W.G. Vernetson, Presentation to Managers Responsible for Reactor Facilities Physical Plant Support, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, November 9, 1990.

24. "Evaluation of September, 1990 Radiation: Dosimetry Report", D.L. Munroe, Radiation Control Office, University of Florida, Gainesville, FL, November 14, 1990.

25. "Isotopic Analysis of Atmospheric Particulate In Orlando Air Samples", R. Rafford and W.G. Vernetson, Final Report of NAA Research Results to Dr. R. Llewellyn(UCF) and S. Yager(UCF), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, November 30, 1990.

26. "Annual Progress Report of the University of Florida Training Reactor for September 1, 1989 - August 31, 1990 Reporting Year," W.G. Vernetson, November, 1990(Delayed to March, 1991).

27. "Natural Alpha Recoil Particle Radiation and Ionizing Radiation Sensitivities In Quartz Detected With EPR: Implications For Geochronometry," W.J. Rink and a.L. Odom, Nuclear Tracks Radiation Measurements - International Journal of Radiation and Applied Measurements, Part D, 18, 1/2, 1991, p. 163-173.

28. "Final Report on SPERT Fuel Inspection: Visual and Radiography", J. Guy and W.G. Vernetson, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, December 1, 1990.

29. "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), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, December 5, 1990.

30. "Comparative Operational Characteristics of the University of Florida Training Reactor," W.G. Vernetson, Presentation In EGN-1002, University of Florida, Gainesville, FL, December 6, 1990.

31. "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, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, December 6, 1990.

32. "Isotopic Analysis of Atmospheric Particulates in Orlando Air Samples", R. Rafford, Final Amended Report of NAA Research Results to Dr. R. Llewellyn(UCF) and S. Yager(UCF), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, December 6, 1990.

33. "Emergency Plan for the University of Florida Training Reactor-Revision 6," W.G. Vernetson, official submittal to USNRC, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, December 13, 1990.

34. "Results of Irradiated Boraflex Absorber Coupon Property Measurements", W.G. Vernetson, Final Report to NUSURTEC, Inc., Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, December 14, 1990.

35. "Neutron Activation Analysis of Union County Well Water Samples," R. W. Rafford, ENU-4905 Senior Design Project, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, January 10, 1991.

36. "Determination of Neutron Fluence Spectra At Beam Ports of the University of Florida Training Reactor," C. Leipner-Gomes, ENU-4905 Senior Design Project, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, January 17, 1991.

37. "University of Florida Training Reactor Characteristics and Experimental Facilities", W.G. Vernetson, Submission for inclusion in The Databases of University Resources: BEST-America/BEST-Canada, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, January 18, 1991.

38. "Evaluation and Certification of Trace Elements In NIST and USGS Standards," C. Janssen, ENU-4905 Senior Design Project Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, Janur ry 19, 1991.

39. "University of Florida Training Reactor/Nuclear Regulatory Commission Management Meeting Presentation" W.G. Vernetson, Facility Status Report to UFTR Management/NRC Management personnel for UFTR license, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, January 29, 1991.

40. "Geologically Classifying Potential Oil Reserves Using Neutron Activation Analysis", R. Strubinger, Wildwood High School Science Fair Presentation(First Place), Wildwood, Florida, January 31, 1991.

41. "Proposal For Funding For the University of Florida Training Reactor Through the U.S. Department of Energy University Reactor Instrumentation Program", W.G. Vernetson, Solicitation No. DE-PS07-91ER13058, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, February, 1991(partially funded).

42. "TRTR - National Organization of Test, Research and Training Reactors Newsletter," Volume 3, No. 1, W.G. Vernetson and E. Miller, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, February, 1991.

43. "Lake Alice Contamination Investigation Using Neutron Activation Analysis," M.J. Sableski, Canterbury High School Science Fair Presentation, Fort Meyers, FL, February, 1991.

44. "Information and Description of the University of Florida Training Reactor Facility." W.G. Vernetson, Presentation on February 4, 1991 for Participants In the 28th Annual Junior Science, Engineering and Humanities Symposium Held At the University of Florida, Gainesville, FL, February 3-5, 1991.

45. "Neutron Activation Analysis of Groundwater Samples From Union County, Florida For the Determination of Trace Metal Content," R. Wade, Union County High School, Union County Science Fair Presentation(First in Chemistry Division, Best of Physical Sciences Division, Marine Sciences Award and Third Place Navy Science Award), Lake Butler, Florida, February 12, 1991.

46. "Finding Trace Element Concentration of Uranium and Thorium In Union County Soil Using Neutron Activation Analysis," M. Stanley, Union County High School, Union County Science Fair Presentation(First in Earth/Space Science Division, Best Overall, Marine Science Award, First Place Navy Science Award), Lake Butler, Florida, February 12, 1991.

47. "Geologically Classifying Potential Oil Reserves Using Neutron Activation Analysis", R. Strubinger, Wildwood High School Regional Science Fair Presentation(Best of Show), Ocala, Florida, February 14-15, 1991(Awarded first place in category award by University of Florida, Department of Chemistry).

48. "Update on Results of Trace Element Analysis Using NAA For Biochemical Assessment of Samples from Pollard, Alabama Oil Field (Phase 2)", R. Ratner, R. Rafford and W.G. Vernetson, NAA Laboratory Progress Report to G.Cwick(SEMSU) and M. Bishop(UWEC), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, February 28, 1991.

49. "University of Florida Reactor Sharing Program," W.G. Vernetson, proposal submitted to Department of Energy, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, March, 1991(Partially Funded).

50. "Geologically Classifying Potential Oil Reserves Using Neutron Activation Analysis", R. Strubinger, Wildwood High School State Science Fair Presentation, Miami, Florida, March, 1991.

51. "Finding Trace Element Concentration of Uranium and Thorium In Union County Soil Using Neutron Activation Analysis," M. Stanley, Union County High School, State Science Fair Presentation, Miami, FL, March, 1991.

52. "Trace Metal Elemental Analysis of Meteorite Samples," R. Rafford, R. Ratner and W. G. Vernetson, Final Report of NAA Laboratory Research Results to Mr. Steve Buell(SAHS), Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, March 1, 1991.

53. "Neutron Activation Analysis of Groundwater Samples From Union County, Florida For the Determination of Trace Metal Content," R. Wade, Union County High School, Regional Science Fair Presentation, Lake City, Florida, March 6-8, 1991.

54. "Finding Trace Element Concentration of Uranium and Thorium In Union County Soil Using Neutron Activation Analysis," M. Stanley, Union County High School, Regional Science Fair Presentation, Lake City, Florida, March 6-8, 1991(Placed in Physical Science Division).

55. "Instrumental Neutron Activation Analysis of Union County Well Water Samples", R. Rafford, Summary In Transactions of the 1991 ANS Eastern Regional Student Conference held at the University of Florida, Gainesville, FL, March 7-9, 1991, p16.

56. "Multiprobe Diagnostic Study of Nuclear Enhanced MHD Plasma", W.Y. Choi, Summary In Transactions of the 1991 ANS Eastern Regional Student Conference held at the University of Florida, Gainesville, FL, March 7-9, 1991, p19.

57. "Instrumental Neutron Activation Analysis of Union County Well Water Samples", R. Rafford, Presentation on March 8, 1991, at the 1991 ANS Eastern Regional Student Conference held at the University of Florida, Gainesville, FL, March 7-9, 1991.

58. "Multiprobe Diagnostic Study of Nuclear Enhanced MHD Plasma", W.Y. Choi, Presentation on March 8, 1991, at the 1991 ANS Eastern Regional Student Conference held at the University of Florida, Gainesville, FL, March 7-9, 1991.

59. "Annual (1990) Dosimetry Data Review", D. L. Munroe, Radiation Control Office, University of Florida, Gainesville, FL, March 11, 1991.

60. "Interim Report on Status of Neutronics Safety Analysis for HEU to LEU Conversion," R. DeMartino, Internal Report on Project Status, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, March 14, 1991.

61. "Proposal Submitted to the Nuclear Regulatory Commission to Meet 10 CRR 50.64 Requirements for Scheduling UFTR Conversion from HEU to LEU Fuel," W.G. Vernetson, updated scheduling proposal submitted to USNRC, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, March 26, 1991.

62. "Update on Results of Trace Element Analysis Using NAA For Biochemical Assessment of Samples from Pollard, Alabama Oil Field(Phase 2)", R. Rafford, R. Ratner and W.G. Vernetson, NAA Laboratory Progress Report To G. Cwick(SEMSU) and M. Bishop(UWEC), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, March 26, 1991.

63. "Results of Qualitative Trace Element Analysis of Steel Shaving Samples", W.G. Vernetson and R. Ratner, NAA Laboratory Report to Futuretech Industries, Inc., Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, April 2, 1991.

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

65. "Results of Trace Element Analysis of North Central Florida Lake Sediments Using Long Irradiations", R. Rafford and W.G. Vernetson, Report of NAA Laboratory Research Results to Mr. Paul Jost(Chiefland High School), Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, April 3, 1991.

66. "University of Florida Training Reactor: Facilities Information and Description", D. Simpkins, Presentation to Science Students at Heritage Christian School, Gainesville, FL, April 5, 1991.

67. "Justification For Purchased Software Updates", R. Ratner, Internal Report on EG&G ORTEC Software Upgrades To NAA Laboratory, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, April 11, 1991.

68. "Static Calculations of the UFTR HEU Core", R. DeMartino, ENU-6937 Research Project Final Report, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, April 15, 1991.

69. "Update on Results of Trace Element Analysis Using NAA For Biochemical Assessment of Samples from Pollard, Alabama Oil Field(Phase 2)", W.G. Vernetson and R. Ratner, NAA Laboratory Progress Report to G. Cwick(SEMSU) and M. Bishop(UWEC), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, April 17, 1991.

70. "TRTR - National Organization of Test, Research and Training Reactors Newsletter," Volume 3, No. 2, W.G. Vernetson and E. Miller, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, May, 1991.

71. "Comments on Proposed Rule: 10 CFR Parts 70, 170, and 171; RIN: 3150-AD87; Revision of Fee Schedule; 100% Fee Recovery", W.G. Vernetson, Comments Submitted to Secretary of USNRC, Docketing and Service Branch, May 9, 1991.

72. "Results of Trace Element Analysis of North Central Florida Lake Sediments Using Short Irradiations," R. Rafford and W.G. Vernetson, Final Report of NAA Laboratory Research Results to Mr. Paul Jost(Chiefland High School), Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, May 9, 1991.

73. "Final Report on the Spring 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, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, May 10, 1991.

74. "Neutronics Calculations For the UFTR LEU Core Conversion", R. DeMartino, Masters Project Research Report For Oral Examination, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, May 10, 1991.

75. "Static Calculations of the UFTR LEU Core", R. DeMartino, Master's Thesis Oral Presentation, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, May 10, 1991.

76. "Static Calculations of the UFTR LEU Core", R. DeMartino, Master's Thesis Project Report, Department of Nuclear77 Engineering Sciences, University of Florida, Gainesville, FL, May 23, 1991.

77. "UFTR Reactor Operator Requalification and Recertification Training Program For July, 1991 Through June, 1993," Official Updated Program Submittal to USNRC, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, May 31, 1991.

78. "Status Report For Project on Computer Generation of Standard Reference Material Table Files For Neutron Activation Analysis", Linda D. Vickers, Status Report on ENU-4905 Senior Research Project, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, June 20, 1991.

79. "Status Report On A Study of Magnitude and Spectral Measurements of Neutron Flux To Support Neutron Radiography," J. Thompson, Oral Presentation To Reactor Facility Staff on Status of FFFS Summer Research Project, University of Florida, Gainesville, Fl, July 12, 1991.

80. "Status Report On A Study of Magnitude and Spectral Measurements of Neutron Flux To Support Neutron Radiography," J. Thompson, Draft Report of Research Project To Be Submitted As Participant In Florida Foundation For Future Scientists 1991 Summer Research Program, University of Florida, Gainesville, FL, July 12, 1991.

81. "A Midsize Reactor Facility - A Regional Resource for Research and Education", W.G. Vernetson, Paper Submitted And Accepted For Presentation At the Winter Meeting of the American Nuclear Society To Be Held In San Francisco on November 10-24, 1991, Nuclear Engineering Sciences Dept., University of Florida, Gainesville, FL, July 16, 1991.

82. "Innovative Computer-Based Nuclear Radiation Detection/Instrumentation Teaching Laboratory System", W.H. Ellis, W.Y. Choi and Q. He, paper submitted and accepted for presentation at the Winter Meeting of the American Nuclear Society to be held in San Francisco on November 10, 1991, Nuclear Engineering Sciences Dept. University of Florida, Gainesville, FL, July 17, 1991.

83. "A Study of Magnitude and Spectral Measurements of Neutron Flux To Support Neutron Radiography," J. Thompson, Research Project Submitted as a Participant from Charlotte High School in Florida Foundation For Future Scientists 1991 Summer Research Program(prepared also for upgrade as a High School Science Fair Project), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, July 19, 1991.

84. "Results of Qualitative and Quantitative Trace Element Analysis of Steel Shaving Samples", W.G. Vernetson and R. Ratner, NAA Laboratory Report to Futuretech, Industries, Inc., Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, July 24, 1991.

85. "Determination of Neutron Fluence Spectra at Beam Ports of the University of Florida Training Reactor", C. Leipner-Gomes, Final Report of ENU-4695 Senior Project, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, July 31, 1991.

86. TRTR - National Organization of Test, Research and Training Reactors Newsletter," Volume 3, No. 3, W.G. Vernetson and E. Miller, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, August, 1991.

87. "Data For Evaluating Results of Fluence on Beryl Samples", W.G. Vernetson, Report on Beryl Irradiation for Color Center Analysis to Dr. P. Gielisse(FSU/FAMU), Nuclear Engineering Sciences Department, University of Florida, Gainesville, Fl, August, 1991.

88. "Identification and Cataloging of Trace Elements In NIST Standards", X. Wang, Internal NAA Laboratory Research Report, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August, 1991.

89. "A Report of the Computer Generation of Standard Reference Material Table Files For Neutron Activation Analysis", Linda D. Vickers, ENU-4905 Senior Research Project Report, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 2, 1991.

90. "A Report on the Analysis of Trace Elements In Oil Field Samples From Pollard, Alabama", Lisa Vickers, ENU-4905 Senior Research Project, Nuclear Engineering Sciences Department, University of Florida, Gainesville, FL, August 2, 1991.

91. "Neutron Activation Analysis of Synthetic Agricultural Fertilizer For the Determination of Trace Metal Content." R. A. Wade, III, oral presentation on FFFS Summer Research Project, University of Florida, Gainesville, FL, August 7, 1991.

92. "A Study of Magnitude and Spectral Measurements of Neutron Flux To Support Neutron Radiography," J. Thompson, Oral Presentation on FFFS Summer Research Project, University of Florida, Gainesville, FL, August 8, 1991.

93. "Neutron Activation Analysis of Synthetic Agricultural Fertilizer For the Determination of Trace Metal Content." R. A. Wade, III, Research Project Submitted as a Participant from Union County High School in Florida Foundation of Future Scientists 1991 Summer Research Program(prepared also for upgrade as a High School Science Fair Project), Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL, August 9, 1991.

94. "Computer-Based Nuclear Radiation Detection/Instrumentation Laboratory Teaching Station With Courseware Included," W.H. Ellis, Proposal Submitted To University of Florida Division of Sponsored Research, Department of Nuclear Engineering Sciences, University of Florida, Gainesville, FL August 15, 1991(Partially Funded).

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

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 OF NRC/UFTR

MANAGEMENT CONFERENCE

HELD ON

JANUARY 29, 1991

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

FEB 27 1991

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: MANAGEMENT MEETING SUMMARY

This letter refers to the Management Meeting held at our request on January 29, 1991. This meeting concerned activities authorized for your Nuclear Reactor Facility. The issues discussed at this meeting related to your research reactor program, your performance, and current issues. A list of attendees, a meeting summary, and a copy of your handout are enclosed.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

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

Sincerely,

J. Philip Stohr, Director
Division of Radiation Safety
and Safeguards

Enclosures:
1. List of Attendees
2. Meeting Summary
3. Handout

cc w/encls: (See page 2)

FEB 27 1991

Dr. J. S. Tulenko, Chairman
Nuclear Engineering Sciences Department
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

Dr. Ratib A. Karam, Director
Neely Nuclear Research Center
Georgia Institute of Technology
900 Atlantic Drive, NW
Atlanta, GA 30332

Garry D. Miller, Associate Director
Nuclear Reactor Program
North Carolina State University
Box 7909
Raleigh, NC 27695-7909

Dr. R. U. Mulder, Director
Reactor Facility
University of Virginia
Charlottesville, VA 22901

Administrator
Department of Environmental Regulation
Power Plant Siting Section
State of Florida
2600 Blair Stone Road
Tallahassee, FL 32310

State Planning and Development
Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol Building
Tallahassee, FL 32301

Dr. Mary E. Clark, Chief
Office of Radiation Control
Department of Health and
Rehabilitative Services
1317 Winewood Boulevard
Tallahassee, FL 32999

State of Florida

FEB 27 1991

ENCLOSURE 1

LIST OF ATTENDEES

University of Florida

W. Bolch, Member, Reactor Safety Review Subcommittee
D. Munroe, Radiation Control Officer
M. Ohanian, Chairman, Reactor Safety Review Subcommittee
W. Properzio, Director, Environmental Health and Safety
J. Tulenko, Chairman, Nuclear Engineering Sciences Department
W. Vernetson, Nuclear Facility Director

Nuclear Regulatory Commission

S. Ebneter, Regional Administrator, Region II (RII)
B. Mallett, Deputy Director, Division of Radiation Safety and Safeguards (DRSS), RII
E. McAlpine, Chief, Radiation Safety Projects Section (RSPS), DRSS, RII
C. Bassett, Senior Radiation Specialist, RSPS, DRSS, RII
P. Holmes-Ray, Senior Resident Inspector, Crystal River Nuclear Power Plant
T. Michaels, Senior Program Manager, Non-Power Reactors, Decommissioning and Environmental Project Directorate, Division of Reactor Projects - III, IV, V and Special Projects, Office of Nuclear Reactor Regulation (NRR)

FEB 27 1991

ENCLOSURE 2

MANAGEMENT MEETING SUMMARY

A Management Meeting was held at the Nuclear Science Center on the campus of the University of Florida (UFL) on January 29, 1991, to discuss the licensee's research reactor program, past performance and current issues. The meeting was held at the request of the NRC.

The NRC Regional Administrator opened the meeting by discussing how the agency has established an organization, both at the regional and the headquarters levels, to deal with the needs and concerns of the non-power reactor (NPR) community. He then reviewed the training program that has been established for those inspectors who perform inspections of NPRs. The training program is designed to ensure that the inspectors give the appropriate level of attention to the rules and regulations that the licensees are required to follow. The Regional Administrator also indicated that these types of management meetings were intended to improve understanding, communication, and the working relationship between the NPRs and the NRC.

The UFL Nuclear Facility Director presented a slide presentation which outlined the characteristics of the University of Florida training reactor (UFTR), the role of the UFTR in the region, and an overview of the usages of the UFTR. UFL representatives went on to express concern about various subjects including: 1) the number of inspections at the facility, 2) the need, on occasion, to cancel a class in order to respond to inspection activities, 3) lack of good communications at times, 4) training on the new 10 CFR Part 20, and 5) Technical Specification changes that get revised by the NRC after being submitted by the licensee.

Following the discussion, both the NRC and the UFL representatives agreed to strive for better communications in the future and to maintain the good working relationship that has existed. The NRC Regional Administrator closed the meeting by thanking the UFL officials for the opportunity to visit the facility and discuss these issues. The ULF Nuclear Facility Director then conducted a tour of the UFTR facility for the NRC representatives.

UNIVERSITY OF FLORIDA
TRAINING REACTOR

MANAGEMENT MEETING
PRESENTATION

for

Nuclear Regulatory Commission
Region II Representatives

William G. Vernetson
Director of Nuclear Facilities

UNIVERSITY OF FLORIDA

January 29, 1991

UNIVERSITY OF FLORIDA TRAINING REACTOR
KEY CHARACTERISTICS

• Rated Power	100 KWth
• Fuel:	MTR Plate - Type Metal Alloy 93% Enriched
• Core Geometry:	Two Slab Arrangement in Six Fuel Boxes Four 11-Plate Fuel Bundles Per Fuel Box
• Max Thermal Flux:	1.8E12 (Small Volume)
• Control:	4 Swinging Vane-type Cadmium Loaded Blades
• Coolir Flow	40 GPM
• Coolant Temperature	
Core Inlet:	105°F
Core Outlet:	120°F
• Pressure:	1 Atmosphere (Nominal)
• Instrumentation:	B-10 Proportional Chamber Fission Chamber CIC/UIC

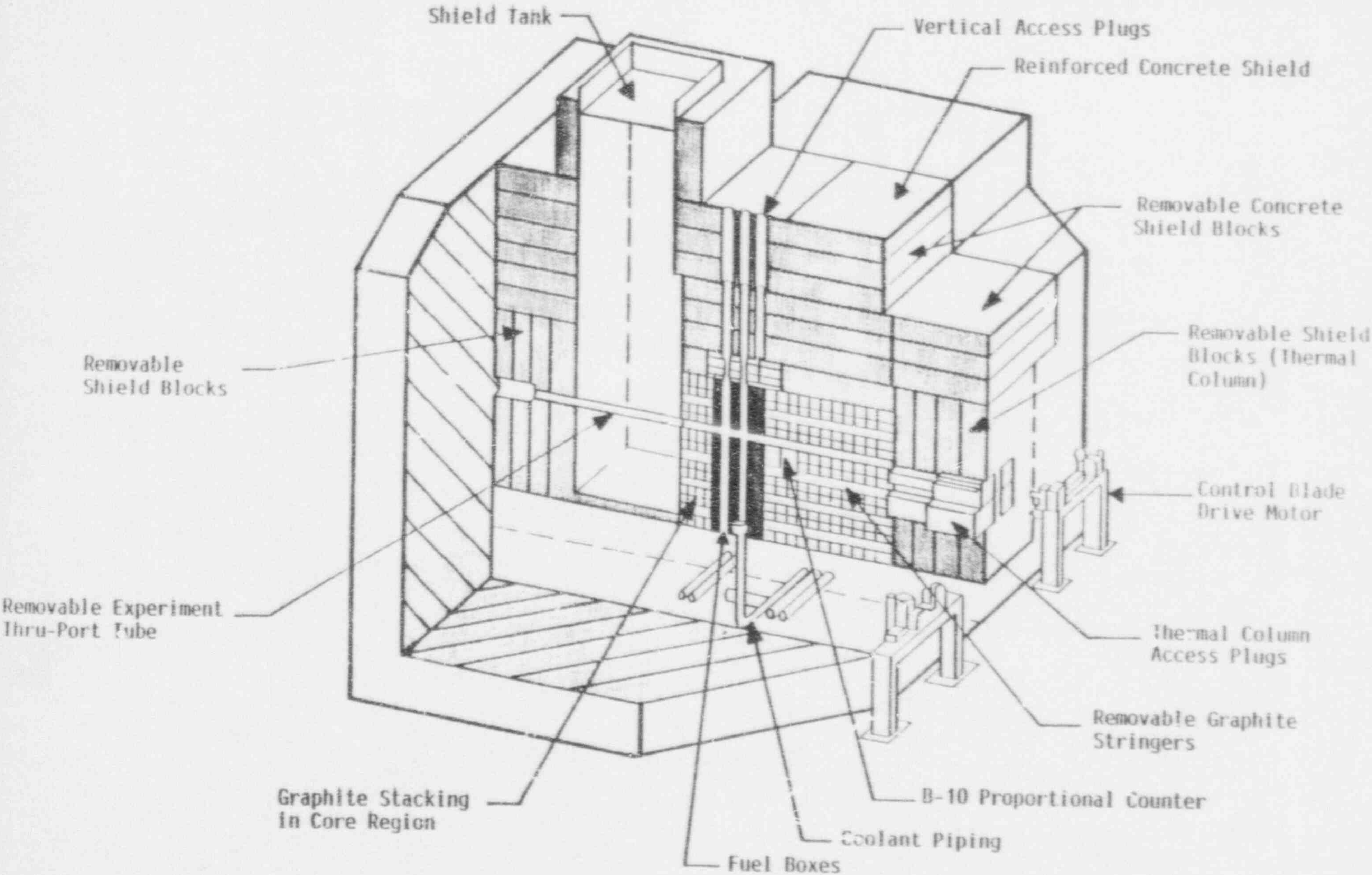


FIGURE 1 CUTAWAY VIEW OF THE UFTR

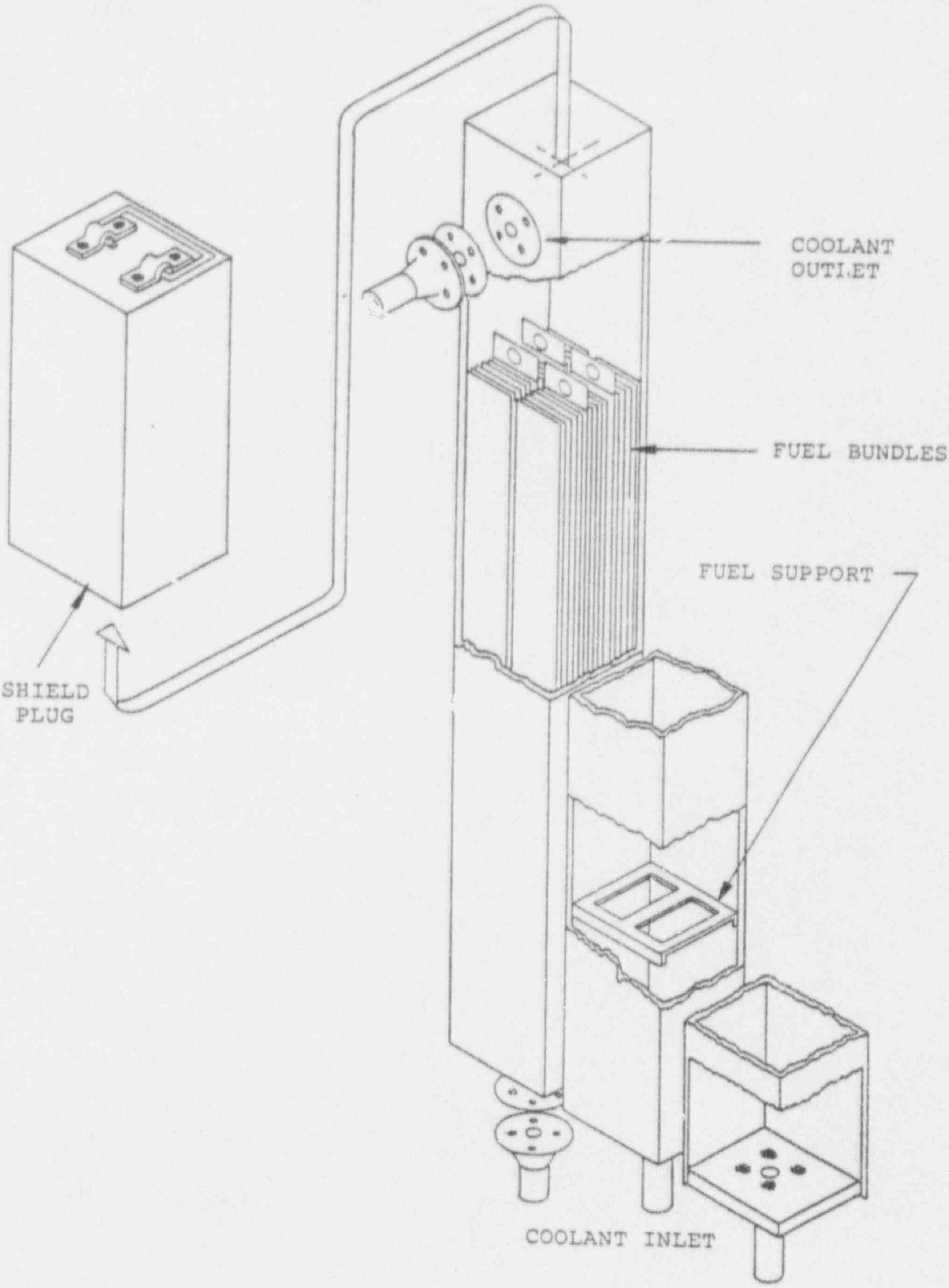
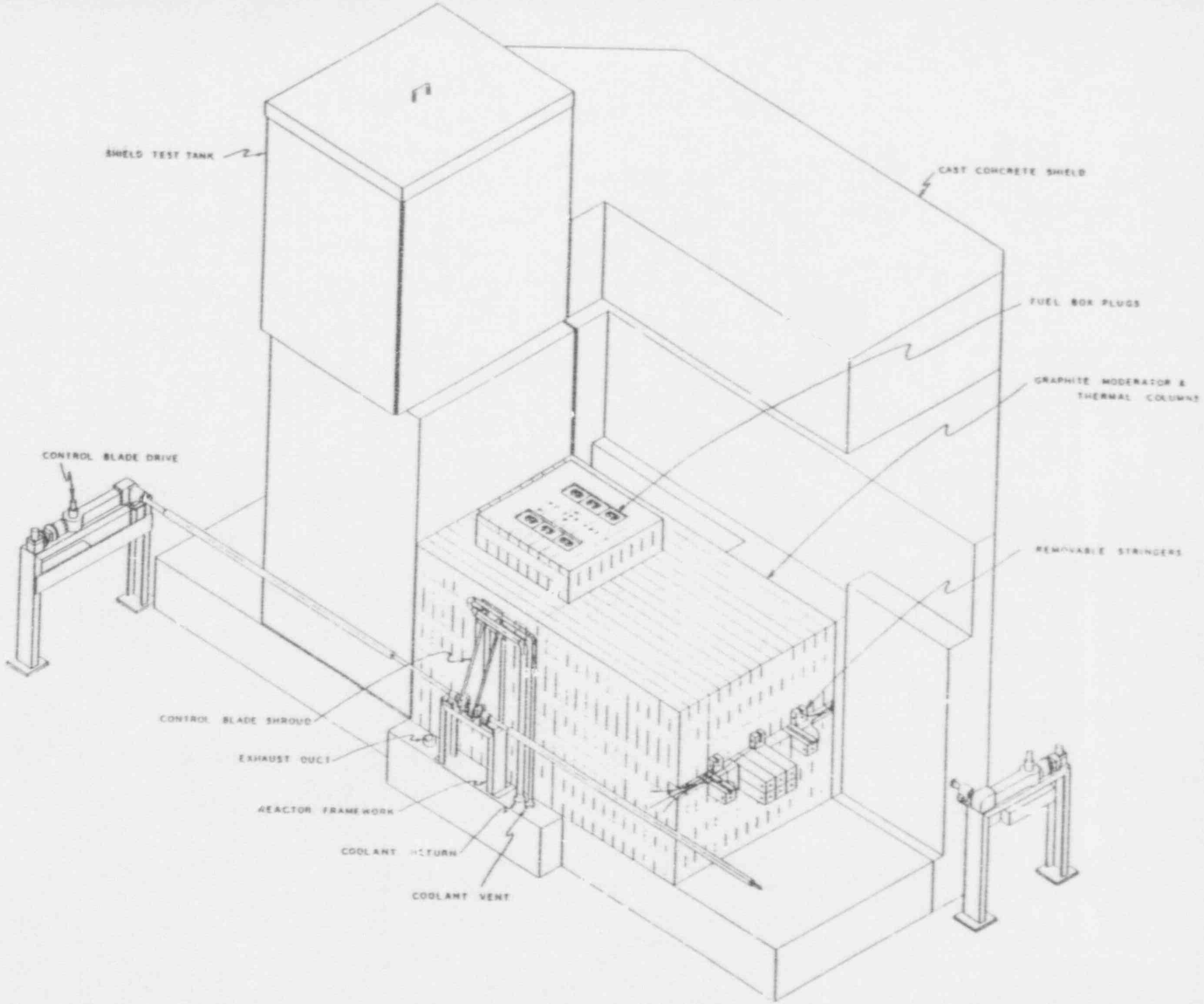


Figure 4-9. ISOMETRIC OF UFTR FUEL BOXES.


SHIELD TEST TANK
CAST CONCRETE SHIELD
FUEL BOX PLUGS
GRAPHITE MODERATOR & THERMAL COLUMNS
REMOVABLE STRINGERS
CONTROL BLADE DRIVE
CONTROL BLADE SHROUD
EXHAUST DUCT
REACTOR FRAMEWORK
COOLANT RETURN
COOLANT VENT

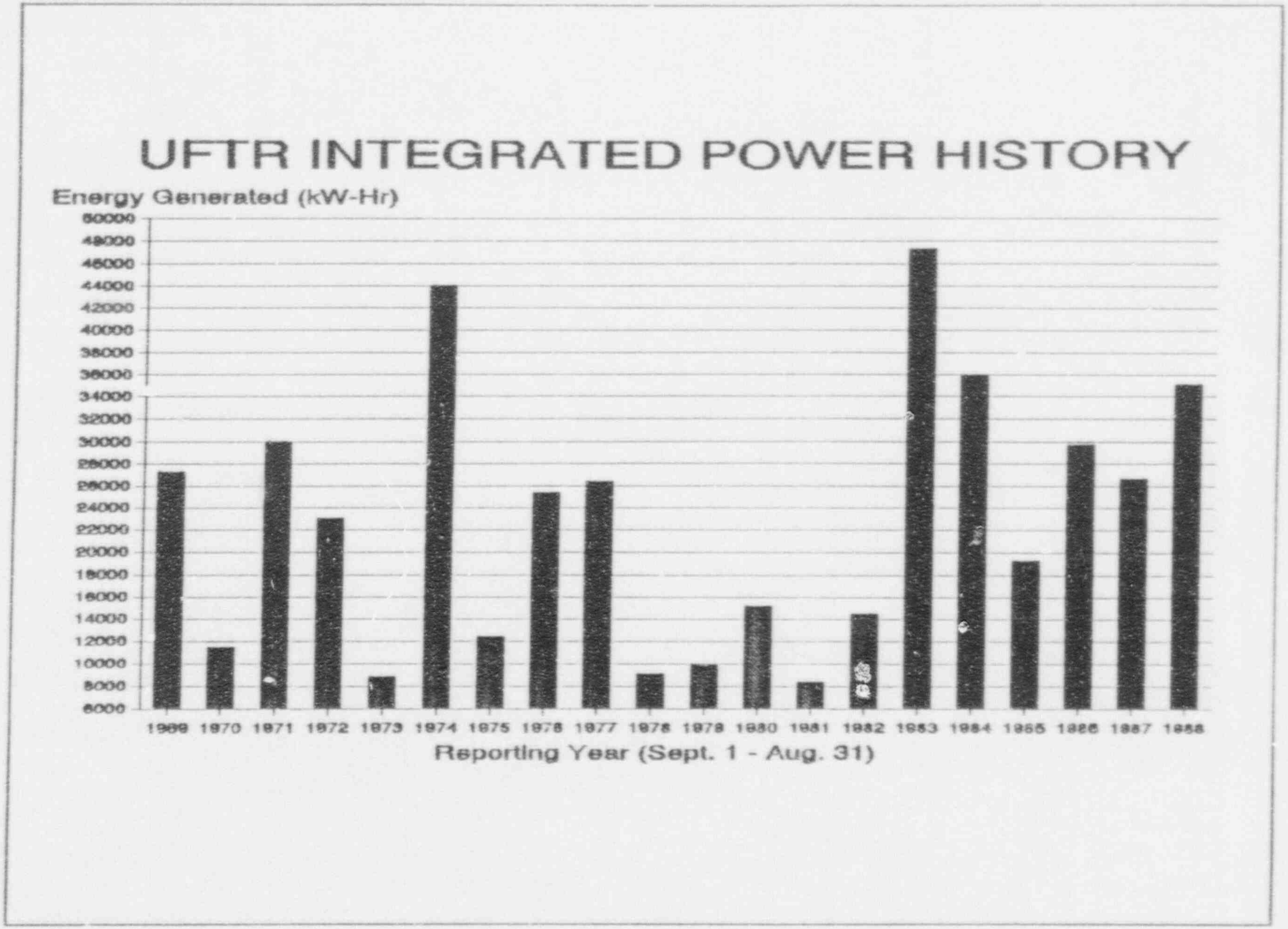
UFTR Regional Role

- UNIQUE REGIONAL FACILITY TO SERVE FLORIDA AND THE SOUTHEAST
  - Initial Startup at 10 kw in 1959
  - Power Increase to 100 kw in 1969
  - Relicensed for 20 Years in 1982
  - Planning HEU/LEU Conversion in 1992
- STATE OF FLORIDA
  - Large Distances Between Population Centers
  - Emerging Technological Base
  - Emerging University System
  - Unique Community College System
- EVOLVING/SHIFTING HISTORICAL USAGE RECORD
  - 1960s (Basic Nuclear Research)
  - 1970s (Utility RO Training/Plasma Research)
  - 1980s (Decreasing Utility Training/Reactor Sharing)
  - 1990s (RX Sharing, HEU/LEU, Diversification, ...)
- NES DEPARTMENT AFFILIATION
  - Historical Leader
  - Large/Well Established Department
  - Diverse but Limited Usage

RECENT UFTR
FACILITY USAGE DATA

- PRODUCTIVE USAGE TIME COMMITMENT
  - 30+ hours per week
  - 15-20 hours critical per week
  - 5-10 EFPHs per week

- BROAD SPECTRUM OF USAGE
  - Education
  - Lab/Special Project Courses
    - Lecture Segments for UF Courses
    - Lectures/Exercises for Visiting Academic Units
  - Training (Utility/College/Other)
  - Research Projects
  - Irradiation and Other Services
  - Demonstrations and Tours


UFTR INTEGRATED POWER HISTORY
Energy Generated (kW-Hr)
50000
48000
46000
44000
42000
40000
38000
36000
34000
32000
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988
Reporting Year (Sept. 1 - Aug. 31)

Overview of Reactor Facility Usages

- **EDUCATION**
  - Secondary Schools
  - Community Colleges
  - Colleges/Universities
- **TRAINING**
  - Secondary Schools
  - Community Colleges
  - Colleges/Universities
  - Utilities
- **RESEARCH**
  - Facility Life Extension
  - Plasma Kinetics
  - NAA for Trace Element Identification
  - Special Detector Development
  - Neutron Radiography Facility Development
- **SERVICE (TYPICAL)**
  - Irradiated Boraflex Evaluation
  - Processed Quartz Evaluation
  - Generation of Radionuclides
  - Source Regeneration
  - Selective Dielectric Irradiation for Color Center Analysis
  - Tracer Analysis of Elemental Diffusion
  - NDE of Electronic Components
- **PUBLIC INFORMATION**

UF USAGE OF UFTR

- REGULAR USERS
  - Advanced Materials Research Center
  - Chemistry Department
  - Environmental Engineering Sciences
  - Innovative Nuclear Space Power Institute
  - Nuclear Engineering Department
- OCCASIONAL USER DEPARTMENTS
  - Anthropology
  - Aquaculture
  - Electrical Engineering
  - Engineering Science and Mechanics
  - Pharmacology
  - Physics
  - Radiation Oncology
  - Radiology

External Educational Users

- UNIVERSITIES
  - Florida A & M University
  - Florida Atlantic University
  - Florida Institute of Technology
  - Florida State University
  - Southeast Missouri State University
  - Stetson University
  - University of Central Florida
  - University of South Florida (Tampa)
  - University of South Florida (St. Petersburg)
  - University of West Florida
  - University of Wisconsin (Eau Claire)
- COLLEGES
  - Florida Southern
  - Rollins
- COMMUNITY COLLEGES
  - Central Florida Community College
  - Florida Community College at Jacksonville
  - Santa Fe Community College
  - Hillsborough Community College
- HIGH SCHOOLS
- MIDDLE SCHOOLS

Training Usages

- REACTOR OPERATOR TRAINING
  - Utilities
  - UF Students
  - UFTR Staff
  - Non-UF Students

- HEALTH PHYSICS TRAINING
  - Community Colleges
  - State Universities
  - UF Students
  - UFTR Staff

- ANALYTICAL LABORATORY TRAINING
  - High Schools/Community Colleges
  - External Colleges/Universities
  - UF Students

Research Usages

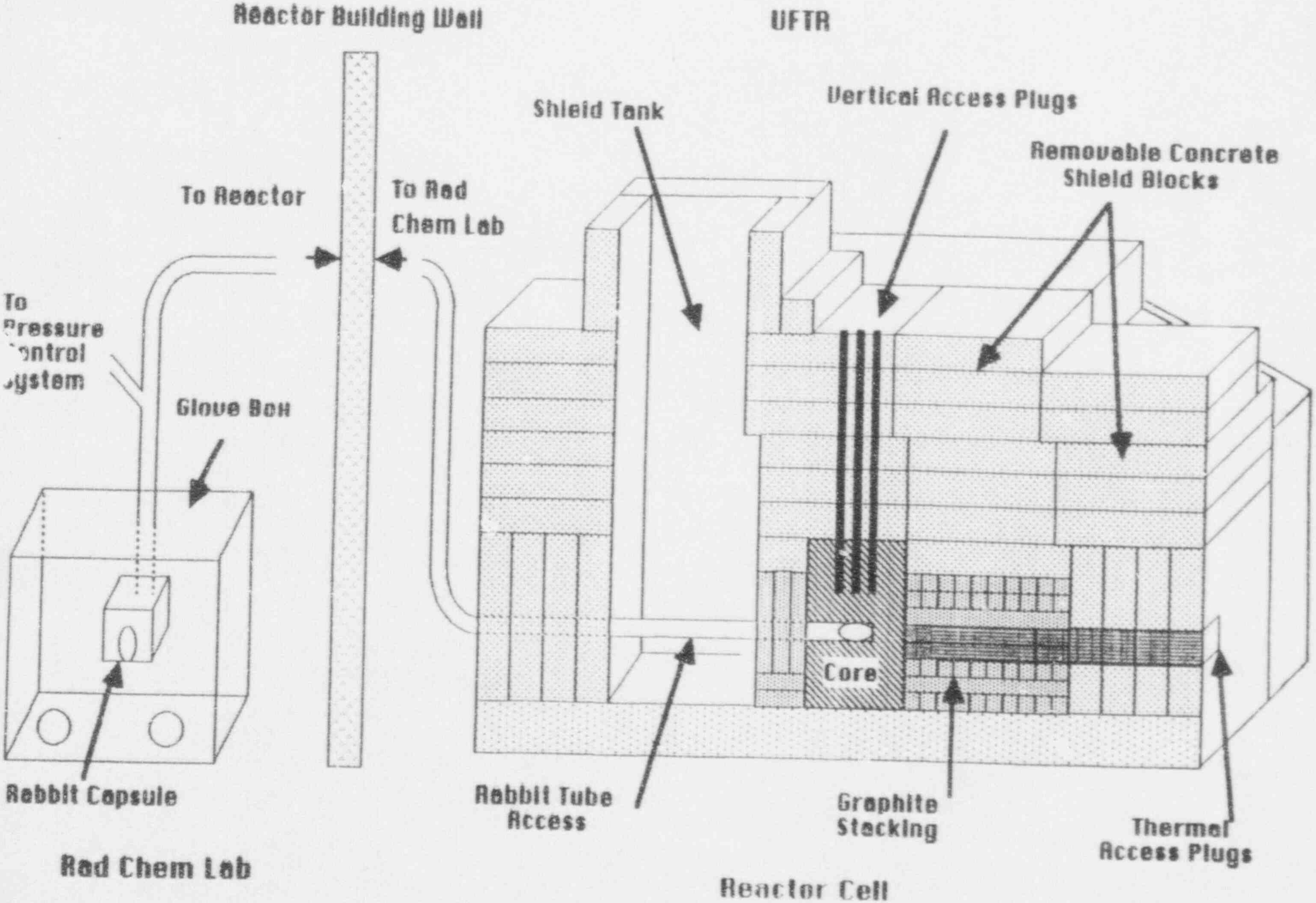
- UFTR LIFE EXTENSION (UFLEX)
  - HEU-TO-LEU Fuel Conversion Studies
  - Gaseous Effluent Characterization
  - Gaseous Effluent Mitigation
  - Radiation Protection Instrumentation Evaluation

- UFTR FACILITY ENHANCEMENT
  - Rabbit System Improvements
  - Neutron Radiography Facility
  - Prompt Gamma Analysis Facility
  - Experimental Port Characterization

RESEARCH USAGES (Continued)

- INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS
  - NBS/NIST/USGS Standards Correlation
  - Evaluation of Environmental Mercury
  - Mercury Uptake in Fish
  - Trace Element Characterization of Dielectrics
  - Various Student Projects
- PLASMA KINETICS
  - Detector Development
  - Reactor Fuel Characterization
- BASIC PHYSICS
  - Dielectric Color Center Investigations
  - Semiconductor Diffusion Studies

The Rabbit System



Neutron Activation Analysis Laboratory
Recent and Current Projects in Trace Element Analysis

- DRILLING FLUID EFFECTS ON SEAGRASS COMMUNITIES (Cr,Ba,Sc)
- VOLCANIC ROCKS (REEs, Ta)
- TAMPA BAY ESTUARINE SEDIMENTS (RARE EARTHS)
- KINETICS OF SODIUM TRANSFER IN DNA (Na)
- EVALUATION OF QUARTZ STOCK PROCESSING (Cl,Ti,F)
- DIELECTRIC (TOPAZ) MATERIAL ORIGINS (Nd, Sm, ...)
- EGYPTIAN AND FLORIDIAN PHOSPHATE ORES (REEs)
- TRACE ELEMENT EVALUATION OF GEOLOGIC QUARTZ (GEOSYNCHRONOMETRY)
- IN-HOUSE STANDARDS CERTIFICATION (USGS vs NBS-NIST)
- BIOGEOCHEMICAL ASSESSMENT OF OIL FIELDS

User-Oriented Facility Improvements

- RABBIT SYSTEM
  - Reimplementation
  - Standardized/Increased Capacity
  - Improved Reliability
  - Improved Radiation/Shielding Control
- NAA LABORATORY
  - PC-based Analyzers/ORTEC Software
  - Electronic Balance
  - NIST/USGS Standards Availability
  - Drying/Sample Preparation Facilities
  - User Services/Training
- NEUTRON RADIOGRAPHY FACILITY
  - Nonpermanent Installation
  - Darkroom Facilities
  - IQI/BPI
  - Film Densitometer
- TRAINING PROGRAM DEVELOPMENT
  - Reactor Operations Laboratory
  - Health Physics Cooperative Work

Planned User-Oriented Improvements

- NAA LABORATORY UPGRADE
  - Instrument/Detector Replacement
  - Implementation of Sctinillation Detector Systems
- NEUTRON RADIOGRAPHY SYSTEM IMPROVEMENTS
- IMPLEMENTATION OF FACILITY-BASED PC-BASED ON-LINE DATA ACQUISITION/ ANALYSIS SYSTEM
- DEVELOPMENT OF PROMPT GAMMA FACILITY

Summary Status Report

- FACILITY NEEDS UPGRADE/MODERNIZATION
- USAGE AT HISTORICAL HIGH IN 1988-1990
- DOE IS A KEY SUPPORT SOURCE
  - REACTOR SHARING
  - HEU/LEU CONVERSION
  - TRTR NEWSLETTER
- FACILITY IS A REGIONAL ASSET
- MANY IMPROVEMENTS HAVE BEEN IMPLEMENTED
- MORE IMPROVEMENTS ARE PLANNED
- OPTIMISTIC OUTLOOK

CURRENT STATUS OF R-56 LICENSEE

- FULL COMPLIANCE
- RECEPTIVE TO REGULATORY REQUESTS
- REDUCED ACTIVITY DUE TO PERSONNEL LOSSES
- THREE TRAINEES IN LICENSING
- ADVERTISED FOR/PLAN TO HIRE NEW MANAGER

APPENDIX B

DOCUMENTATION FOR NRC

INSPECTION REPORTS

NO. 50-83/90-02 AND NO. 50-83/91-01

MATERIAL TRANSMITTED HEREWITH CONTAINS 2.790 INFORMATION

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

NOV 2 3 1990

RECEIVED

NOV 2 1990

NUCLEAR ENGINEERING

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. 50-83/90-02

This refers to the inspection conducted by Ms. Orysia M. Masnyk of this office on October 25, 1990. The inspection included a review of activities authorized for your Nuclear Reactor facility. 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.

Within the scope of the inspection, violations or deviations were not identified.

In accordance with 10 CFR 2.790(d) and 10 CFR 73.21, safeguards activities and security measures are exempt from public disclosure. Therefore, the enclosure to this letter with the exception of the report cover page, which presents a nonexempt summary, will not be placed in the NRC Public Document Room.

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

Sincerely,

William E. Cline

William E. Cline, Chief
Nuclear Materials Safety and
Safeguards Branch
Division of Radiation Safety
and Safeguards

Enclosure: (See page 2)

MATERIAL TRANSMITTED HEREWITH CONTAINS 2.790 INFORMATION

Enclosure:
NRC Inspection Report
(Exempt from Disclosure)

cc w/encl:
Dr. J. S. Tulenko, Chairman
Nuclear Engineering Sciences Department
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

cc w/Inspection Summary:
Dr. Ratib A. Karam, Director
Neely Nuclear Research Center
Georgia Institute of Technology
900 Atlantic Drive, NW
Atlanta, GA 30332

Garry D. Miller, Associate Director
Nuclear Reactor Program
North Carolina State University
Box 7909
Raleigh, NC 27695-7909

Dr. R. U. Mulder, Director
Reactor Facility
University of Virginia
Charlottesville, VA 22901

Mary E. Clark, Chief
Office of Radiation Control
Department of Health and
Rehabilitative Services
1317 Winewood Boulevard
Tallahassee, FL 32999

State of Florida

MATERIAL TRANSMITTED HEREWITH
CONTAINS 2.790 INFORMATION

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

Report No.: 50-83/90-02

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

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

Facility Name: Nuclear Reactor Facility

Inspection Conducted: October 25, 1990

Inspector: W. W. Stansberry for Orysia Masnyk, Safeguards Specialist — 11-16-90 Date Signed

Approved by: C. D. Perry for David R. McGuire, Chief
Safeguards Section
Nuclear Materials Safety and Safeguards Branch
Division of Radiation Safety and Safeguards — 11-16-90 Date Signed

SUMMARY

Scope:

This routine, special unannounced inspection was conducted in the areas of Plans and Procedures and Fixed Physical Protection of Special Nuclear Material of Moderate Strategic Signifiance. Additionally the inspector reviewed Revision 4 to the Physical Security Plan for the SPERT Assembly Facility.

Results:

In the areas inspected, violations or deviations were not identified.

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

RECEIVED APR 1 1991

MAR 27 1991

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. 50-83/91-01

This refers to the inspection conducted by Ms. O. M. Masnyk of this office on March 7, 1991. The inspection included a review of activities authorized for your University of Florida Test Reactor facility. 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.

Within the scope of the inspection, violations or deviations were not identified.

The material enclosed herewith contains Safeguards Information as defined by 10 CFR Part 73.21 and its disclosure to unauthorized individuals prohibited by Section 147 of the Atomic Energy Act of 1954, as amended. Therefore, the material will not be placed in the Public Document Room.

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

Sincerely,

William E. Cline

William E. Cline, Chief
Nuclear Materials Safety and
Safeguards Branch
Division of Radiation Safety
and Safeguards

Enclosure:
NRC Inspection Report
(Exempt from Disclosure)

cc w/encl: (See page 2)

cc w/encl:
Dr. J. S. Tulenko, Chairman
Nuclear Engineering Sciences Department
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

cc w/Inspection Summary:
Dr. Ratib A. Karam, Director
Neely Nuclear Research Center
Georgia Institute of Technology
900 Atlantic Drive, NW
Atlanta, GA 30332

Garry D. Miller, Associate Director
Nuclear Reactor Program
North Carolina State University
Box 7909
Raleigh, NC 27695-7909

Dr. R. U. Mulder, Director
Reactor Facility
University of Virginia
Charlottesville, VA 22901

Mary E. Clark, Chief
Office of Radiation Control
Department of Health and
Rehabilitative Services
1317 Winewood Boulevard
Tallahassee, FL 32999

State of Florida

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

Report No.: 50-83/91-01

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

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

Facility Name: University of Florida Test Reactor

Inspection Conducted: March 7, 1991

Inspector: [signature] 3-26-91
O. M. Masnyk, Safeguards Specialist — Date Signed

Approved by: [signature] 3/26/91
D. R. McGuire, Chief — Date Signed
Safeguards Section
Nuclear Materials Safety and Safeguards Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This routine, unannounced inspection was conducted in the areas of Plans, Procedures, and Reviews; Reports of Safeguards Events; and Fixed Site Physical Protection of Special Nuclear Material of Moderate Strategic Significance.

Results:

In the areas inspected, violations or deviations were not identified.

APPENDIX C

FINAL REPORT TO NRC

ON

FAILURE TO CHECK

CONTROL BLADE INTERLOCKS

PER SOP-A.2

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 29, 1990

Failure To Check Control Blade Interlocks
Per SOP-A.2 - 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(g) of the UFTR Technical Specifications, a description of a potential violation of the Technical Specifications was reported by telephone/telecopy(Attachment I) on 25 October 1990 and a final 14-day written report is submitted with this letter to include NRC notification, occurrence scenario, evaluation of consequences, corrective action and current status. The potentially promptly reportable occurrence involved the performance of three reactor startups on 2 October 1990 without performing a daily checkout or the control blade interlock checks following a previous shutdown as required in UFTR SOP-A.2, "Reactor Startup."

NRC Notification

UFTR Management reviewed this occurrence on October 24-25, 1990 following its discovery on October 24, 1990 and in consultation with several members of the Reactor Safety Review Subcommittee(RSRS) concluded that it represented a potential violation of the UFTR Tech Specs, Section 6.3 pertaining to the requirement that the facility be operated in accordance with written procedures. NRC Notification was made per Section 6.6.2 of the UFTR Tech Specs and reactor restart was approved following the performance of retraining on the applicable SOP section for reactor operators. The NRC notification was carried out by telephone to Mr. Craig Bassett on Thursday October 25, 1990 with a following telecopy on October 25, 1990 as required(see Attachment I).

Initial Event Scenario

In reviewing the October operations log entries on Wednesday, October 24, 1990, it was noted that an apparent violation of the UFTR Standard Operating Procedures had occurred on 2 October, 1990. On 2 October, 1990, a daily checkout was started at 0810 and completed at 0825. The reactor was then run several times with a shutdown concluded at 1539 hours. At 1705 hours 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 this startup at 1705 hours, 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 begun at 1733, 1804 and 1826 respectively.

Chapter 4 of the UFTR Technical Specifications on Surveillance Requirements in Section 4.2 on Surveillance Pertaining to Limiting Conditions for Operation in Paragraph 4.4.2 entitled, "Reactor Control and Safety Systems Surveillance" contains two applicable paragraphs (6) and (7) quoted as follows:

4.2.2(6) 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 hr prior to startup, and (c) no known condition exists that could prevent successful completion of a weekly or daily checkout.

4.2.2(7) The limitations established under Paragraph 4.2.2(6) (a) and (b) can be deleted if a reactor startup is made within 6 hr of a normal reactor shutdown on any one calendar day.

Although Tech Spec requirements on the restarts were met in all four startups after 1705 hours, the last three(3) startups on the afternoon of 2 October 1990 failed to meet the additional requirement delineated in UFTR SOP-A.2, "Reactor Startup" §4 Paragraph 4.4.6 that the control blade interlocks be checked prior to the restart when the daily checkout is omitted as allowed under Tech Specs 4.2.2(7), since the previous normal reactor shutdown had occurred within 6 hours. Therefore, the last three(3) UFTR startups on 2 October 1990 represent a potential violation of Section 6.3 of the UFTR Tech Specs pertaining to the requirement that the facility be operated in accordance with written procedures.

Evaluation of Consequences

The reactor staff and administration agree there was no compromise to reactor safety in this event, nor was there danger of personnel receiving excessive radiation doses. Members of the RSRS consulted in this matter, including all members of the Executive Committee, also concur. The problem is administrative in nature and does involve a potential violation of the UFTR Tech Specs through omission of a procedural step. Note that the event is similar to the November, 1988 event where the interlock checks were overlooked entirely. Here however, the operator was reminded to perform the interlock checks the first time and simply assumed the one check was sufficient. It is worth noting that, had a new daily checkout been performed prior to the first startup at 1705 hours instead of just checking the control blade interlocks, the subsequent interlock checks would not be required.

In this case there would be no violation of SOP-A.2 and hence the Tech Specs; however, for the blade withdrawal interlock checks, the exact same checks are done in the daily checkout as when the daily is omitted per Tech Spec Paragraph 4.2.2(7). For this reason the reactor administration is considering deleting the requirement that the blade interlock checks be performed prior to every startup after the 8 hour limit on the daily checkout is exceeded. A conversation with Mr. Craig Bassett of Region II on October 25, 1990 indicates this is probably the best thing to do.

Corrective Action

Prior to restart, all operators received retraining on the requirements for performing daily checkouts contained in UFTR SOP-A.2, "Reactor Startup" in Paragraphs 4.4.2, 4.4.4 and 4.4.6 with special emphasis on the SOP A.2 requirements for the operator involved in the occurrence.

Current Status

All operators have been made cognizant of this problem to assure the oversight and failure to perform blade interlock checks per UFTR SOP-A.2, "Reactor Startup" will not recur. In the meantime, a change is being developed to allow deletion of this interlock check per the Tech Specs; this change will be reviewed by the RSRS at its next regular meeting.

Sincerely,

William G. Vernetson

William G. Vernetson
Director of Nuclear Facilities

WGV/p
Attachments

Joan Marchoma 10/30/90
Notary Date

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

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 29, 1990

MEMORANDUM

TO: Reactor Safety Review Subcommittee

FROM: W.G. Vernetson *W.G. Vernetson*

SUBJECT: Failure to Perform Control Blade Interlock Check

In reviewing the October operations log entries on Wednesday, October 24, 1990, I noted an apparent violation of the UFTR Standard Operating Procedures had occurred on 2 October, 1990. On 2 October, 1990, a daily checkout was started at 0810 and completed at 0825. The reactor was then run several times with a shut[illegible]ed at 1539 hours. At 1705 hours the reactor was started up for an ex[illegible] operations lab exercises for an RO trainee and a reactor op[illegible]ation[illegible]dent. Prior to this startup at 1705 hours, the control blade [illegible]ocks were checked as required by SOP-A.2, Paragraph 4.4.6. H[illegible]rol blade interlocks were not checked following shutdown for suc[illegible]restarts begun at 1733, 1804 and 1826 respectively.

Chap[illegible] UFTR Technical Specifications on Surveillance Requirements in Section [illegible] on Surveillance Pertaining to Limiting Conditions for Operation in Paragraph 4.4.2 entitled, "Reactor Control and Safety Systems Surveillance" contains two applicable paragraphs (6) and (7) quoted as follows:

> 4.2.2(6) 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 hr prior to startup, <u>and</u> (c) no known condition exists that would prevent successful completion of a weekly or daily checkout.

> 4.2.2(7) The limitations established under Paragraph 4.2.2(6) (a) and (b) can be deleted if a reactor startup is made within 6 hr of a normal reactor shutdown on any one calendar day.

Although Tech Spec requirements on the restarts were met in all four startups after 1705 hours, the last three(3) startups on the afternoon of 2 October 1990 failed to meet the additional requirement delineated in UFTR SOP-A.2, "Reactor Startup" 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 Tech Specs 4.2.2(7). Therefore, the last three(3) UFTR startups on 2 October 1990 represent a potential violation of Section 6.3 of the UFTR Tech Specs pertaining to the requirement that the facility be operated in accordance with written procedures.

The reactor staff and administration agree there was no compromise to reactor safety in this event, nor was there danger of personnel receiving excessive radiation doses. The problem is administrative in nature and does involve a potential violation of the UFTR Tech Specs through omission of a procedural step. Note that this event is similar to the November, 1988 event where the interlock checks were overlooked entirely. However, it is worth noting that, had a new daily checkout been performed prior to the first startup at 1705 hours instead of just checking the control blade interlocks, the subsequent interlock checks are not required. In this case there would be no violation of SOP-A.2 and hence the Tech Specs; however, for the blade withdrawal interlock checks, the exact same checks are done in the daily checkout as when the daily is omitted per Tech Spec Paragraph 4.2.2(7). For this reason the reactor administration is considering deleting the requirement that the blade interlock checks be performed prior to every startup after the 8 hour limit on the daily checkout is exceeded. A conversation with Mr. Craig Bassett of Region II on October 25, 1990 indicates this is probably the best thing to do.

Prior to restart, all operators received retraining on the requirements for performing daily checkouts contained in UFTR SOP-A.2, "Reactor Startup" in Paragraphs 4.4.2, 4.4.4 and 4.4.6 with special emphasis for RO G.W. Fogle on the SOP requirements.

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 25, 1990

Failure To Check Control Blade
Interlocks Per SOP-A.2

U.S. 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

As per telephone call of 25 October, 1990, relative to performance of four startups for training at the end of the normal work day with three(3) reactor startups performed without a daily checkout (or alternately, blade interlock checks) being performed within the required time interval pursuant to UFTR SOP-A.2, " Reactor Startup," we have reviewed and concluded this is a potential violation of Tech Specs, Section 6.3 pertaining to the requirement that the facility be operated in accordance with written procedures. Therefore, we are reporting this occurrence per Section 6.6.2 of the UFTR Tech Specs. If the daily checkout had been performed, all the actions for the blade interlock checks for all the startups would have been unchanged fror what was actually done, though not involving a violation of SOP-A.2. Therefore, following the performance of retraining on the applicable SOP section for the reactor operator in question and discussion of the occurrence with all operators and several members of the Safety Review Committee, the reactor has continued in normal operation.

Notary Public

William G. Vernetson 10/25/90
Willliam G. Vernetson — Date
Director of Nuclear Facilities

WGV/p
cc: RSRS

UFTR Form SOP-O.7A

RECORD OF NRC TELEPHONE COMMUNICATIONS

Incoming/Outgoing (Circle)

DATE 10/25/90 CONTACT Craig Bassett

ORGANIZATION NRC I&E LOCATION Atlanta

PHONE # 404-331-5570 IS THIS A TS ITEM Yes.
(requires special handling)

SUBJECT AREA:

Failure to check control blade interlocks per SOP-A.2 for all but the first startup following longer than 8 hrs. after daily checkout. Similar occurrence in Nov, 88

Have discussed with some of RSRS - not going to special meeting but will transmit info.

If daily had been done vs. interlock checks nothing would have been done differently vs. interlock checks.

ACTION REQUIRED:

Prompt & 14 day report.

Will consider changing SOP.

BY Oct 25 & Nov 3.
(Date)

SIGNATURE WGVernetson

APPENDIX D

UFTR EMERGENCY PLAN

REVISION 6 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 6
December 13, 1990

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 6 to the approved UFTR Emergency Plan. Revision 6 has been reviewed by UFTR management and the Reactor Safety Review Subcommittee(RSRS) to assure Revision 6 does not decrease the effectiveness of the UFTR Emergency Plan. All the changes are considered minor in nature.

First, Revision 6 consists of changes to Figure 1.2 on Page 1-4 to document the location of the rapid sample insertion pneumatic(rabbit) system in the northwest corner of the radiochemistry laboratory as well as the conversion of the NAA Laboratory(southwest corner) into a separate room with removal of the two hoods in the center of the room. Other changes documented on the updated Figure 1.2 are the room numbers which have been changed over the past year.

Second, Revision 6 consists of a change on Page 10-5 to correct a typographical error for the location of the Emergency Equipment Cart to be in Room 106 of the Nuclear Sciences Center, not Room 109 as previously indicated.

Finally, Revision 6 consists of an updated Emergency Equipment Inventory at the Emergency Support Center. The change consists of correcting the stated location of the equipment required to be in Rooms 106 and 108 of the Nuclear Science Center, not just 108. In addition, several typographical errors and omissions in Table 10.3 have been corrected.

As indicated, all 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.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

Notary

WGV/p

Enclosures
cc: NRC Region II
Reactor Safety Review Subcommittee
R. Piciullo

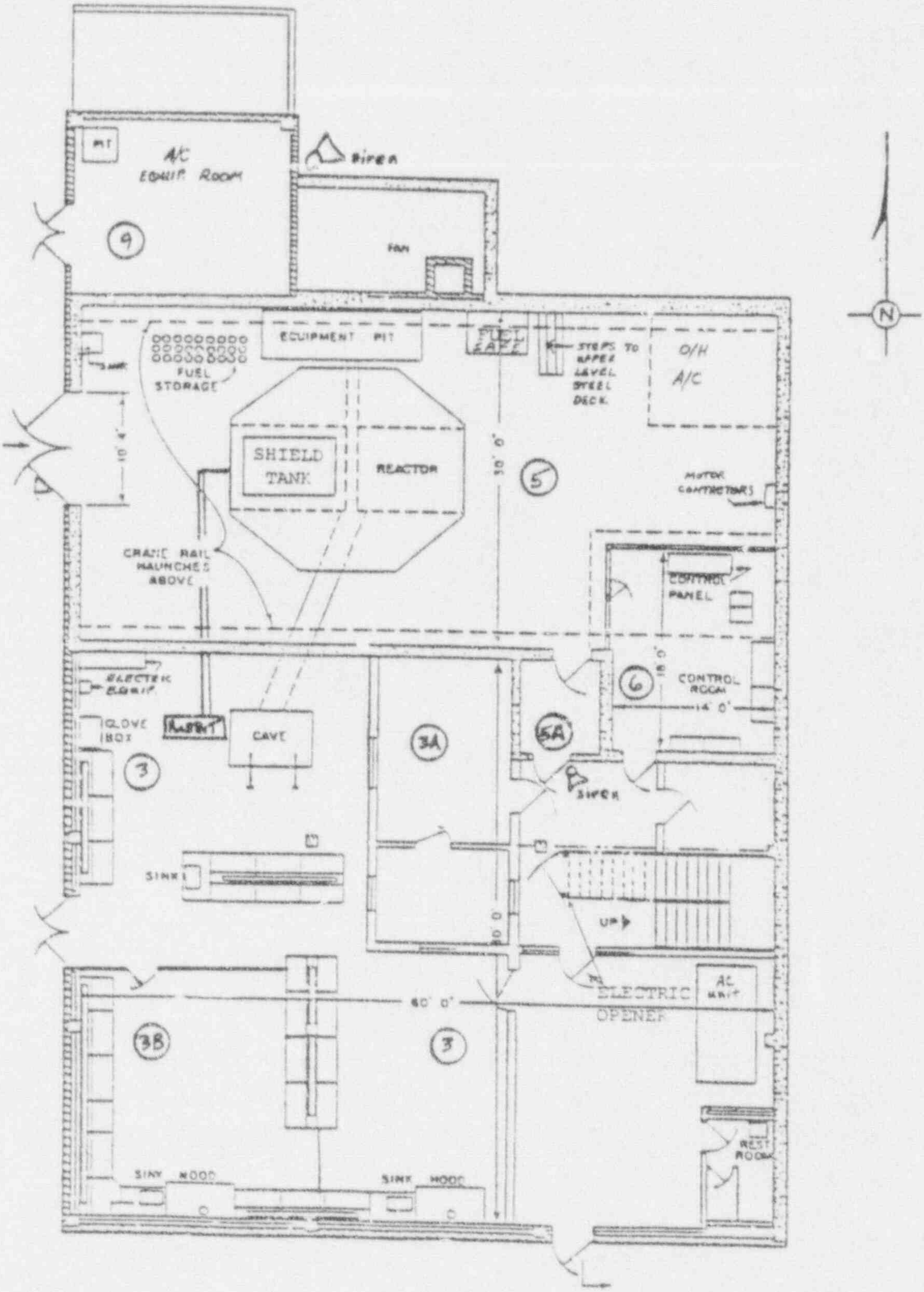


Figure 1.2. First Floor Plan for the University of Florida Training Reactor Building

Emergency supplies at the UFTR Facility including the emergency equipment cart located in the Nuclear Sciences Center, Room 106, adjacent to Room 108 NSC are verified to be operational and complete on a weekly basis by an assigned UFTR staff member with the requisite health physics training. Specific items of emergency equipment inventoried and minimum quantities of each available in Room 106 NSC for use in Room 108 NSC are listed in Table 10.3. For most items, the quantity on hand far exceeds the requirements of Table 10.3 with additional quantities of all items available through the Radiation Control Office.

Table 10.3

Decontamination Room

Emergency Equipment Inventory

The following listing details the minimum 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
*Teletector(High level survey meter)	1
*E-140(Low level GM meter)	1
D-Cell batteries	4
Walkie-Talkie Radios(Recommended Only)	2

Note: Starred items are in the Emergency 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 assume operability.

APPENDIX E

UFTR STANDARD OPERATING PROCEDURES

MAJOR REVISIONS GENERATED FOR

1990-1991 REPORTING YEAR:

1. "UFTR SOP-0.1, "OPERATING DOCUMENT CONTROLS"(REV 2)

2. "UFTR SOP-0.5, "UFTR QUALITY ASSURANCE PROGRAM"(REV 2)

3. "UFTR SOP-D.1, "UFTR RADIATION PROTECTION AND CONTROL"(REV 4)

UFTR OPERATING PROCEDURE 0.1

1.0 Operating Document Controls

2.0 Approval

Reactor Safety Review Committee	[signature]	8/29/91 Date
Director, Nuclear Facilities	William G. Vernetson	8/29/91 Date

3.0 Purpose and Discussion

3.1 The purpose of this procedure is to provide a system for controlling and processing standard operating procedures and procedure changes to promote consistent and proper operation of the UFTR facilities.

3.2 This procedure may be used to process changes to the UFTR Technical Specifications which must be reviewed and approved by the NRC as well as the RSRS prior to insertion in UFTR document manuals.

3.3 Definitions

3.3.1 'Operating Documents Manual' shall designate the manual containing UFTR Standard Operating Procedures, Technical Specifications and limited numbers of other operations-related documents.

3.3.2 'Temporary Change Notice' shall designate a limited change to a Standard Operating Procedure that does not alter the meaning or intent of the original document and shall be used to add cautionary, informative, or clarifying notes or to improve readability of the original document. 'Temporary Change Notice' shall be designated 'TCN', and when used in conjunction with a document, shall be denoted as TCN-number (month, year).

3.3.3 'Revision' shall designate, but is not limited to, any significant change of intent or meaning of the original standard operating procedure, and incorporates(thus eliminating) all TCN's generated since the last revision. 'Revision' shall be designated using the term 'REV', and when used in conjunction with a document, shall be denoted as REV-number (month, year).

3.3.4 'Change' shall indicate a revision or temporary change notice.

3.3.5 'Master File Copy' shall designate the original, as an approved document from which all other copies are to be made.

3.3.6 'Controller' shall denote the individual, appointed by the Reactor Manager, responsible for the first line administration of the applicable portions of this procedure on a temporary or permanent basis.

3.3.7 'Controlled Copy' is a UFTR document classification requiring controls as specified in this procedure.

3.3.8 'Information Copy' is a UFTR document classification requiring controls as specified in this procedure.

3.3.9 'Uncontrolled Copy' is a UFTR document classification requiring controls as specified in this procedure.

3.3.10 'Review Standard' shall be a listing of the Standard Operating Procedures and the Technical Specification portions of the controlled Operating Documents Manual delineating the latest revision to each procedure and the Technical Specifications and any and all applicable TCN's when used to verify the contents of the controlled document.

3.3.11 'Review" shall be a comparison of the document's contents with a list of the latest revisions and applicable temporary change notices as noted on the 'review standard.'

3.3.12 'Distribution List' shall be a list of all document manual holders who request or require notification of revisions or temporary change notices(for the period of time that they are to receive the material) detailing the locations to which the changes are to be routed.

3.3.13 'Document Control Files' shall mean a set of files and/or notebooks where the records of changes to UFTR Standard Operating Procedures are maintained.

4.0 Limits and Precautions

4.1 This procedure is not to be construed as replacing or relaxing any other requirements for control of UFTR documentation.

4.2 Information copies will not routinely be used for UFTR facility operations.

4.3 Uncontrolled copies will not be used for UFTR facility operations.

5.0 References

5.1 UFTR Technical Specifications

5.2 UFTR FSAR

5.3 UFTR Document Control Files

6.0 Records Required

6.1 Document Control Files

6.2 UFTR Form SOP-0.1A, (Coversheet/Change Request Form)

6.3 UFTR Form SOP-1B, (Distribution Request Form)

6.4 UFTR Form SOP-0.1C, (Review Standard Coversheet)

6.5 UFTR Form SOP-0.1D, (Location List For Controlled and Information Copi of UFTR Operating Documents Manuals)

7.0 Instructions

7.1 UFTR Document Classification and Administration

7.1.1 Master File Copy shall designate the copy of the latest revisions and applicable temporary change notices of UFTR Standard Operating Procedures as well as the latest complete version of the UFTR Technical Specifications as maintained in the Facility Director's Office.

7.1.1.1 Any revision or temporary change notice installed in a copy of UFTR documents controlled by this procedure shall be a mechanical reproduction of the latest revision or temporary change notice from the Master File.

7.1.1.2 Coversheets (UFTR Form SOP-0.1A) of the copies in the Master File will have only Section A, items 1 through 5 completed, with Section B optional as desired, and th e coversheets will be retained as integral material in the Master File at the front of th document section to which they apply.

7.1.2 Controlled Copy shall designate copies of UFTR documents to be treated as follows:

7.1.2.1 C trolled copies shall be maintained in binders marked 'Controlled Copy.'

7.1.2.2 Each Controlled Copy will be assigned to a specific location or individual and not removed from that location or individual except as it becomes superceded.

7.1.2.3 Controlled copies not assigned to individuals will be updated and reviewed by the controller or the controller's designated alternate.

7.1.3 Information Copy shall designate copies of UFTR documents to be treated as follows:

7.1.3.1 Information copies shall be maintained in binders marked 'Information Copy.'

7.1.3.2 Information copies will be given to the custody of designated individuals when assigned.

7.1.3.3 Each Information Copy will be updated and reviewed by that individual designated as its custodian unless unassigned.

7.1.3.4 Information copies will not routinely be used for UFTR facilities operation.

7.1.4 Uncontrolled Copy shall designate copies of UFTR documents to be treated as follows:

7.1.4.1 Uncontrolled copies have no specified location or custodian, and need not be marked. Any UFTR document not marked as either "controlled copy", or "information copy," shall be assumed to be an uncontrolled copy.

7.1.4.2 Uncontrolled copies need not be updated or reviewed.

7.1.4.3 Uncontrolled copies shall not be used for UFTR facility operations.

7.2 Generating a change

7.2.1 Changes shall be requested in writing on a Coversheet/Change Request Form as contained in Appendix II (UFTR Form SOP-0.1A). The person suggesting or requesting the change or his/her designated representative shall complete Section A, Items 1 through 4.

7.2.1.1 TCN's may be pen and ink changes, page replacements, or replacement of the whole procedure, but must be so specified on the Coversheet/Change Request Form, as part of the "summary of change," Section A Item 4 of UFTR Form SOP-0.1A. Each page of a procedure affected by a TCN should be labeled beneath the Revision Number (REV: month/year) with the TCN Number(TCN: month/year).

7.2.1.2 REV's must be complete reproductions (typewritten) of the document undergoing revision; that is, REV's do not simply consist of changed pages but are to be installed so that each page of the document undergoing change is part of the REV and marked as the Revision Number (REV: month/year) to eliminate the previous revision and all intervening TCN's.

7.3 Implementing Changes

7.3.1 After a change has been reviewed and approved for installation(as evidenced by signatures of the Facility Director and the Reactor Safety Review Subcommittee Chairman on Section 2.0 of the approved revision and on UFTR Form SOP-0.1A (Coversheet/Change Request Form) for revisions or temporary change notices, the controller shall:

7.3.1.1 Complete Section B, Items 1 through 3 on the Cover Sheet/Change Request Form;

7.3.1.2 Install the change in the Master File as directed by the coversheet;

7.3.1.3 Prepare and distribute a mechanical reproduction of the change(s) for all controlled and information copies to include the approved controlling UFTR Form SOP-0.1A, (Coversheet/Change Request Form).

7.3.1.4 Assure installation of the latest change(s) into all other controlled copies per the instructions on the contr g UFTR Form SOP-0.1A (Coversheet/Change Request Form) as delineated in Fa.t B, Step 3 and complete Section B, Items 4 and 5.

7.3.1.5 Place all completed Coversheet/Change Request Forms in the Document Control Files for all controlled copies except for the Master File which contains the original with Part B, Items 4 and 5 not completed.

7.3.1.6 Distribute the prepared mechanical reproductions of the change(s) for all information copies to all information copy custodians.

7.3.2 When the information copy custodian has received the change ..aterial from the controller, he/she should:

7.3.2.1 Install the change per the approved controlling UFTR Form SOP-0.1A(Coversheet/ Change Request Form);

7.3.2.2 Complete Part B, Items 4 and 5 of the approved UFTR Form SOP-0.1A (Coversheet/Change Request Form);

7.3.2.3 Return the completed UFTR Form SOP-0.1A (Coversheet/Change Request Form) to the document controller.

7.3.3 When the completed UFTR Form SOP-0.1A (Coversheet/Change Request Form) is returned to the controller, it should be placed in the Document Control Files.

7.4 Periodic Review

7.4.1 Each controlled copy of the UFTR Operating Documents Manual (to include Standard Operating Procedures and Technical Specification:' shall be reviewed for completeness biennially at intervals not to exceed 30 months as c. nmitted to the Nuclear Regulatory Commission. Each information copy should be reviewed for completeness on the same schedule. This review is designated as the B-3 Surveillance with the surveillance data sheet contained in UFTR SOP-0.5.

7.4.2 For every review, the controller shall prepare UFTR Form SOP-0.1C(Review Standard). A copy of the Review Standard shall be issued to the custodian of each Controlled Copy and each Information Copy of the Operating Documents Manual.

7.4.3 All controlled copies should be reviewed within 30 days of issuance of the Review Standard. All controlled copies shall be reviewed within 60 days of issuance of the Review Standard. Each custodian of an Information Copy should review the contents of his controlled document within 60 days of receipt of the Review Standard.

7.4.3.1 If no discrepancies are noted in review, the person performing the review should sign and date each page of the "Review Standard" used in the review process and return it to the controller.

7.4.3.2 If discrepancies are noted during the review, the custodian or the person performing the review should indicate the deficient sections on the Review Standard and return the material to the Document Controller who shall provide replacement for the deficient material to the copy custodian.

7.4.4 A review of a specific copy may be requested by the copy holder at any time, and should be requested if the copy custodian notes incorrect or incomplete sections in his/her copy.

7.4.5 Completed Review Standards shall be maintained in the Document Control Files.

APPENDIX I

Contents of Document Control Files

CONTENTS OF

DOCUMENT CONTROL FILES

Item Number	Description of Contents
1	Copies of all Approved Standard Operating Procedures in the latest form (Master File).
2	Copy of the UFTR Technical Specifications(Master File).
3	Copies of Temporary Procedures (Master File).
4	(One) copy of superceded material(Master File).
5	The original coversheet returned after action on the copies is completed: A. Controlled Copies B. Information Copies
6	Copies of all applicable TCN's (Master File).
7	Latest (completed) Review Standard for each copy (B-3 Surveillance File).

APPENDIX II

Forms For Documenting Control

of

Operating Documents Manuals

FORM SOP-0.1A

COVERSHEET/CHANGE REQUEST FORM

PART A GENERATING THE CHANGE REQUEST

This form is to be completed to serve as the cover sheet in generating changes to UFTR Standard Operating Procedures to assure adequate review and approval.

1. This request is for a (revision/TCN) of procedure ____________
2. This request is generated by ____________
3. Reason for change ____________
   ____
   ____
   ____
4. Summary of change ____________
   ____
   ____
   ____
5. Approval
   A. Facility Director ____________
   B. RSRS Chairman ____________

PART B INSTALLING THE APPROVED CHANGE

1. Type of document (Controlled/Information/Uncontrolled)copy.
2. Location of copy holder ____________
3. Directions for installing the change ____________
   ____
   ____
4. Data on entering change ____________
   A. Person making entry ____________
   B. Date of entry ____________
5. Date cover sheet returned to controlled ____________

FORM SOP-0.1B

DISTRIBUTION REQUEST FORM

This form is required to be on file to justify placing an individual on the distribution list to receive current UFTR Standard Operating Procedures as well as revisions and temporary change notices as they are produced.

1. Name of Requestor ____________________
2. Position of Requestor ____________________
3. Campus mailing address ____________________

   ____

   ____

   ____
4. Telephone number ____________________
5. Period for which forwarding of changes is requested ____________________
6. Reason for which forwarding of changes is requested ____________________

   ____

   ____

   ____

   ____

   ____

UFTR FORM SOP-0.1C

REVIEW STANDARD

This form is used to list the latest revisions and applicable temporary change notices for all approved UFTR Standard Operating Procedures so that the copy holder may ensure he/she has the latest available UFTR Standard Operating Procedures. This form is also used to list the latest amendments and affected pages for the UFTR Technical Specification.

1. Location/Copyholder: ______________________________

2. Procedure/Designation — Revision Number/TCN Numbers

Procedure/Designation	Revision Number/TCN Numbers
UFTR SOP-0.1	
UFTR SOP-0.2	
UFTR SOP-0.3	
UFTR SOP-0.4	
UFTR SOP-0.5	
UFTR SOP-0.6	
UFTR SOP-0.7	
UFTR SOP-0.8	
UFTR SOP-A.1	
UFTR SOP-A.2	
UFTR SOP-A.3	
UFTR SOP-A.4	
UFTR SOP-A.5	
UFTR SOP-A.6	
UFTR SOP-A.7	
UFTR SOP-A.8	

UFTR FORM SOP-0.1C

REVIEW STANDARD(continued)

Procedure/Designation	Revision Number/TCN Numbers
UFTR SOP-B.1	
UFTR SOP-B.2	
UFTR SOP-B.4	
UFTR SOP-C.1	
UFTR SOP-C.2	
UFTR SOP-C.3	
UFTR SOP-C.4	
UFTR SOP-D.1	
UFTR SOP-D.2	
UFTR SOP-D.3	
UFTR SOP-D.4	
UFTR SOP-D.5	
UFTR SOP-D.6	
UFTR SOP-E.1	
UFTR SOP-E.2	
UFTR SOP-E.3	
UFTR SOP-E.4	
UFTR SOP-E.6	
UFTR SOP-E.7	
UFTR SOP-E.8	

UFTR FORM SOP-0.1C

REVIEW STANDARD(continued)

Procedure/Designation	Revision Number/TCN Numbers
UFTR SOP-F.1	
UFTR SOP-F.2	
UFTR SOP-F.3	
UFTR SOP-F.4	
UFTR SOP-F.5	
UFTR SOP-F.6	
UFTR SOP-F.7	
UFTR SOP-F.8	

3. Technical Specifications/ Amendments

Technical Specifications/Amendments	Affected Page Numbers
Reissued Tech Specs (8/82)	
Amendment 14	
Amendment 15	
Amendment 16	
Amendment 17	

UFTR FORM SC . -0.1D

LOCATION LIST FOR CONTROLLED AND INFORMATION
COPIES OF UFTR OPERATING DOCUMENTS MANUALS

LOCATION LIST FOR MANUALS OF CONTROLLED COPIES:

1. UFTR CONSOLE
2. FACILITY DIRECTOR'S OFFICE
3. TRAINING FILE
4. REACTOR MANAGER'S OFFICE
5. EMERGENCY SUPPORT CENTER, ROOM 108 NSC
6. UFTR OPERATING STAFF OFFICE

CUSTODY LIST FOR MANUALS OF INFORMATION COPIES:

1. PROFESSOR JAMES S. TULENKO - NES CHAIRMAN; MEMBER, RSRS
2. DR. M.J. OHANIAN - CHAIRMAN, RSRS
3. DR. W. EMMETT BOLCH - MEMBER, RSRS
4. MR. DONALD MUNROE - RADIATION CONTROL OFFICER;
5. MR. DOUGLAS SIMPKINS SRO TRAINEE
6. MR. GEORGE FOGLE - RO
7. MR. RICK PICIULLO - SRO
8. MR. DANIEL CRONIN - SRO TRAINEE
9. UFTR OPERATING STAFF OFFICE - (RO TRAINEE)

UFTR OPERATING PROCEDURE 0.5

1.0 Quality Assurance Program

2.0 Approval

Reactor Safety Review Subcommittee . [signature] 8/29/91
Date

Director, Nuclear Facilities . . William G. Vernetson 8/29/91
Date

3.0 Purpose and Discussion

3.1 Purpose

3.1.1 Delineate requirements of the Quality Assurance program at the UFTR.

3.1.2 Delineate licensee responsibilities towards the Quality Assurance program at the UFTR.

3.2 Discussion

3.2.1 General description of Quality Assurance program of the UFTR.

3.2.1.1 Scope - the Quality Assurance program at the UFTR controls:

Note: Routine preventive maintenance or surveillances conducted in accordance with approved procedures are considered routine reactor operations, and are not intended to be governed by this procedure.

3.2.1.1.1 All replacements, modifications, or changes to systems having a nuclear safety related function;

3.2.1.1.2 Material procurement, material maintenance, and material use for systems having a nuclear safety related function;

3.2.1.1.3 Documentation and control of tests and procedures for systems having a nuclear safety related function

3.2.1.1.4 Documentation of Modifications

3.2.1.2 Applicability -

3.2.1.2.1 The Quality Assurance program applies to physical structures, systems, components whose intended functions are:

3.2.1.2.1.1 Prevention of accidents that could cause undue risk to the health of the public, or

3.2.1.2.1.2 Mitigation of the consequences of accidents that could cause undue risk to the health and safety of the public.

3.2.1.2.2 Specific equipment includes reactor safety and control system, reactor protection system and radiation monitoring systems.

3.2.1.2.3 This procedure is not intended to govern the requirements for Quality Assurance and control of activities that occurred prior to the inception of this program; however, it should be recognized that documentation and controls that occurred before the inception of this program meet the intent of the Quality Assurance program.

3.2.2 Licensee responsibilities

3.2.2.1 The primary responsibility of the UFTR administration is the establishment and implementation of this Quality Assurance program, including identification of:

3.2.2.1.1 Bounds of this Quality Assurance Program

3.2.2.1.2 Specific activities governed by this QA (Quality Assurance) procedure.

3.2.2.1.3 Organizations supporting this procedure and their functions.

3.2.2.1.4 QA functional organization

4.0 Precautions and Limitations

4.1 Routine preventive maintenance and surveillances conducted in accordance with approved procedures are considered routine reactor operations, and are not intended to be specifically governed by this procedure.

4.2 This procedure is not intended to govern the requirements for Quality Assurance and control of activities that occurred prior to the inception of this program; however, it should be recognized that documentation and controls that occurred before the inception of this program meet the intent of the Quality Assurance program.

5.0 References

5.1 UFTR Safety Analysis Report

5.2 UFTR Technical Specifications

5.3 UFTR Standard Operating Procedures

5.4 UFTR Emergency Plan

5.5 UFTR Physical Security Plan

5.6 UFTR Operator Training and Requalification Certification P.an

5.7 ANSI Standard N-402-1976, "Quality Assurance Program Requirements for Research Reactors".

6.0 Records Required

6.1 Operations Log

6.2 Maintenance Log

6.3 UFTR Form SOP-0.5A, "Material Control Documentation Index"

6.4 UFTR Form SOP-0.5B, "Procurement Document Package Coversheet"

6.5 UFTR Form SOP-0.5C, "Process Control Instruction Coversheet"

6.6 UFTR Form SOP-0.5D, "Special Test Control Coversheet"

6.7 UFTR Form SOP-0.5E, "Annual QA Audit Checklist"

6.8 UFTR Surveillance Data Sheets

7.0 Instructions

7.1 QA functional organization and responsibilities

7.1.1 QA Level 5 - Technical Staff Support (TSS)

7.1.1.1 Definition - Technical, engineering support such as Radiation Control Technicians, NES Staff Engineers, non-licensed UFTR staff, Physical Plant Engineers, etc.

7.1.1.2 Functions and responsibilities -

7.1.1.2.1 Identify needs and deficiencies and bring them to the attention of the Reactor Manager/Facility Director;

7.1.1.2.2 Propose solutions(or independently evaluate proposed solutions as directed by the Reactor Manager/Facility Director) within areas of expertise;

7.1.1.2.3 Perform maintenance, surveillances, or other QA functions under the supervision of or at the direction of a licensed UFTR operator;

Note: Areas of expertise are defined as the appropriate job classification or specialty.

7.1.2 QA Level 4 - (UFTR Reactor Operators)

7.1.2.1 Definition - Licensed Reactor Operator

7.1.2.2 Functions and responsibilities:

7.1.2.2.1 Identify needs and deficiencies and bring them to the attention of the Reactor Manager/Facility Director;

7.1.2.2.2 Propose solutions (or independently evaluate proposed solutions as directed by the Reactor Manager/Facility Director);

7.1.2.2.3 Perform maintenance, surveillances, or QA functions as authorized;

7.1.2.2.4 Authorize, supervise, direct QA activities of level 5 personnel;

Note: Areas of expertise include working knowledge of the SAR and standard operating procedures; operational characteristics of the UFTR, associated equipment, and interfacing systems; Title 10, Code of Federal Regulations; areas defined by the individual's experience.

7.1.3 QA Level 3 - (UFTR Supervisory Personnel)

7.1.3.1 Definition - Senior Reactor Operator

7.1.3.2 Functions and responsibilities:

7.1.3.2.1 Identify needs and deficiencies and bring them to the attention of the Reactor Manager/Facility Director;

7.1.3.2.2 Propose solutions (or independently evaluate proposed solutions as directed by the Reactor Manager/Facility Director);

7.1.3.2.3 Perform maintenance, surveillances, or QA functions in accordance with the requirements of SOP-0.2, SOP-0.3, or other applicable procedures;

7.1.3.2.4 Authorize, supervise, direct QA activities of Level 4 and 5 personnel.

7.1.4 QA Level 2 - (UFTR Administration)

7.1.4.1 Definition - Reactor Manager/Facility Director

7.1.4.2 Functions and responsibilities:

7.1.4.2.1 Identify needs and deficiencies;

7.1.4.2.2 Propose solutions (or independently evaluate proposed solutions);

7.1.4.2.3 Perform maintenance, surveillances, or QA functions in accordance with the requirements of SOP-0.2, SOP-0.3, or other applicable procedures;

7.1.4.2.4 Authorize, supervise, direct QA activities of Level 3, 4, 5 personnel

7.1.4.2.5 Indicate specific codes, standards, and regulations to be used or referenced in the QA action;

7.1.4.2.6 Evaluate results of QA action and convey results to the Reactor Safety Review Subcommittee.

7.1.5 QA Level 1 - (UFTR Upper Level Administration)

7.1.5.1 Definition - Reactor Safety Review Subcomittee

7.1.5.2 Functions and responsibilities:

7.1.5.2.1 Technical and Staff Support Function:

7.1.5.2.1.1 Perform functional evaluation of proposed actions;

7.1.5.2.1.2 Propose solutions

7.1.5.2.2 Review and Audit Function:

7.1.5.2.2.1 Evaluate proposed actions to assure the action involves no unreviewed safety questions;

7.1.5.2.2.2 Ensure the proposed action has all requisite analysis and evaluation prior to performance;

7.1.5.2.2.3 Review the results of the action;

7.1.5.2.2.4 Review and audit the QA program.

7.2 QA Program functions and responsibilities

7.2.1 Quality Assurance Documentation

7.2.1.1 Design changes

7.2.1.1.1 Design changes will be controlled by QA procedure SOP-0.3 with attendant required documentation;

7.2.1.1.2 Evaluations and determinations of design changes relative to whether unreviewed safety questions are involved will be controlled by SOP-0.4.

7.3 Tests and Maintenance

7.3.1 Prior to commencing tests or maintenance governed by this procedure, the following documentation must be in place:

7.3.1.1 Procedure with an independent evaluation indicating that:

7.3.1.1.1 The procedure will accomplish its intended function;

7.3.1.1.2 The procedure complies with applicable codes, standards and regulations.

7.3.1.1.3 The procedure specifies acceptance tests and criteria that would indicate successful completion of the action;

7.3.1.2 An operations log entry and a maintenance log page initiated for any malfunction or failure.

7.3.2 Procedures that are Standard Operating Procedures do not require a Special Test Control Coversheet(UFTR Form SOP-0.5D); tests and maintenance procedures that have no control under Standard Operating Procedures and that do not represent unreviewed safety questions are required to have an evaluation as per UFTR Form SOP-0.5D, "Special Test Control Coversheet" contained in Appendix II.

7.3.3 The Reactor Manager (Level 2) will review the procedure and either

7.3.3.1 Reject the procedure,

7.3.3.2 Return the procedure to the originator for alterations or expanded detail, or

7.3.3.3 Perform a 10 CFR 50.59 Evaluation (and Determination as necessary) per UFTR SOP-0.4

7.3.4 The Facility Director (Level 2) will review the procedure and either

7.3.4.1 Reject the procedure, or

7.3.4.2 Return the procedure for further clarification or alteration, or

7.3.4.3 Perform a 10 CFR 50.59 Evaluation (and Determination as necessary) per UFTR SOP-0.4.

7.3.5 The RSRS (Level 1) will review the 10 CFR 50.59 Evaluation and Determination with the procedure,(per UFTR SOP-0.4) and

7.3.5.1 Accept the procedure as written,

7.3.5.2 Accept the procedure with revisions,

7.3.5.3 Return the procedure to the Facility Director for alteration, or

7.3.5.4 Reject the procedure on a specified basis.

7.3.6 When the procedure is approved for performance per UFTR SOP-0.4 QA Level 2 may assign the task to Level 2, Level 3 or Level 4 personnel via a Maintenance Log Page entry.

7.3.7 An entry in the daily operations log shall be made referencing the Maintenance Log Page.

7.3.7.1 When work commences,

7.3.7.2 As significant steps or results are accomplished, and

7.3.7.3 When the work is completed

7.3.8 When the work is completed and the results evaluated by Level 2 personnel, all specified documentation will be submitted to the RSRS for review, and the action will be considered completed when the proper information is entered in:

7.3.8.1 The maintenance log page, with all appropriate information appended, 7.3.8.2 If applicable, in the modifications file.

Note: Preventive Maintenance Surveillances performed in accordance with approved Standard Operating Procedures: 1) do not require a Maintenance Log entry; SOP-0.2 specifies those actions requiring a Maintenance Log entry; and 2) are not intended to be addressed by this procedure except in general QA controls, having already received the appropriate consideration and control action in SOP-0.2.

7.4 Material Controls

7.4.1 Material Procurement - documentation prepared by Level 2, 3, or 4

7.4.1.1 As the need is identified for specific material to be purchased or obtained, a Procurement Document Package will be generated detailing: 1) date; 2) storage location, and 3) a Material Control Code that indicates ultimate material use.

Note: The Material Control Code should be formatted as per the Material Procurement Document Abbreviations listed in Table I of Appendix I. A documentation index of Material Control Codes and order/billing dates are maintained using UFTR Form SOP-0.5A (Material Control Documentation Index). UFTR Form SOP-0.5B (Procurement Document Package Coversheet) should be used to control the various pieces of documentation required for procurement records.

7.4.1.1.1 For some materials, such as those manufactured in house or on campus, a general description of the material composition, quality, and processing or manufacturing may be sufficient.

7.4.1.1.2 For materials purchased from commercial sources, the package should contain

7.4.1.1.2.1 An attached or written catalog description plus pertinent operational and material specifications;

7.4.1.1.2.2 Copy of the University of Florida purchase order completed for the item(if a PO is used);

7.4.1.1.2.3 Justification for potential or possible usage;

7.4.1.1.2.4 As the material arrives, the package will be expanded to include the following:

7.4.1.1.2.4.1 Additional specifications, as available from packing, packaging material or personal communications with a vendor representative;

7.4.1.1.2.4.2 The material, on arrival, will be tagged or marked to bear the designation Month-Day-Year(material control code) to be placed with the package;

7.4.1.1.2.5 When the material is used, the purpose and location of the use will be indicated on the package in such a way that the capability exists of finding the material from the description alone.

7.4.2 Material Control - documentation prepared by Level 2, 3 or 4

7.4.2.1 Material obtained for a dedicated use that may suffer degradation outside of a controlled environment, such as electronic components, will be maintained in the Reactor Use Only locker or equivalent storage location.

7.4.2.2 Material in the Reactor Use Only locker will be maintained in a dust inhibiting container (such as plastic wrapping), and the container shall be marked as indicated in 7.4.1.1.2.5.

7.4.2.2.1 Material with a non-dedicated material control code shall have an indicated storage location marked on UFTR Form SOP-0.5B, and shall be maintained in a manner that will minimize potential for material degradation within reasonable limits

7.4.2.3 As material is used (or committed to use) in a system or component, a copy of the material procurement package will be placed in the appropriate file in the Equipment and Systems section in the reactor cell file cabinet.

7.5 Process Control - prepared by Level 1, 2, 3, 4 or 5

7.5.1 Applicable process control standards and instructions will be referenced in the procedure designed to accomplish the proposed action and shall be reviewed by Level 2 personnel as part of the Maintenance Log Page.

7.5.2 Applicable process control standards and instructions may be industrial standards, military standards, or procedures, instructions, checklists, checkpoints, inspection specifications either selected from sources external to the UFTR or generated in-house.

7.5.2.1 Applicable process control standards and instructions to be used at specific points in the work process shall be indicated in the work procedure.

7.5.2.2 Applicable process control standards and instructions generated in-house shall have at least two separate, independent reviews by persons cognizant and capable of performing a critical evaluation of the process control standards and instructions, as indicated by signature on the appropriate document

7.5.3 Process control standards/instructions should be maintained in a Process Control Instruction Notebook with a Process Control Instruction Coversheet (UFTR Form SOP-0.5C), maintained to assure each process control instruction is complete including review and approval by Level 5. UFTR Form SOP-0.5C is contained in Appendix II.

7.6 Test Control

7.6.1 The monthly report to the Reactor Safety Review Subcommittee shall contain entries delineating

7.6.1.1 Surveillances performed during the reporting month,

7.6.1.2 Surveillances postponed from the previous reporting period,

7.6.1.3 Surveillances due to be performed during the next reporting month

7.6.2 For the purposes of this Quality Assurance program, test will be classified as:

7.6.2.1 Technical Specification Surveillances,

7.6.2.1.1 For information purposes, an inventory of scheduled (required) UFTR surveillances, tests and checks with file folder designations(letter-number) is contained in Appendix IV for all regular surveillances performed on a quarterly or less often schedule.

7.6.2.1.2 The letter designations for required surveillances is Q(Quarterly), S(Semiannual), A(Annual), B(Biennial) and V(Five Years).

7.6.2.2 Other Commitments

7.6.2.2.1 Externally Generated Requirements(NRC, RSRS, etc).

7.6.2.2.2 Internally Generated Requirements(Reactor Manager memo, Good Practice, etc).

7.6.3 Test control procedures are classified according to the controlling document as follows:

7.6.3.1 Standard Operating Procedures (SOP)

7.6.3.1.1 Standard Operating Procedures represent integrated test procedures receiving RSRS approval;

NOTE: Routine preventive maintenance or surveillances conducted in accordance with approved procedures are considered routine reactor operations, and are not intended to be governed by this procedure, although it should be recognized that the Standard Operating Procedures fulfill all the requirements of the Quality Assurance program.

7.6.3.1.2 Standard Operating Procedures are maintained in the Standard Operating Procedures Manuals.

7.6.3.2 Auxiliary Operating Instructions

7.6.3.2.1 Auxiliary Operating Instructions are instructions for specific tasks, operations and tests considered to be routine and commonly performed but requiring specific documentation for:

7.6.3.2.1.1 Reference purposes.

7.6.3.2.1.2 Specific acceptable methods of task performance.

7.6.3.2.2 Auxiliary Operating Instructions are reviewed and approved by the Facility Director following an independent review by appropriate QA program personnel.

7.6.3.2.3 Auxiliary Operating Instructions are maintained in a notebook available to the operating staff.

7.6.3.3 Special Test Procedures

7.6.3.3.1 Special Test Procedures is a general term for procedures recorded and performed as part of Maintenance Log Pages, Radiation Work Permits, Special Facility Memoranda, etc.

7.6.3.3.2 Special Test Procedures not previously implemented shall have a 10 CFR 50.59 Evaluation and Determination made per SOP-0.4 made prior to implementation.

7.6.3.3.3 Special Test Procedures include guidance relative to:

7.6.3.3.3.1 Identification of items that are nuclear safety related,

7.6.3.3.3.2 Documentation of performance and performance evaluations (as applicable),

7.6.3.3.3.3 Specifications delineating;

7.6.3.3.3.3.1 Required test frequency,

7.6.3.3.3.3.2 Parameters required for successful comple.

7.6.3.3.3.3.3 Prerequisites, cautions and warnings.

7.6.3.3.4 All Special Test Procedures are maintained in appropriate files (special tests with limited applicability will be maintained with the controlling maintenance log page or RWP, special tests with general or repeated applicability will be maintained with the Auxiliary Operating Procedures) with attached Special Test Control Coversheet (UFTR Form SOP-0.5D) which is used to assure the Special Test Control Procedure is complete including proper review and approval to include appropriate QA Program personnel and the RSRS. UFTR Form SOP-0.5D is maintained in Appendix II.

7.6.3.4 Surveillance Data Sheets

7.6.3.4.1 Surveillance Data Sheets (SDS) are independent documents that are used to direct and record the performance of a specific surveillance or task.

7.6.3.4.2 Surveillance Data Sheets use previously approved or accepted methods to direct task performance, and provide an integrated consistent format for recording the data and/or performance of the tasks(s).

7.6.3.4.3 All current approved/accepted UFTR Surveillance Data Sheets are maintained in Appendix V.

7.7 Control of Measuring and Test Equipment

7.7.1 All required test equipment will be available.

7.7.2 All test equipment to be used in procedures governed by this program shall:

7.7.2.1 Be checked for operability and accuracy, in accordance with a method generated in-house - the method shall be documented as a procedure or instruction with at least two separate, independent reviews by persons cognizant and capable of performing a critical evaluation of the equipment, equipment use, and method of checking the accuracy and operability of the equipment as indicated by signature on the appropriate document, or

7.7.2.2 Be operationally checked against an independent source or device, or

7.7.2.3 Have a calibration performed at intervals specified or recommended by the manufacturer by methods specified or recommended by the manufacturer.

7.8 Audits

7.8.1 QA audits will be performed yearly by the RSRS at intervals not to exceed 15 months.

7.8.2 Documentation of the performance of the audit shall consist of the inclusion of the QA audit in the previously established audit format.

7.8.3 Audit procedure

7.8.3.1. The following areas shall be specifically examined by reviewing all required documentation for randomly selected QA action items:

7.8.3.1.1 Facility Operations to include

7.8.3.1.1.1 Tech Spec Surveillance Requirements

7.8.3.1.1.2 Documentation of Experiments

7.8.3.1.1.3 Health Physics Records

7.8.3.1.1.4 Fire Protection Records

7.8.3.1.1.5 Special Nuclear Material Records

7.8.3.1.1.6 Maintenance Records

7.8.3.1.1.7 Control of Modifications

7.8.3.1.1.8 Procurement Control Records

7.8.3.1.1.9 Material Control Records

7.8.3.1.1.10 Process Control Records

7.8.3.1.1.11 Special Test Control Records

7.8.3.1.1.12 Records for Control of Measuring and Test Equipment

7.8.3.1.1.13 Correspondence with and commitments to NRC

7.8.3.1.1.14 Normal Operations Records

7.8.3.1.1.15 Waste Shipment Records

7.8.3.1.1.16 Fuel Shipment/Receiving Records

7.8.3.1.2 Quality Assurance Program

7.8.3.1.2.1 Program Implementation

7.8.3.1.2.2 Document Control Records

7.8.3.1.2.3 Reactor Cell Housekeeping

7.8.3.1.3 Requalification Training Program Records

7.8.3.1.4 Facility Emergency Plan to include

7.8.3.1.4.1 Emergency Response Plan

7.8.3.1.4.2 Implementing Procedures

7.8.3.1.4.3 Records of Implementation

7.8.3.1.4.4 Results of Drills

7.8.3.1.4.5 Recommendations from Drills

7.8.3.1.5 Facility Security Plan to include

7.8.3.1.5.1 Physical Security Plan and Implementing Procedures

7.8.3.1.5.2 Physical Security Records

7.8.3.1.5.3 Safeguards-Type Records

7.8.3.1.5.4 Physical Security Event Records

7.8.3.1.5.5 Physical Security Logs

7.8.3.1.6 Safety Analysis Report Revisions

7.8.3.1.7 Response to previous audit findings

7.8.3.2 As each area is audited, the auditor should document the results; completion of the audit should be documented on UFTR Form SOP-0.5E with individual auditors signing the appropriate entry for the area audited.

APPENDIX I

MATERIAL CONTROL DOCUMENTATION

TABLE I

MATERIAL PROCUREMENT DOCUMENT ABBREVIATIONS

tandard material procurement abbreviations used to specify the material ontrol code may be formatted in three parts as follows:

FORMAT - (Designation for Type of Use, General Use Category, System for Intended Use)

pplicable abbreviations for the three parts of the format statement are efined below. Note that the abbreviations listed here are not considered to onstitute a complete list.

. DESIGNATION

D - Dedicated Use
ND - Non-Dedicated Use
C - Consumable

I. GENERAL USE

A. Dedicated/Non-Dedicated Codes:

PS - Power Supply	REL - Relay	BAT -Battery
AMP - Amplifier	DET - Detector	REC - Recorder
SW - Switch	COM - Component	WIR - Wiring

B. Consumable Codes:

R - Radiation Control Supplies	H - Hardware
L - Lab Supplies	P - Plumbing Supplies
J - Janitorial Supplies	E - Electrical Supplies
M - Machine Shop Supplies	O - Other (should be specified)

II. SYSTEM

PCS - Primary Coolant System	RMS - Radiation Monitoring System
SCS - Secondary Coolant System	TRS - Temperature Recorder System
STS - Shield Tank System	PRS - Pneumatic Rabbit System
RSS - Reactor Structure System	RPS - Reactor Protection System
RVS - Reactor Vent System	CBDS - Control Blade Drive System
ESC - Emergency Support Center	PSS - Physical Security System
FSS - Facility Security System	

BPI - Blade Position Indicator System
NI - SC 1 - Safety Channel 1, Nuclear Instrumentation
NI - LC - Nuclear Instrumentation (Linear Channel)
REC-LIC - Two Pen Recorder (Linear Channel)
REC-LOC - Two Pen Recorder (Log Channel)

UFTR FORM SOP-0.5A

Material Control Documentation Index

Date of Order/Billing Date	Material Control Code
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
19.	
20.	

UFTR FORM SOP-0.5B1

Procurement Document Package Coversheet

All blanks except IIIC should be completed prior to storage; indicate NA where non-applicable applies.

I. Item Designation

A. Material Control Code .... ____________

B. Description of Items(s) ... ____
____

C. Specifications

1. Required .... ____
____

2. Desired .... ____
____

D. Intended Use .... ____
____

II. Order Information

A. Purchase Order Number .... ____________
B. Catalog Information .... ____________
C. Packing List .... ____________
D. Vendor Communications .... ____________
E. Estimated/Actual Cost .... ____________
F. Previous Supply Parameters ______/______
1. Purchase Date .... ____________
2. Previous Cost .... ____________
3. Previous Quantity Ordered .... ____________
4. Previous/Alternate Supplier .... ______/______

III. Controls After Receipt

A. Acceptability .... ____________
B. Storage Requirements
1. Location .... ____________
2. Environmental Controls .... ____________
C. Date of Use/Removal From Inventory .... ____________

Originator	Date	RM/FD Review/Approval	Date

UFTR Form SOP-0.5B2

University of Florida Nuclear Engineering Sciences Department Material Transfer Form

All blanks except IIIC should be completed prior to storage; indicate NA where non-applicable applies.

I. Item Designation

A. Material Control Code .... ________

B. Description of Item(s) .... ________________________________

C. Specifications ________________________________

1. Required .... ________________________________

2. Desired .... ________________________________

____

____

D. Intended Use .... ________________________________

II. Transfer Information ________________________________

A. Visual Inspection/Material Condition .... ________________

B. Functional Check:

1. Test Equipment Type/Identification .... ________________

2. Test Method .... ________________

3. Results .... ________________

C. Transfer: ________________

1. Transferred By .... ________________

2. Received By .... ________________

D. Comments: ____

III. Controls After Receipt

A. Acceptability .... ________________

B. Storage Requirements

1. Transferred By .... ________________

2. Received By .... ________________

C. Date of Use/Removal From Inventory .... ________________

Note: This form may be used for procurement documentation from other sources within the University of Florida when purchase orders, packing lists and other documentation may not be available.

________	________	________	________
Originator	Date	RM/FD Review/Approval	Date

APPENDIX II

PROCESS AND TEST CONTROL COVERSHEETS

UFTR Form SOP-0.5C

Process Control Instruction Coversheet

One copy of this Process Control Instruction Coversheet and approved material is to be maintained in the Process Control Notebook.

I. Title/Designation of Process Control Instruction: ______________________

II. Purpose of Process Control Instruction: ______________________
____

III. Origin of Process Control Instructions: ______________________

A. Type of Source (Check one).

1. Equipment Manufacturer .... ______________________
2. System Manufacturer .... ______________________
3. Industrial Standard .... ______________________
4. Military Standard .... ______________________
5. Generated In-House .... ______________________

B. Type of Instruction (Check One)

1. Material Included as Copied From Reference .... ______
2. Material Included as written .... ______
3. Manual Pages Included .... ______

IV. Evaluation of Process Control Instruction

A. Applicability of Process: ______________________
____

B. Evaluation and Comments: ______________________
____

V. Process Control Instruction Review and Approval

A. Level 5 or above

______________________ ______________
Originator Review/Approval Date

B. Level 2

______________________ ______________
Rx Mgr/Fac Dir Review/Approval Date

UFTR Form SOP-0.5D

Special Test Control Coversheet

I. Title/Designation of Test Procedure: ______________________

II. Reason for Generating Test Procedure: ______________________
____
____

Note: If test procedure is generated due to a failure, the occurrence of failure must be recorded in the daily operations log.

III. Results of Unreviewed Safety Question Evaluation (UFTR Forms SOP-0.4 and Form SOP-0.4B): . . ______ ____________

IV. Test Procedure Evaluation Categories:

A. Functional Evaluation
B. Compliance With Codes, Standards and Regulations
C. Specification of Acceptance Criteria

V. Test Procedure Review and Approval:

	Functional Evaluation	Compliance	Specification of Acceptance Crit.		
A.	________	________	________		
	________	________	________		
	________	________	________	________ Originator	____ Date
B.	________	________	________		
	________	________	________		
	________	________	________	________ Rx. Manager	____ Date
C.	________	________	________		
	________	________	________		
	________	________	________	________ Fac. Director	____ Date
D.	________	________	________		
	________	________	________		
	________	________	________	________ RSRS Chairman	____ Date

APPENDIX III

ANNUAL QA AUDIT CHECKLIST

Annual QA Audit Checklist

Audit Area	Date Performed	Auditor Signature
I. Facility Operations		
A. Surveillance Requirements		
1. Tech Spec(Q-1,Q-2,Q-4,Q-5,S-1,S-2, S-4,S-5,S-11, A-2, A-3, B-1, B-2,V-1)		
2. Other(S-8, S-9, A-1, B-3, B-4)		
B. Documentation of Experiments		
C. Health Physics Records		
1. Radiation Protection Weekly Surveys		
2. Dosimetry Records		
3. Swipe Logs		
4. RWP Notebook		
5. Sample Irradiation/Disposition Records		
6. Irradiated Material Transfer Records		
D. Fire Protection Records(Q-7)		
E. Special Nuclear Material Records		
1. Fuel Inventory Records(S-3)		
2. Fuel Access Records		
F. Maintenance Records		
G. Control of Modifications		
1. Unreviewed Safety Question Evaluations and Determinations (Form SOP-0.4A/0.4B))		
2. QA Document Checklist For Modification Packages (Form SOP-0.3A)		
H. Procurement Control Documents		
I. Material Control Documents		
J. Process Control Documents		
K. Special Test Control Documents		
L. Control of Measuring and Test Equipment Documents		
M. Correspondence/Commitments to NRC		
N. Normal Operations Records		
1. Daily Operations Logs		
2. Weekly/Daily Checkout Records		
O. Waste Shipment Records		
P. Fuel Shipment/Receiving Records		
II. Quality Assurance Program(SOP-0.5)		
A. Program Implementation		
B. Document Control Records		
C. Reactor Cell Housekeeping		
III. Requalification Training Program Records		
IV. Facility Emergency Plan		
A. Emergency Response Plan		
B. Implementing Procedures		
C. General Implementation(Q-6)(S-10)(Q-3)		
D. Drill Results		
E. Drill Recommendations		
V. Physical Security Plan(PSP)		
A. PSP Including Procedures		
B. Physical Security Records(S-6)(S-7)		
C. Safeguards-Type Records(Q-8)		
D. Security Event Records		
E. Physical Security Logs		
1. Entrance/Exit/Material Searches		
2. UPD Surveillances		
VI. Safety Analysis Report(Revisions)		
VII. Response to Previous Audit Findings		

Reactor Manager/Facility Director Review ________ Date ________

RSRS Review/Approval ________ Date ________

APPENDIX IV

INVENTORY LIST OF SCHEDULED UFTR SURVEILLANCE/TEST/CHECK DESIGNATIONS

UFTR SURVEILLANCE/TEST/CHECK DESIGNATIONS

Q-1 Quarterly Check of Scram Functions(SOP-0.5)
Q-2 Calibration Check of Area and Stack Radiation Monitors(SOP-0.5)
Q-3 Quarterly Radiological Emergency Evacuation Drill(SOP-0.5)
Q-4 Quarterly Radiological Survey of Unrestricted Areas(SOP-0.5)
Q-5 Quarterly Radiological Survey of Restricted Areas(SOP-0.5)
Q-6 Quarterly Check of Posting Requirements(SOP-0.5)
Q-7 Quarterly Check of UFTR Building Fire Alarm System(SOP-0.5)
Q-8 Quarterly Report of Safeguards Events(SOP-F.3)
Q-9 Quarterly Calibration Check of Air Particulate Detector(SOP-0.5)

S-1 Measurement of Control Blade Drop Times(SOP-0.5)
S-2 Annual Reactivity Measurements(Worth of Control Blades, Total Excess Reactivity Insertion Rate and Shutdown Margin)(SOP-A.7)
S-3 Semi-Annual Inventory of Special Nuclear Material(SOP-C.3)
S-4 Measurement of Argon-41 Stack Concentration(Includes Measurement of Dilution Air Flow-Rate - Previously A-2 Surveillance)(SOP-E.6)
S-5 Measurement of Control Blade Controlled Insertion Times(SOP-0.5)
S-6 UFTR Semi-Annual Security Plan Key Inventory(PSP)
S-7 Semi-Annual Check(Replacement) of Security System Batteries(PSP)
S-8 Semi-Annual Leak Check of Neutron Sources(SOP-0.5)
S-9 Semi-Annual Replacement of Well Pump Fuses(SOP-0.5)
S-10 Emergency Call List Check Form(SOP-0.5)
S-11 Semi-annual Replacement of Control Blade Clutch Current Light Bulbs(SOP-0.5)

A-1 Instrument and Test Equipment Calibration(SOP-0.5)
A-2 UFTR Nuclear Instrumentation Calibration Check and Calorimetric Heat Balance(SOP-E.4)
A-3 Annual Measurement of UFTR Temperature Coefficient of Reactivity(SOP-E.7)

B-1 Biennial Check to Assure Negative UFTR Void Coefficient of Reactivity(SOP-E.8)
B-2 Biennial Inspection of Incore Reactor Fuel Elements(SOP-0.5)
B-3 Biennial Evaluation of UFTR Standard Operating Procedures Manuals for Completeness(SOP-0.5)
B-4 Biennial Evaluation of UFTR Standard Operating Procedures(SOP-0.5)

V-1 Five Year Surveillance Inspection of Mechanical Integrity of Control Blade and Drive Systems(SOP-0.2)

APPENDIX V

INVENTORY OF APPROVED SURVEILLANCE DATA SHEETS

NOT CONTROLLED BY SEPARATE STANDARD OPERATING PROCEDURES

Q-1.... 4/84(TCN: 6/89, 10/89, 7/90, 7/91)
Q-2.... 9/85(TCN: 6/89, 5/90)
Q-3....12/83(TCN: 4/86, 5/87, 4/88, 7/91)
Q-4....10/82(TCN: 7/89, 10/89, 7/91)
Q-5....11/82(TCN: 7/89)
Q-6....02/87(TCN: 4/88, 10/89)
Q-7....10/89(TCN: 7/91)
Q-9.... 3/90

S-1.... 6/84(TCN: 7/91)
S-5.... 3/84
S-8....10/85
S-9.... 1/86(TCN: 3/86)
S-10...11/85(TCN:9/88, 10/89)
S-11... 2/86(TCN:10/88, 12/88)

A-1....10/89(TCN:3/91)

B-2... 1/86(TCN:3/88)
B-3... 2/87(TCN: 12/87, 12/88, 10/89, 7/91)
B-4.... 2/87(TCN: 12/88, 10/89, 6/91)

NOTE 1: Listings of Temporary Change Notices (TCNs) are for changes to the Surveillance Data Sheets since the last major revision of the Surveillance Data Sheet, not the last change to UFTR SOP-0.5.

NOTE 2: Surveillance Data Sheets as a group count as page 30 of UFTR SOP-0.5.

UFTR QUARTERLY #1 (Q-1)

SCRAM CHECKS

Date: ______________________ Date of Last Checks: ______________________

WARNING: When any of the following checks opens the Dump Valve or results in shutting off the Primary Coolant Pump, the Dump Valve will be opened (UFTR SOP A.4, Section 7.10.2), Primary Coolant Pump will be shut off, and the system permitted to completely drain (3 minutes) before proceeding further with these checks. This delay is to preclude breakage of the rupture disc.

A. Procedures and Results:

1. CORE VENT FAN power loss: Raise any blade about 40 units. Shut off Vent Fan for scram. Restart core vent fan. (scram)______

2. DILUTION FAN power loss: Insert scram check test adapter under Relay K-11. Use switch on adapter to bypass core vent fan scram by shunting contacts 6 and 7. Raise any blade about 40 units. Shut off Dilution Fan for scram. Restore Relay K-11 to normal. Restart Dilution Fan. (scram)______

NOTICE: For the primary coolant scram checks, jumper connections are made at the small terminal box accessible at the left of the console rear center panel after rear door has been removed.

> **CAUTION**
>
> Make and unmake connections in the order listed to minimize probability of electrical shorts, or shocks to personnel. Use the special short jumper leads. Replace terminal box cover upon completion of checks.

3. **PRIMARY COOLANT PUMP** power loss: Jumper TB 2-4 to TB 1-4 to bypass PC flow scram. Jumper TB 2-3 to TB 1-3 to bypass PC low level scram. Raise any blade about 40 units. Shut off PC Pump for scram. Cycle console power-on switch to open dump valve to permit system to drain. Remove jumper connecting TB 1-3 to TB 2-3. Leave jumper connecting TB 2-4 to TB 1-4 in place. (scram)______

4. **PRIMARY COOLANT LEVEL** loss: Insert test adapter under relay K-8. Shunt contacts 6 and 7 to bypass PC pump scram. Raise any blade about 40 units. Shut off PC pump to initiate scram. Cycle console power-on switch to open dump valve and permit system to drain. Remove jumper TB 1-4 to TB 2-4. Leave test adapter in place. (scram)______

5. **PRIMARY COOLANT FLOW** loss (inlet line sensor): Jumper TB 12-2 to TB 1-4 to bypass return line flow scram. Jumper TB 2-3 to TB 1-3 to bypass primary coolant low level scram. Raise any blade about 40 units. Raise red primary coolant flow scram set point on console PC Flow Meter to flow point for scram. Restore flow scram set point to correct setting (30 gpm). Remove jumper TB 1-4 to TB 12-2. Leave jumper TB2-3 to TB 1-3 in place. Leave test adapter in place. (scram)______

PRIMARY COOLANT FLOW loss (return line sensor): Jumper TB 12-2 to TB 12-1 to bypass fill line flow scram. Raise any blade about 40 units. Shut off PC pump for scram which occurs in about 40 seconds, when return line has drained. Open the dump valve by cycling console power-on switch. Remove all jumpers and restore relay K-8 to normal. (scram)______

(time in seconds)______

6. **NEUTRON CHAMBER HIGH VOLTAGE REDUCTION:**

   a. 10% Drop in Neutron Chamber High Voltage (W/R Drawer):

   Raise any 2 blades about 40 units. Pull W/R Drawer forward about 12 inches and depress W/R Drawer High Voltage Test Switch for scram and water drop. Depress PC Pump switch. Re-insert W/R Drawer. (water dump and scram)______

   b. **10% Drop in Neutron Chamber High Voltage (Safety Channel #2):**

   Open right rear console door. Raise any 2 blades about 40 units. Reach over rear swinging panel and depress Safety Channel #2 High Voltage Switch for scram and water drop. Restore rear panel. Depress PC Pump switch. (water dump and scram)______

7. **SHIELD TANK LOW WATER LEVEL:**

   a. Remove hooks from crane sling. Attach sling to lifting lugs on shield tank shield block by using the shackles. Remove shield block and place on southeast corner of concrete reactor structure (should not rest on the steel bridge). Remove shield tank aluminum cover.

   b. Raise any control blade about 40 units. Mark water level on switch body as a reference. Loosen clamp (7/16" wrench is required) and slowly raise assembly out of the water. Check that water level on switch body at scram corresponds to level on detector. (scram)______

   c. Restore switch to normal.

   NOTE: Check water level at this time and make up demineralized water if needed. Enter start time of water makeup and total amount added into operating log under <u>Comments</u> in Section D.

CAUTION

Do not overfill tank. One inch of water equals 14.7 gallons of water, and at 1 gpm, takes 14.7 minutes. Enter stop time of water makeup into operating log when water makeup is completed.

8. CONTROL CONSOLE ELECTRICAL POWER loss:

   a. Raise all control blades about 40 units. Turn off console power by depressing the console power (power-on) green lighted switch. Restore power and verify that reactor is in scram condition (all scram lights illuminated), and that all control blades are at bottom limits.

   b. Restore Power (all rods on the bottom). (water dump and scram) ________

B. Completion of Checkout and Restoring Reactor to Operatable Condition:

1. Replace aluminum cover on small terminal box .... ________
2. Replace all control console rear doors .... ________
3. Replace shield tank cover and shield block .... ________
4. Record quantity of water added to shield tank in Section D.

   comments... ... ________

5. Perform temperature monitoring panel checks per commitment to NRC from Final 14 Day Report dated March 31, 1989 and concerning Trip on High PC Temperature Due to Monitoring System Failure:

   a. Inspect Temperature monitoring panel contactors (upper and lower) and slidewire .... ________

   b. Clean and/or replace as necessary .... ________

C. Non-Reactor Trip Checks

1. Check to assure the source interlock initiates at $\geq$ 2 cps (2 cps expected).. (cps)________
2. Check level at which extended range light goes out and assure it goes out at less than 500 cps (400 cps expected, 600 required) .... (cps)________

D. Comments: (reference applicable section for all comments):

____

____

____

____

Performed by	Date	Acknowledged/Reactor Manager	Date

UFTR QUARTERLY #2 (Q-2)

Area and Stack Monitor Calibration Check

Date: ____________________ Date of last check: ____________________

Source Isotope ______________________________

Serial Number ______________________________

Activity ______________________________

Procedure: Calculate the distance from the center of the source to the center of the detector for radiation fields of 1 mr/hr, 2.5 mr/hr, 10 mr/hr and 25 mr/hr. Note that calibration adjustments require a maintenance log page and Reactor Manager authorization.

Set trip #2 alarm set point at 2.5 mr/hr and trip #1 alarm set point at 10 mr/hr. (These settings are conservative relative to trip settings allowed in UFTR Tech Specs, Table 3.3)

Determine source positions for 100 cps and 40.0 cps on stack monitor and verify source placements yield proper count rate. (These settings are conservative relative to trip settings allowed in UFTR Technical Specifications, Table 3.3)

Set stack count rate high level alarm at 4000 cps.

References: Gulf General Atomic Radiation Monitoring System Manual
Radiation Control Techniques Including RCT #37.
UFTR Tech Specs: Section 3.4.1, Table 3.3 and
Section 4.2.4 Paragraph (1).

RESULTS FOR AREA RADIATION MONITORS

Distance (Horizontal)	Expected Reading	East Detector	North Detector	South Detector
______	1.0 mr/hr	______	______	______
______	2.5 mr/hr	______	______	______
______	10.0 mr/hr	______	______	______
______	25.0 mr/hr	______	______	______

RESULTS FOR STACK RADIATION MONITOR

Expected Result	Stack Reading
______	______
______	______

Performed By ______ Date ______ Acknowledgement Rx Mgr/Fac Dir ______ Date ______

UFTR QUARTERLY 3 (Q-3)
QUARTERLY EVACUATION DRILL RECORD

DATE: ______ ________ DATE OF LAST DRILL: ____________ TIME: ________

DRILL INITIATOR: ______________________________

DETAILS OF SIMULATED EMERGENCY (SEE DRILL SCENARIO FILE CARD): ______

MAJOR ACTIONS OF KEY PERSONNEL IN EVALUATING AND REDUCING SIMULATED EMERGENCY:
(NOTE: LOG OF DRILL EVENTS IS ATTACHMENT I)

RECOMMENDATIONS FOR IMPROVEMENT (SEE ATTACHMENT II FOR DETAILS):

POST-DRILL EMERGENCY KIT INSPECTION RESULTS (SEE SOP-B.1A APPENDIX II):

COMPLETED BY: ____________

CHECK OF OPERABILITY OF EMERGENCY EXITS:

UFTR REAR DOOR: ________ RADIO-CHEMISTRY LAB EMERGENCY DOOR: ________

CHECKED BY: ______________________________

REVIEWED: ________________ ACKNOWLEDGED: ________________

RADIATION CONTROL OFFICER — REACTOR MANAGER/FACILITY DIRECTOR

REFERENCES: SOP-B.1A TECHNICAL SPECIFICATIONS FOR UFTR, SECTION 4.2.6(3)

UFTR QUARTERLY 3 (Q-3)

QUARTERLY EVACUATION DRILL SCENARIO CARD

Date ______________________ Time: ______________

Stack Count Rate: ____________ Initiator: ____________

S C E N A R I O

____
Emergency Classification

____
William G. Vernetson

Q-3 QUARTERLY RADIOLOGICAL EMERGENCY DRILL
RECOMMENDATIONS TRACKING RECORD

Date of Drill Recommendation	Recommendation Description	Date of Resolution	Rx Mgr/Fac Dir Approval

Q-3 QUARTERLY RADIOLOGICAL EMERGENCY DRILL
RECOMMENDATIONS TRACKING RECORD (CONTINUED)

Date of Drill Recommendation	Recommendation Description	Date of Resolution	Rx Mgr/Fac Dir Approval

Q-4 SURVEILLANCE
UNRESTRICTED AREA INDOOR RADIATION SURVEY

Current Survey Date: ______________ UFTR Power Level: _________kW
Date of Last Survey: ______________
Survey Instruments: (A) ________________________ __________________
Make and Model Serial #
Surveyor(s): ____ ________
____

Radiation Levels (uR/hr @3' height)

	Building #				
Location	634	131	24	184	30
G-A					
G-B					
G-C					
1-A					
1-B					
1-C					
2-A					
2-B					
2-C					
3-A					
3-B					
3-C					
4-A					
4-B					
4-C					
5-A					
5-B					
5-C					

Are there any differences of greater than 50% in radiation levels between this survey and the last survey?____No___Yes, evaluation: ____
Are all radiation levels less than 2000 uR/hr?_____yes____no, explain: ____
(A negative response requires prompt remedial action and special response)

Q-4 SURVEILLANCE
UNRESTRICTED AREA OUTDOOR RADIATION SURVEY

Current Survey Date: ______________ UFTR Power Level: __________ kW

Date of Last Survey: ______ ______________

Survey Instruments: (A) __________________ __________________
Make and Model Serial #

Surveyor(s) ____

____

Location	Radiation Level (uR/hr @ 3' height)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

Are there differences of greater than 50% in radiation levels between this survey and the last survey?_____No_____Yes, evaluation: ____

Are all radiation levels less than 2000 uR/hr?_____Yes______No, explain ____

(A negative response requires prompt remedial action and special response)

Q-4 SURVEILLANCE
UNRESTRICTED AREA INDOOR RADIATION SURVEY
BUILDING 557-UFTR Building and Annex

Current Survey Date: ______________________ UFTR Power Level: _______ kW
Date of Last Survey: ______________________
Survey Instruments: (A) ________________________ ____________
(B) ________________________ ____________
Make and Model Serial #
Surveyor(s) ______________________________________
____

Radiation Level			
Location	Instrument A uR/hr	Instrument B mR/hr	Position
G-A			3 '
G-B			3 '
G-C			12 "
G-D			12 "
G-E			12 "
G-F			12 "
G-G			12 "
G-H			12 "
G-I			3 '
G-J			3 '
G-K			3 '
G-L			3 '
G-M			12 "
G-N			12 "
G-O			12 "
1-A			3 '
1-B			3 '
1-C			12 "
1-D			12 "

Q-4 SURVEILLANCE
UNRESTRICTED AREA INDOOR RADIATION SURVEY
Building 557 - UFTR Building and Annex
(continuation)

Location	Radiation Level		
	Instrument A uR/hr	Instrument B mR/hr	Position
1-E			3'
1-F			3'
1-G			3'
1-H			3'
1-I			3'
1-J			3'
1-K			3'
1-L			3'
1-M			3'
1-N			3'
1-O			3'

Are there differences of greater than 50% in radiation level between this survey and the last survey?____No ____Yes,
evaluation:____

Are radiation levels less than 2000 uR/hr?____Yes_____No,
explain____
(A negative response requires prompt remedial action and special response)

REVIEW AND ACKNOWLEDGMENT

______________________________ ______
RADIATION CONTROL OFFICER DATE

______________________________ ______
FACILITIES DIRECTOR DATE

Q-5 SURVEILLANCE
RESTRICTED AREA RADIATION SURVEY

Current Survey Date: ______________________ UFTR Power Level: _______kW
Date of Last Survey: ______________________
Survey Instrument(s) (A) ______________ ______________
(B) ______________ ______________
(C) ______________ ______________
Make and Model Serial #

Surveyor(s) ____
____

Survey Location	Radiation Levels (mR/hr or mrem/hr) A	B	C	Position
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

Are there differences of greater than 50% in radiation levels between this survey and the last survey?_____No____Yes, evaluation: ____
Are all areas properly posted? ______Yes______No, explain____
____

REVIEW AND ACKNOWLEDGEMENT

________________________________ __________
RADIATION CONTROL OFFICER DATE

________________________________ __________
FACILITIES DIRECTOR/Reactor Manager DATE

QUARTERLY CHECK OF POSTING REQUIREMENTS

Date: ____________________ Date of Last Check: ____________________

A. The following items are required to be posted in the Control Room:

_____ NRC Form-3 "Notice to Employees" (Revision 7/91 or later)
_____ Notice Describing 10 CFR Part 19, 10 CFR Part 20, the UFTR Licensing Documents, and the Operating Procedures Applicable to Licensed Activities, and stating where they may be examined to include:

a. 10 CFR 19, "Notices, Instructions and Reports to Workers; Inspections."
b. 10 CFR 20, "Standards for Protection Against Radiation".
c. UFTR License With Amendments.
d. Environmental Impact Appraisal.
e. Safety Analysis Report
f. Technical Specifications.
g. Safety Evaluation Report (NUREG-0913)
h. Emergency Plan
i. Standard Operating Procedures.

_____ Any Notice of Violation Involving Radiological Working Conditions, Proposed Imposition of Civil Penalty, or Order Issued Pursuant to Subpart B of 10 CFR Part 2, and any Response from the Licensee.
_____ Call List #2, "Important UFTR-Related Telephone Numbers for Problem Resolution" (Check For Current Copy).
_____ Current Operator Licenses for all Operators.
_____ Limits on Energy Production for Argon-41 Effluent.
_____ Safety rules for a Radioisotope Laboratory (Form RC-4).
_____ State of Florida Notice on Standards for Worker Protection (HRS Form 1081).

B. The following items are required to be posted outside the Control Room:

_____ NRC Form-3 "Notice to Employees" (Revision 7/91 or later).
_____ Notice Describing 10 CFR Part 19, 10 CFR Park 20, the UFTR Licensing Documents, and the Operating Procedures Applicable to Licensed Activities, and stating where they may be examined to include:

a. 10 CFR 19, "Notices, Instructions and Reports to Workers: Inspections."
b. 10 CFR 20, "Standards for Protection Against Radiation".
c. UFTR License With Amendments.
d. Environmental Impact Appraisal.
e. Safety Analysis Report.
f. Technical Specifications.
g. Safety Evaluation Report (NUREG-0913)
h. Emergency Plan
i. Standard Operating Procedures.

_____ Any Notice of Violation Involving radiological Working Conditions, proposed Imposition of Civil Penalty, or Order Issued Pursuant to Subpart B of 10 CFR Part 2, and any Response from the Licensee.

_____ Call List #1, "Initiation of Radiological Emergency - Reactor Emergency or Facility Emergency".(Check for Current Copy).

_____ Call List #2, "Important UFTR-Related Telephone Numbers for Problem Resolution" (Check for Current Copy).

C. Comments/Deficiencies: ____
____
____

Q-7

QUARTERLY CHECK OF UFTR

FIRE ALARM SYSTEM

The fire alarm system for reactor Building #557 has four(4) individually monitored zones as follows:

1. Zone 1 - UFTR Reactor Cell, and Control Room
2. Zone 2 - Stairs Offices and Laboratories
3. Zone 3 - Upstairs Offices and Laboratories and
4. Zone 4 - Reactor Annex and Materials Science Annex Upstairs and Downstairs

A quarterly check should be conducted for a different one of these four(4) zones, once per year to assure the entire system is checked annually. One zone should be checked each quarter at intervals not to exceed four(4) months.

The quarterly check will consist of the following steps, normally performed by physical plant personnel with observation and assistance by reactor operations staff as necessary:

1. Select the zone to be tested.
2. Clean and examine the main panel and battery outside 108 NSC.
3. Verify local alarm activation and assure transmission of alarm signal to the monitoring system.
4. Operate all manual fire alarm pull boxes in the selected zone.
5. Check all smoke detectors operating in the selected zone using an approved smoke detector tester.
6. Check and determine that all fire alarm horns are in working order in the selected zone.
7. Examine and clean ionization, smoke and thermal detectors in the selected zone.

When a quarterly check is successfully completed, the Q-7 Quarterly Check of Fire Alarm System form should be completed by the applicable personnel performing the check and associated test, the operations staff member observing and assisting with the checks to include a general evaluation of results and any comments and then transmitted to the Reactor Manager or Facility Director for acknowledgement and further action as may be warranted.

Q-7

QUARTERLY CHECK OF UFTR

FIRE ALARM SYSTEM

his Q-7 Surveillance Data Sheet or equivalent should be used to ocument performance of the Quarterly Check of the UFTR Fire Alarm ystem to include those checks and tests on the overall system that hould be performed quarterly.

ate: ____________ Date of Last Check: ____________

ones Tested Previously During This year: ____________

one Selected For the Current Quarterly Check: ____________

teps Performed For the Quarterly Check and Test in the selected Zone re as follows:

a. Clean and examine the main system panel and battery outside Room 108 NSC .... ________

b. Verify local alarm activation and assure transmission of alarm signal to monitoring system .... ________

c. Operate all manual fire alarm pull boxes .... ________

d. Check operation of all smoke detectors using an approved smoke detector tester .... ________

e. Check and determine that all fire alarm horns are in working order .... ________

f. Examine and clean ionization, smoke and thermal detectors .... ________

sults and comments: ____________

____

____

commendations: ____________

____

____________ ____________ ____________

rformed By/Date Observed By/Date Rx Mgr./Fac.Dir.Acknowledgement/Date

UFTR Quarterly #9 (Q-9)

QUARTERLY CALIBRATION CHECK OF AIR PARTICULATE DETECTOR

Date Calibrated	Calibrated By	Date Next Due	Results (SAT/SAT with Adjustments)	Calibration Record Attached (Initial and Date)

UFTR SURVEILLANCE #10 (Q-10)

QUARTERLY AIR HANDLER CONDENSATE CHECK FOR CONTAMINATION

Date of Sample Collection: ________ Date of Last Sample Collection: ___

Sample Collector (Name/Signature): ________________________________

1. Sample Description: ________________________________
   Date Sample Collected: ____________ Counting Device Used: ____________
   Date Sample Counted: ____________ Instrument Efficiency: ____________
   Sample Volume (ml): ____________ Isotope(s) Analyzed: ____________
   Background Count Time: (min) _____ Sample Count Time: (min) _______
   Background Count Rate: (cpm) _____ Sample Count Rate: (cpm) _______

   NET COUNT RATE: ________________________________ cpm
   SAMPLE ACTIVITY: ______________ ± ______________ uCi/ml
   LOWER LIMIT OF DETECTION: ________________________ uCi/ml
   REPORTED SAMPLE ACTIVITY: ________________________ uCi/ml
   SAMPLE ANALYZER (Name/Signature): ____________ / ____________

2. Sample Description: ________________________________
   Date Sample Collected: ____________ Counting Device Used: ____________
   Date Sample Counted: ____________ Instrument Efficiency: ____________
   Sample Volume (ml): ____________ Isotope(s) Analyzed: ____________
   Background Count Time: (min) _____ Sample Count Time: (min) _______
   Background Count Rate: (cpm) _____ Sample Count Rate: (cpm) _______

   NET COUNT RATE: ________________________________ cpm
   SAMPLE ACTIVITY: ______________ ± ______________ uCi/ml
   LOWER LIMIT OF DETECTION: ________________________ uCi/ml
   REPORTED SAMPLE ACTIVITY: ________________________ uCi/ml
   SAMPLE ANALYZER (Name/Signature): ____________ / ____________

3. Sample Description: ________________________________
   Date Sample Collected: ____________ Counting Device Used: ____________
   Date Sample Counted: ____________ Instrument Efficiency: ____________
   Sample Volume (ml): ____________ Isotope(s) Analyzed: ____________
   Background Count Time: (min) _____ Sample Count Time: (min) _______
   Background Count Rate: (cpm) _____ Sample Count Rate: (cpm) _______

   NET COUNT RATE: ________________________________ cpm
   SAMPLE ACTIVITY: ______________ ± ______________ uCi/ml
   LOWER LIMIT OF DETECTION: ________________________ uCi/ml
   REPORTED SAMPLE ACTIVITY: ________________________ uCi/ml
   SAMPLE ANALYZER (Name/Signature): ____________ / ____________

EVIEW AND ACKNOWLEDGEMENT

______________________ ________ ______________________________ ____
adiation Control Officer Date Reactor Manager/Facility Director Da

UFTR SEMIANNUAL #1 (S-1)

Blade Drop Time Checks

Date: ____________________ Date of last check: ____________________

Procedure:

1. Set up dual channel Strip Chart Recorder atop reactor console with controls facing to the rear. Place recorder power switch in the "off" position, and connect the power cord into a source of 120 vac.

   Note: Do not attempt to set up or operate recorder (or amplifier) without being familiarized with the equipment's operating instructions.

2. Set chart speed on the fastest possible setting.

3. Set each strip chart on "2 volts per chart line."

4. Using fabricated junction box with its attached test cable and leads, make the following connections:

   a. Connetions made by mating small flat 3 prong plug to socket.

   b. Connect left red and black banana plug pair to channel one input with red to input #2 and black to input #1.

   c. Connect right red and black banana plug pair to channel two input with red to input #2 and black to input #1

   d. Remove appropriate rod drive cable plug either J-7 (Regulating Blade), J-8 (Safety 3), J-9 (Safety 2), or J-10(Safety 1). Insert test plug into the now opened jack, and insert the rod drive cable plug into the jack on the test box.

5. Perform a satisfactory daily pre-operational check as per UFTR SOP-A.1 (Pre-operational Checks) Part IIb - DAILY CHECK LIST if not previously completed this day ....Satisfactory Checks

   ____________________.
   R.O. Initial

6. Raise selected control blade to its upper limit.

7. Start recorder. When the chart paper is running, drop the control blade and stop the recorder.

UFTR SEMIANNUAL #1 (S-1)

Blade Drop Time Checks(continued)

8. Repeat steps 4d, 6, and 7 until remaining blades are taken through the procedure.

9. Determine blade drop time:

   Count the number of cycles between the upper and lower limits of blade travel from the recorder chart paper. Divide the number of cycles by 60 cycles per second to compute blade drop time.

References: UFTR TECHNICAL SPECIFICATIONS,
Strip Chart Recorder Technical Manual

Results:

	Upper Blade Position	Lower Blade Position	Drop Time (Seconds)
Safety #1	________	________	________
Safety #2	________	________	________
Safety #3	________	________	________
Reg. Blade	________	________	________

Comments: ____

____

____

____

____

____

____

____

Performed by: ____________ Acknowledged: ________________ ______
Rx Mgr/Fac Dir Date

UFTR SEMIANNUAL #5 (S-5)

BLADE CONTROLLED INSERTION TIME CHECKS

Date: ______________________ Date of Last Check: ______________________

As part of the UFTR Technical Specifications under Section 4.2.2 Reactor Control and Safety System Surveillance, Paragraph (2) requires that control blade full controlled insertion time shall be measured semiannually, at intervals not to exceed 8 months. The procedure is as follows:

1. Perform a satisfactory daily pre-operational check as per UFTR SOP-A.1 (Pre-operational Checks) Part 7.2 - DAILY CHECKLIST if not previously completed this day. . . . . Satisfactory Checks ____________.
   R. O. Initials

2. Raise the selected control blade to its upper (full out) limit.

3. Drive the raised blade from its top (full out) position to its bottom (full in) position where the bottom light illuminates, interrupting the down drive while timing the entry using the digital timer available.

4. Repeat Step 3 for each of the three remaining blades.

5. Record data and results in the following table:

	Upper Blade Position	Lower Blade Position	Controlled Insertion Time (Minutes)	Controlled Insertion Time (Seconds)
Safety #1				
Safety #2				
Safety #3				
Reg. Blade				

______________________ Performed By   ________ Date   ______________________ Acknowledged - Reactor Manager   ________ Date

SEMI-ANNUAL LEAK CHECK OF NEUTRON SOURCES

I. Leak Check of Pu-Be Source

Date Last Performed: ______________ Date of This Check: ______________

Results of Check: ____

____

____

____

____

Performed By: __________________________ __________________________
Name Signature

II. Leak Check of Sb-Be Source

Date Last Performed: ______________ Date of This Check: ______________

Results of Check: ____

____

____

____

____

III. Performed By: __________________________ __________________________
Name Signature

____ ______________
Reactor Manager/Facility Director Acknowledgement Date

SEMIANNUAL REPLACEMENT OF DEEP WELL SECONDARY PUMP FUSES

Note: All three well pump fuses located in a box on the outside East wall of the building (behind the podocarpus bush) should be replaced with equivalent 250 volt/60 amp rated fuses. A record of such replacements should be recorded on this continuing form and on the control room status board.

Date	Fuses Replaced By	Manufacturer and Model/ Type/Class Number Designation of Replacement Fuses	RM/FD Acknowledgement

EMERGENCY CALL LIST CHECK FORM

Date: ______________ Date of Last Check: ______________

A semi-annual check (conducted as required by the Emergency Plan and as preparation for the Annual Drill) is required to ensure that the UFTR Emergency Call Lists are updated and posted to reflect the current personnel situation. One of these checks should be completed within 60 days prior to the annual drill involving interactions with outside agencies. This form properly completed, signed, dated and acknowledged along with applicable Call Lists is the official record that this semi-annual check has been conducted.

Call List 1 (See Attachment 1) **Call List 1 Date:** __________

_____UFTR SOP Manual (Console Copy)

_____Emergency response Center (Room 108 NSC)

_____Emergency Response Auxiliary Supply Room (Room 106 NSC)

_____Radio-Chem Lab (near the phone outside the NAA Lab)

Call List 2 (See Attachment 2) **Call List 2 Date:** __________

_____UFTR SOP Manual (Console Copy)

_____Bulletin Board Outside Control Room

_____UFTR Control Room

_____Emergency Response Center (Room 108 NSC)

_____Emergency Response Auxiliary Supply Room (Room 106) NSC)

Call List 3 (See Attachment 3) **Call list 3 Date:** __________

_____Upstairs door connecting the Reactor Building to the NSC

_____Downstairs door connecting the Reactor Building to the NSC

_____Security controlled door downstairs accessing the buffer area

_____Security controlled door upstairs accessing the buffer area

Comments/Deficiencies: ____

____

Performed By:	Date	RX Mgr./Facility Director Acknowledgement	Date

REPLACEMENT OF CONTROL BLADE CLUTCH CURRENT LIGHT BULBS

Discussion

To prevent failure of control blade clutch current light bulbs during reactor operations and resultant dropping of a control blade as a partial trip, all control blade clutch current light bulbs shall be replaced semi-annually at intervals not to exceed 8 months as per the June 23, 1988 commitment to the NRC relative to the June 10, 1988 bulb failure. This replacement is considered major maintenance since the bulbs are part of the reactor control system. This major maintenance is controlled as a surveillance (S-11).

Instructions

1. Record date of last replacement.................................... ______________
2. Record the S-11 replacement operation in the daily operations log.................................... ______________
3. Replace the S-1, S-2 and S-3 clutch current bulbs with UFTR Type A (385) or approved equivalent; Record bulb number.................................... ______________
4. Replace the Regulating Blade clutch current bulb with UFTR Type C (382) or approved equivalent; Record bulb number.................................... ______________
5. Check and record clutch (DC) voltage values for all blades (points 11 and 12 in terminal box under control blade drive units/in pedestals):

   a. S-1 __________ c. S-3 __________

   b. S-2 __________ d. RB __________

Items 6 - 9 require only the initials of the individual performing and attesting to the checks and that the results of the checks are acceptable.

6. Check blade drop times for all blades (see S-1 Instruction) ______________
7. Check controlled removal times for all blades (see UFTR SOP-A.1, Part I).................... ______________
8. Check controlled insertion times for all blades (see S-5 Instructions).................... ______________
9. Indicate satisfactory completion of S-11 surveillance in the Daily Operations Log and on the Status Board....... ______________

Performed By	Date	RM/FD Acknowledgement	Date

INSTRUMENT AND TEST EQUIPMENT CALIBRATION

One analog multimeter (Simpson 260 or equivalent) and one digital multimeter used to support maintenance and surveillance testing at the UFTR should be calibrated on an annual basis.

Multimeters can be calibrated at:

EIL Instruments
1914 Canova St., S.E.
Palm Bay, FL 32909

407-725-8300

Letters of transmittal and calibration certifications should be attached to this form for each instrument calibrat i to provide documentation of the calibration.

Calibration Record

Entry No.	Type of Instrument	Model	Serial No.	Date Shipped	Date Returned	Calibration Due

BIENNIAL INSPECTION OF INCORE REACTOR FUEL ELEMENTS

DATE: ______________________ DATE OF LAST CHECK: ____________________

In performing the incore inspection of reactor fuel elements, the provisions of UFTR SOP-C.1, "Irradiated Fuel Handling" must be followed. If more than two bundles are inspected, additional numbered copies of this form should be used.

1. Fuel Bundle Inspected:

   Number/Time.............................. ____________________
   Designation.............................. ____________________
   Location................................. ____________________

   Comments: ____

   ____

   ____

   ____

   ____

   Inspectors: ____
   (SRO in Charge): ____
   (Others): ____

2. Fuel Bundle Inspected: ____

   Number/Time.............................. ____________________
   Designation.............................. ____________________
   Location................................. ____________________

   Comments: ____

   ____

   ____

   ____

   ____

   Inspectors: ____
   (SRO in Charge): ____
   (Others): ____

____________________________ __________
RM/FD Review and Approval Date

UFTR BIENNIAL SURVEILLANCE #3 (B-3)

BIENNIAL REVIEW OF STANDARD OPERATING PROCEDURE MANUALS FOR COMPLETENESS

This B-3 Surveillance Data Sheet is used to document the biennial check of all Standard Operating Procedure Manuals to assure that all are complete and contain the latest changes. This surveillance requires a current UFTR Form SOP-0.1C (Review Standard) to be completed to list the latest approved Revisions and Temporary Change Notices for all applicable SOPs. Individual Copy Holders/ locations are supplied with the completed Review Standard and are responsible to complete this surveillance using the Table in Part III to record missing items in a timely manner with the option to supply manuals to the UFTR staff for completion of the surveillance if desired.

PART I: CHECKLIST

Date: ____________________ Date of Last Check: ____________________

A. Verify Availability of a Completed Review Standard .... ________

B. Transmit Completed Review Standard to all Copy Holders per the List of Copy Holders/Locations in Part II .... ________

C. Transmit a Copy of the Table of SOPs in Part III of this Surveillance for Completion by Copy Holders and Record Date of Transmission .... ________

D. For all Controlled/Information Copies:

1. Enter Date of Return of Completed Part III Tabulation on Part II ...... ________

2. Record SOP Status on Part II .... ________

3. Assure all Missing Items are Provided and Reissue Review Standard and Table of SOPs in Part III as Needed (Note that holders of uncontrolled copies may supply the manual to UFTR Staff for completeness check) .... ________

4. Enter Date of Return of Completed Part III Tabulation and SOP Status on Part II .... ________

5. Repeat Steps 3 and 4 as Necessary .... ________

E. Assure Completion of Checklist in Part II .... ________

F. File All completed Part III Tabulations To Document Manual Check .... ________

____________________ __________ Check Performed By Date

____________________ __________ Rx Mgr/Fac Dir Acknowledgement Date

UFTR BIENNIAL SURVEILLANCE #3 (B-3)

PART II: RECORD OF MANUAL REVIEW

This record of manual review is to be completed by the UFTR Staff Person responsible for conducting the B-3 Surveillance.

Location List for Controlled Copies	Date Review Std. Issued	Date's Returned	SOP Status	Review Date	Return Date/ SOP Status
. UFTR Console					
. Facility Director's Office					
. Training File					
. Reactor Manager's Office					
. Emergency Support Center (108 NSC)					
. UFTR Operations Staff Office					

Custody List for Information Copies	Date Review Std. Issued	Date's Returned	SOP Status	Review Date	Return Date/ SOP Status
. Prof. J.S. Tulenko(NES Chairman)					
. Dr. M.J. Ohanian(Chairman,RSRS)					
. Dr. W.E. Bolch(Member,RSRS)					
. Mr. D.L. Munroe(Member,RSRS)					
. UFTR Operations Staff Office					
. UFTR Operations Staff Office					
. UFTR Operations Staff Office					
. UFTR Operations Staff Office					
. UFTR Operations Staff Office					

UFTR BIENNIAL SURVEILLANCE #3 (B-3)

PART III: TABULATION OF MISSING MATERIAL

This section should be used by each manual holder or staff member to list all missing items for the manual in question for transmission to the individual responsible for the B-3 Surveillance. Return to Room 105 UFTR Building.

Manual Identification: ____________________ Name of Holder: ____________

Comments: ____

MISSING ITEMS(PAGES, TCN'S, REVISIONS, ETC.)

SOP-0.1 ____________________	SOP-C.4 ____________________
SOP-0.2 ____________________	SOP-D.1 ____________________
SOP-0.3 ____________________	SOP-D.2 ____________________
SOP-0.4 ____________________	SOP-D.3 ____________________
SOP-0.5 ____________________	SOP-D.4 ____________________
SOP-0.6 ____________________	SOP-D.5 ____________________
SOP-0.7 ____________________	SOP-D.6 ____________________
SOP-0.8 ____________________	SOP-E.1 ____________________
SOP-A.1 ____________________	SOP-E.2 ____________________
SOP-A.2 ____________________	SOP-E.3 ____________________
SOP-A.3 ____________________	SOP-E.4 ____________________
SOP-A.4 ____________________	SOP-E.6 ____________________
SOP-A.5 ____________________	SOP-E.7 ____________________
SOP-A.6 ____________________	SOP-E.8 ____________________
SOP-A.7 ____________________	SOP-F.1 ____________________
SOP-A.8 ____________________	SOP-F.2 ____________________
SOP-B.1 ____________________	SOP-F.3 ____________________
SOP-B.2 ____________________	SOP-F.4 ____________________
SOP-B.4 ____________________	SOP-F.5 ____________________
SOP-C.1 ____________________	SOP-F.6 ____________________
SOP-C.2 ____________________	SOP-F.7 ____________________
SOP-C.3 ____________________	SOP-F.8 ____________________

NOTE: All F-Series Procedures are withheld from public disclosure and SOP Manuals except SOP-F.7 and SOP-F.8. In addition, SOP-B.3 and SOP-E.5 have been superceded and do not exist.

UFTR BIENNIAL SURVEILLANCE #4 (B-4)

BIENNIAL EVALUATION OF UFTR STANDARD OPERATING PROCEDURES

PART I: CHECKLIST

Date:______________________ Date of Last Evaluation:__________________

This B-4 Surveillance Data Sheet is used to document the biennial review of all UFTR Standard Operating Procedures to assure they are meeting the needs of the facility, especially for assuring safe operation. Part I is a checklist to be completed as the reviewer performs the evaluation. Completion of this evaluation could be expected to involve approximately two full years as SOPs are reviewed individually.

Part II is used to list recommended revisions and temporary change notices to correct, clarify, or otherwise change Standard Operating Procedures. Additions or deletions of entire SOPs may also be recommended in Part II. Recommendations for changes should be accompanied by a completed cover sheet (UFTR Form SOP-0.1A). Whenever additional space is needed, reference attachments.

A. Verify Usage of a Controlled Copy of UFTR SOP Manual.......... ________

B. Verify Completeness of Each Procedure (Prior to Review) by Checking Latest File Copy; Enter Revision and TCN Numbers on Part II.. ________

C. Verify Availability of UFTR Form SOP-0.1A (Cover Sheet/Change Request Form)........................... ________

D. Complete Review and Evaluation of Each UFTR SOP to Include Completion of UFTR Form SOP-0.1A as Necessary (record evaluations of each SOP by line entry on Part II)............. ________

E. List Proposed Titles on Part II of Any Additional SOPs Recommended for Consideration........................... ________

F. List Recommended Deletions of SOPs........................... ________

G. Transmit B-4 Surveillance Data Sheets to Reactor Manager or Facility Director for Completion of Last Column in Part II.... ________

H. Assure Reactor Manager or Facility Director has Supplied Comments/Recommendations in Column 4................. ________

NOTE: Items recommended for implementation in the last column should be prepared for review within 90 days of procedure review.

Evaluation Performed By	Date Completed	Rx Mgr/Fac Dir Acknowledgement	Date

UFTR BIENNIAL SURVEILLANCE #4 (B-4)

BIENNIAL EVALUATION OF UFTR STANDARD OPERATING PROCEDURES

PART II: RESULTS OF EVALUATION

ocedure ber	Latest REV/TCN	Reviewer and Date Completed	Recommended Changes (REV or TCN) (reference attmnts)	Rx Mgr/Fac Dir Recommendations (reference attmnt
-0.1				
-0.2				
-0.3				
-0.4				
-0.5				
-0.6				
-0.7				
-0.8				
-A.1				
-A.2				

UFTR BIENNIAL SURVEILLANCE #4 (B-4)

BIENNIAL EVALUATION OF UFTR STANDARD OPERATING PROCEDURES

PART II: RESULTS OF EVALUATION(continued)

ocedure mber	Latest REV/TCN	Reviewer and Date Completed	Recommended Changes (REV or TCN) (reference attmnts)	Rx Mgr/Fac Dir Recommendations (reference attmnts
P-A.3				
P-A.4				
P-A.5				
P-A.6				
P-A.7				
P-A.8				
P-B.1				
P-B.2				
P-B.4				
P-C.1				
P-C.2				
P-C.3				
P-C.4				

UFTR BIENNIAL SURVEILLANCE #4 (B-4)

BIENNIAL EVALUATION OF UFTR STANDARD OPERATING PROCEDURES

PART II: RESULTS OF EVALUATION(continued)

rocedure umber	Latest REV/TCN	Reviewer and Date Completed	Recommended Changes (REV or TCN) (reference attmnts)	Rx Mgr/Fac Dir Recommendations (reference attmnts
)P-D.1				
)P-D.2				
)P-D.3				
)P-D.4				
)P-D.5				
)P-D.6				
)P-E.1				
)P-E.2				
)P-E.3				
)P-E.4				
)P-E.6				

APPENDIX I

10 CFR PART 20(NRC) AND FLORIDA 10D-91

MAXIMUM PERMISSIBLE EXPOSURE LIMITS

QUOTED FROM NRC REGULATIONS(10 CFR 20)

AND FLORIDA HRS REGULATIONS(CHAPTER 10D-91)

UFTR RADIOLOGICAL PROCEDURE D.1

1.0 UFTR Radiation Protection and Control

2.0 Approval

Reactor Safety Review Subcommittee . [signature] 8/29/91
Date

Facility Director . . . . [signature] 8/29/91
Date

4.1.3 Requirements for instructing"fertile females" regarding the risks to the unborn child and efforts to limit any exposure to the developing child are contained in Section VB of Reference 5.3.

4.1.4 Requirements of 10 CFR 19 and references to other documents delineating the requirements for instructions to radiation workers and others are also contained in Section VB of Reference 5.3.

4.2 Limits on concentrations above background in air and water may be found in References 5.1, 5.2 and 5.3.

Note: These concentrations may be averaged over periods not greater than 30 days.

4.3 The maximum permissible transferable surface contamination will be 100 dpm/100 cm^2 for beta-gamma or 50 dpm/100 cm^2 for alpha. If an object exceeds these contamination limits, it must be decontaminated to a level less than or equal to the above limits or the contamination must be suitably contained by bagging or an equivalent method prior to transferring the object from the UFTR Cell to any other area.

4.4 Before work or operations may be undertaken in the UFTR of a nature that radiation hazards, whether actual or potential, are such that normal working dose rates(less than or equal to 75 mRem/week whole body, or 500 mRem/week extremities, or 400 mRem/week skin) could be expected to be exceeded, a Radiation Work Permit will be properly prepared and the provision of UFTR-SOP-D.2 complied with.

Note: The normal working dose rates in Section 4.4 are given on a weekly basis to assure proper monitoring and maintaining exposures as low as reasonably achievable(ALARA).

5.0 References

5.1 Title 10, Code of Federal Regulations, Chapter 1, Part 20.

5.2 Florida Division of Health, Control of Radiation Hazard Regulations.

5.3 University of Florida Radiation Control Guide(Revised: 10/89).

6.0 Records Required

6.1 UFTR Radiation Protection Weekly Survey(Forms SOP-D.1A and SOP-D.1B).

6.2 UFTR Radiation Work Permit as delineated in UFTR-SOP-D.2

6.3 UFTR Dosimeter Log

6.4 UFTR Personnel Exposure Records

Note: The responsibility for maintaining personnel radiation exposure records remains with the University of Florida Radiation Control and Radiological Services Department.

7.0 Instructions

7.1 Personnel monitoring devices shall be worn by:

7.1.1 Each individual who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 25% of the applicable value specified in Section 4.1 or Appendix I of this procedure.

7.1.2 Each individual under 18 years of age or pregnant women who enter a restricted area under such circumstances that the individual receives, or is likely to receive, a dose in any calendar quarter in excess of 5% of the applicable value specified in Section 4.1 or Appendix I of this procedure.

7.1.3 Each individual who enters a high radiation area.

7.2 Radiation protection survey requirements

7.2.1 Weekly survey requirements

7.2.1.1 Monitor surface contamination in the UFTR Cell by taking random swipes, and record the results on the weekly survey forms contained in Appendix II (Form SOP-D.1A, Form SOP-D.1B). Swipes will be representative of approximately 100 square centimeters of surface area.

7.2.1.2 Check airborne particulate contamination by drawing approximately 50 cubic meters (1800 cubic feet) of air through a filter with a high volume air sampler. Count the air sample ~24 hours after the collection time and record the activity on Form SOP-D.1A of Appendix II of this procedure.

7.2.1.3 Evaporate water samples obtained by the UFTR staff and determine the gross activity. Record the results on Form SOP-D.1A of Appendix II of this procedure.

7.2.1.4 Perform a radiation survey of areas where radioactive material is stored in the UFTR Cell. These areas shall include as a minimum, the low level radioactive material storage rack and the spent fuel pit storage area. Record the required radiation survey results on Form SOP-D.1A of Appendix II of this procedure.

7.2.1.5 Perform routine checks and record problems, comments, discrepancies, and satisfactory completion on Form SOP-D.1A in Appendix II of this procedure for the following items:

7.2.1.5.1 Check portable survey meters to insure they are available, calibrated and in proper working order.

7.2.1.5.2 Check that all radioactive material is properly labeled and stored.

7.2.1.4.3 Check that all area caution signs are properly posted and reflect the current radiological limitations for the area.

7.2.1.5.4 Check that radioactive material waste containers are available and properly labeled.

7.2.1.5.5 Verify that operational checks of area monitors, stack monitor, portal monitor and APD were completed during the UFTR Weekly Pre-Operational Check.

7.2.1.5.6 Perform an inventory of the emergency equipment listed in Appendix III of this procedure.

7.2.1.5.7 Check that any radioactive waste ready for shipment is properly packaged and labeled. List the activity level on the weekly survey form.

7.2.1.6 Submit completed UFTR Forms SOP-D.1A and SOP-D.1B from Appendix II to the Reactor Manager or Facility Director for review weekly, prior to filing in UFTR files. Copy of the results will also be supplied to the Radiation Control Office.

7.2.2 Other survey requirements

FORM SOP-0.1A

UFTR RADIATION PROTECTION WEEKLY SURVEY

DATE ______________________ ASSAYED BY ______________________

EACH SWIPE TAKEN AS INDICATED ON FORM SOP-0.1B REPRESENTS APPROXIMATELY 100 CM^2 OF SURFACE AND IS COUNTED IN A GAS FLOW PROPORTIONAL COUNTER FOR THE PRESENCE OF BETA AND/OR ALPHA ACTIVITY FOR ONE MINUTE. APPLICABLE COUNTER EFFICIENCIES AND BACKGROUND COUNT RATES ARE AS FOLLOWS:

	EFFICIENCY (%)	BACKGROUND COUNT RATE (CPM)
ALPHA		
BETA		

1. RADIATION LEVEL MEASUREMENTS

INSTRUMENT ______ SERIAL NO. ________

A. LOW LEVEL STORAGE RACK ________

B. FUEL PIT STORAGE AREA ________

2. ROUTINE CHECKS

A. PORTABLE BETA-GAMMA, GAMMA AND NEUTRON DETECTORS AVAILABLE AND CALIBRATED ________

B. RADIOACTIVE MATERIAL PROPERLY POSTED ________

C. AREA CAUTION SIGNS PROPERLY POSTED ________

D. WASTE CONTAINERS AVAILABLE AND LABELED ________

E. OPERATIONAL CHECKS OF RADIATION MONITORS ________

1) ☐ NORTH WALL MONITOR

2) ☐ EAST WALL MONITOR

3) ☐ SOUTH WALL MONITOR

4) ☐ STACK MONITOR

5) ☐ PORTAL MONITOR

6) ☐ APD MONITOR

3. CHECK THAT DECON ROOM INVENTORY IS COMPLETE AS PER LISTING IN APPENDIX III ________

4. CHECK AIR SAMPLE (20 MINUTE COUNT) ON 1" DISC CUT FROM CENTER OF 3-1/2" COLLECTING FILTER ________

______ HOURS AFTER SAMPLING. (APPROX. 24 HOURS)

5. RECORD ACTIVITY (1 MINUTE COUNT) FOR WATER SAMPLES EVAPORATED TO DRYNESS ________

6. SURVEY AND RECORD ACTIVITY OF ANY RADIOACTIVE WASTE MATERIAL READY FOR SHIPMENT ________

7. TRANSMIT COMPLETED WEEKLY SURVEY FORMS SOP-0.1A AND SOP-0.1B TO REACTOR MANAGER OR FACILITY DIRECTOR WITH COPY TO RADIATION CONTROL OFFICE ________

____

RM/FD ACKNOWLEDGEMENT

SAMPLE ACTIVITY RECORDS

SAMPLE IDENTIFICATION	VOLUME (ML)	NET COUNT RATE (CPM) BETA	NET COUNT RATE (CPM) ALPHA	ACTIVITY (µCI/ML) BETA	ACTIVITY (µCI/ML) ALPHA
PRIMARY					
SECONDARY HEAT EXCHANGER					
SECONDARY SAMPLE TANK					
SHIELD TANK WATER					
FILTER					
PARTICULATE SAMPLER					

COMMENTS ______________________

APPENDIX II
(UFTR SOP D.1)

UFTR RADIATION PROTECTION
WEEKLY SURVEY FORMS

3.0 PURPOSE AND DISCUSSION

3.1 These procedures establish techniques and standards within the guidelines of the United States Nuclear Regulatory Commission's Rules and Regulations, Title 10, Part 20, "Standards for Protection Against Radiation", the Florida Division of Health's "Control of Radiation Hazard Regulations" and the University of Florida's "Radiation Control Guide".

3.2 Definitions

3.2.1 "Restricted Area" means any area to which access is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials. The UFTR Cell, Control Room and Airlock comprise a restricted area.

3.2.2 "Unrestricted Area" means any area to which access is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials and any area used for residential quarters.

3.2.3 "Radiation Area" means any area accessible to personnel in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 5 millirem or in any 5 consecutive days a dose in excess of 100 millirem.

3.2.4 "High Radiation Area" means any area accessible to personnel in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem.

3.2.5 "Calendar Quarter" means not less than 12 consecutive weeks or not more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be such that no day is included in more than one calendar quarter or omitted from inclusion within a calendar quarter.

3.2.6 "Personnel Monitoring Devices" are devices to be worn or carried by an individual for the purpose of measuring and/or monitoring radiation dose received.

3.3 The radiation protection weekly survey shall be performed weekly, preferably on the first working day of the week. During extended shutdown periods for administrative purposes, maintenance or modifications the weekly survey requirements shall be performed, as appropriate, on all operable systems.

7.2.2.1 Perform precautionary surveys as necessary to establish radiation levels during the transfer of irradiated samples or experiments to or from the UFTR and prior to removal from the cell

7.2.2.2 Perform precautionary area beta-gamma and neutron radiation level surveys during the first startup after major shielding alterations. Compare results with previous similar surveys taken prior to the alterations.

7.2.2.3 Perform precautionary beta-gamma and neutron radiation level surveys around areas involved during insertion or removal of experiments from UFTR experimental ports.

7.2.2.4 Perform frisks and/or swipe surveys on all individuals and/or equipment upon leaving all areas where they are likely to have become contaminated.

4.0 Limits and Precautions

4.1 External exposure: Since any radiation exposure is undesirable, it is important that all exposures be as low as reasonably achievable. The maximum permissible exposures to be used at the University of Florida, as abstracted from the University of Florida Radiation Control Guide are set forth below :

4.1.1 Maximum Permissible Occupational or Restricted Area Exposures

1. Whole body; head and trunk; active blood forming organs; lens of eyes; gonads .... 300 mRem/month or 1000 mRem/calendar quarter

2. Extremities including feet and ankles .... 2000 mRem/month or 6000 mRem/calendar quarter

3. Skin of whole body .... 1600 mRem/month or 5000 mRem/calendar quarter

Specific approval to operate under the more liberal State or Federal Regulations must be obtained for each such occasion from the Radiation Control Committee by submitting a written proposal through the Radiation Control Officer. These more liberal limits of exposure are listed in Appendix I, SOP D.1.

4.1.2 Maximum permissible non-occupational or unrestricted area exposure and maximum permissible exposure to minors and women who have declared pregnancy is 10% of limits specified in Section 4.1.1.

1. Whole Body; head and trunk; active blood forming organs; lens of eyes; gonads .... 30 mRem/month or 100 mRem/calendar quarter.

2. Extremities including afeet and ankles .... 200 mRem/month or 600 mRem/calendar quarter

3. Skin of Whole Body..................... 160 mRem/month or 500 mRem/calendar quarter

UFTR BIENNIAL SURVEILLANCE #4 (B-4)

BIENNIAL EVALUATION OF UFTR STANDARD OPERATING PROCEDURES

PART II: RESULTS OF EVALUATION(continued)

rocedure umber	Latest REV/TCN	Reviewer and Date Completed	Recommended Changes (REV or TCN) (reference attmnts)	Rx Mgr/Fac Dir Recommendations (reference attmnts
OP-E.7				
OP-E.8				
OP-F.1				
OP-F.2				
OP-F.3				
OP-F.4				
OP-F.5				
OP-F.6				
OP-F.7				
OP-F.8				

ecommendations for Titles of Additional SOPs: ______________________

____

____

____

TABLE 1

MAXIMUM PERMISSIBLE EXPOSURE LIMITS

PER NRC AND STATE OF FLORIDA REGULATIONS

Maximum permissible exposures as specified in the Code of Federal Regulations, Title 10, Part 20, "Standards for Protection Against Radiation" and in the Florida Department of Health and Rehabilitative Services , Chapter 10D-91, 'Control of Radiation Hazards" are .

A. Maximum Permissible Occupational or Restricted Area Exposure:

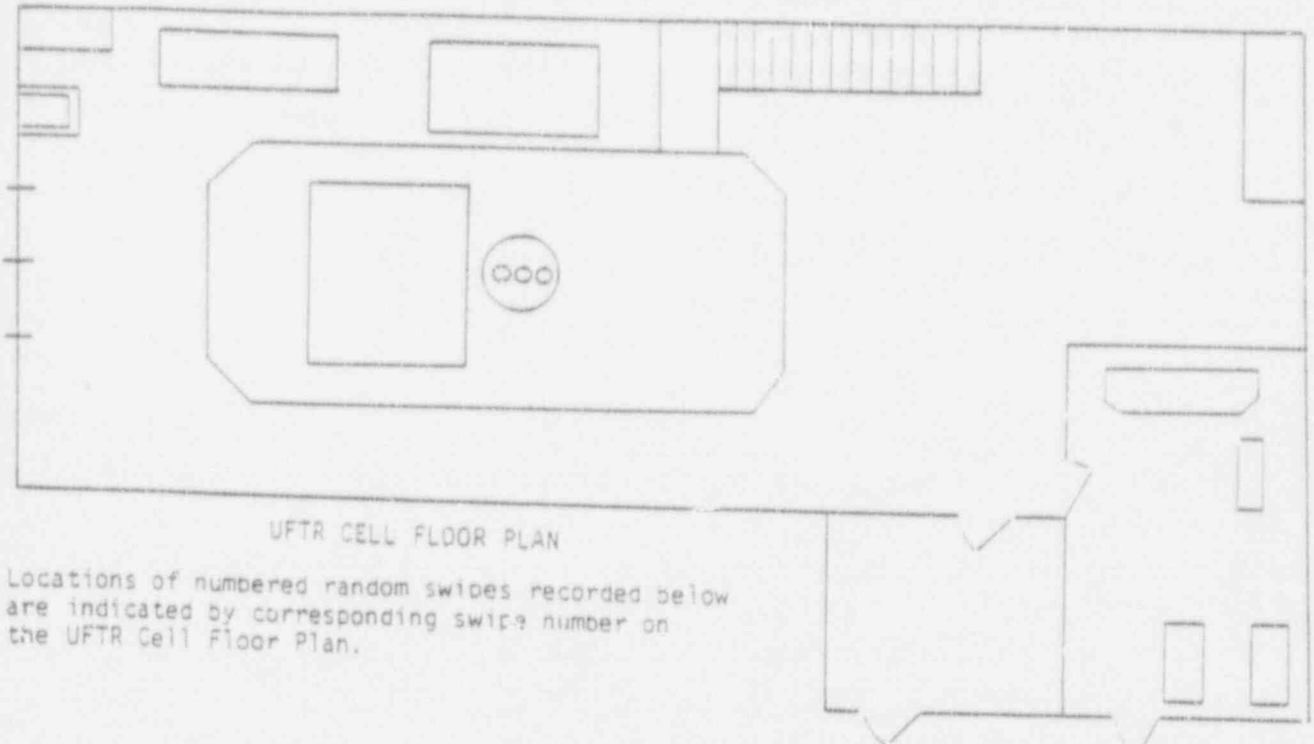
1. Whole body; head and trunk; active blood forming organs; lens of eyes; gonads .... 1-1/4 Rem per calendar quarter
2. Hands and forearms; feet and ankles .... 18-3/4 Rem per calendar quarter
3. Skin of whole body .... 7-1/2 Rem per calendar quarter

B. Maximum Permissible Non-Occupational or Unrestricted Area Exposure and Maximum Permissible Exposure to Minors and Women Who have Declared Pregnancy:

1. Whole body; head and trunk; active blood forming organs; lens of eyes; gonads .... 125 mRem per calendar quarter
2. Hands and forearms; feet and ankles .... 1875 mRem per calendar quarter
3. Skin of whole body .... 750 mRem per calendar quarter

FORM SOP 0 18

UFTR SWIPE SURVEY RESULTS



UFTR CELL FLOOR PLAN

Locations of numbered random swipes recorded below are indicated by corresponding swipe number on the UFTR Cell Floor Plan.

SWIPES	ALPHA ACTIVITY DETERMINATIONS			BETA ACTIVITY DETERMINATIONS		
Sample No.	Gross Count Rate (cpm)	Net Count Rate (cpm)	Activity (DPM)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Activity (DPM)

APPENDIX III

EMERGENCY SUPPORT CENTER

EQUIPMENT INVENTORY

TABLE 2

EMERGENCY SUPPORT CENTER EQUIPMENT INVENTORY

The following listing details the minimum emergency equipment available in the Emergency Support Facility(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
*Teletector(High level survey meter)	1
*E-140(Low level GM meter)	1
D-Cell batteries	4
Walkie-Talkie Radios(Recommended only)	2

Note: Starred items are in the Emergency 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 Walkie-Talkie Radios kept in the Locker in Room 106 NSC to assure operability.

APPENDIX F

UFTR REACTOR OPERATOR

REQUALIFICATION AND CERTIFICATION

TRAINING 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

May 31, 1991
Requalification Training Program

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 current operator requalification and recertification program training cycle for the University of Florida Training Reactor as submitted with a letter dated May 30, 1989 is scheduled to end in June, 1991. Therefore, we propose to renew the current plan with no change except for the new dates. In effect, the revised plan will be essentially the same as that currently being used for the two-year training cycle. A copy of this revised plan is included as Enclosure 1 with this letter for reference purposes. This renewed plan as included here will cover the UFTR operator requalification and recertification program from July, 1991 through June, 1993.

As usual, we propose to continue using this proposed program beyond the next two-year cycle; that is, we will automatically restart the same two-years requalification and recertification program training cycle every two-year beginning in July, 1993.

If you need further information on this plan or the proposed usage of it for all future two-year training cycles, please let us know.

Sincerely,

W.G. Vernetson
Director of Nuclear Facilities

WGV/p
Enclosure
cc: Reactor Safety Review Subcommittee
R. Piciullo
U.S.N.R.C. Region II

UNIVERSITY OF FLORIDA TRAINING REACTOR

OPERATOR REQUALIFICATION AND RECERTIFICATION PROGRAM PLAN

(July 1991 through June 1993)

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 training for UFTR personnel meets or exceeds the requirements established by 10 CFR 55 Appendix A and draft ANSI/ANS-15.4 standard dated September 15, 1977 entitled, "Selection and Training of Personnel for Research Reactors."

Responsibility for the administration of the program shall rest with the Director of Nuclear Facilities of the Department of Nuclear Engineering Sciences and his/her duly designated representative.

All licensed operators are required to participate in all phases of this program except where specifically exempted. 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 in force at the UFTR shall consist of eight (8) 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 of Operators
7. Requalification Records
8. Requalification Document Review

I. REQUALIFICATION SCHEDULE

The UFTR requalification program shall be conducted over a period not to exceed two years and shall be followed by successive two-year programs. To assure that the program is effective, the various requirements shall be executed according to the time schedules outlined in this program guide. The current two-year Requalification Training Schedule (July, 1989 - June, 1991) is contained in Appendix A of this program plan.

II. LECTURES, REVIEWS AND EXAMINATIONS

A. Lectures

The requalification program shall be 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 Procedures (one 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.

B. Examinations

An examination shall be administered at the end of each lecture session listed in Table 2, no later than four weeks after the lecture or review session. For designated cases, a final examination covering all topics may be substituted for individual examinations. Results of the certified individual's evaluation from the examinations and from the on-the-job training described under Section VI, Paragraph B, "Annual On-the-Job Training," are used 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.

C. Fuel Handling

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.

D. 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. Furthermore, a written monthly report summarizing the activities in the reactor, including modification, maintenance, results of calibrations and tests, as well as any procedural changes will be distributed to all licensed reactor operators and discussed, as needed.

E. 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.

F. 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.

III. REQUALIFICATION OPERATIONS AND CHECKOUTS

A. 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.

B. 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 license operators when the reactor is operable.

1. Each licensed operator shall perform at least one reactor startup quarterly at intervals not to exceed four months.

2. Each licensed operator shall perform at least one daily checkout quarterly at intervals not to exceed four months.

3. Each licensed operator shall perform at least one weekly checkout semi-annually at intervals not to exceed eight months. 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.

C. Credit for Reactivity Control Manipulations

For the purpose of meeting requalification requirements, each licensed operator and senior operator may take credit only for reactivity control manipulations which they perform themselves.

D. Records

It is the responsibility of each operator to insure that these requirements are met and logged in the operator's Requalification folder. Each operator shall also be responsible to ensure that monthly operating hours are logged in the same folder.

IV. EMERGENCY DRILLS

Emergency drills shall be held quarterly. 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. A review of the drill and applicable emergency procedures shall be performed with all certified individuals within seven days after completion of the drill.

V. 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 authorized functions.

VI. EVALUATION OF OPERATORS

A. Biennial Evaluations

An in-depth evaluation of the operating performance of each licensed operator shall be performed and documented biennially and/or prior to their re-certification anniversary to insure that they have the knowledge, competence and dexterity to operate the reactor safely and to take appropriate actions in response to abnormal situations that may arise.

The evaluation shall include results from the examinations, the annual on-the-job evaluation of operational proficiency (as delineated under paragraph B of this Section), and any other available indications of the operator's capability to discharge his/her duties in a safe and competent manner.

B. Annual On-the-Job Training

Each licensed Reactor Operator and Senior Reactor Operator shall demonstrate satisfactory understanding of the operation of the facility systems, operating procedures and facility procedure license changes during an annual walk-through examination administered by a designated Senior Reactor Operator. Each Reactor Operator and Senior Reactor Operator is also required to take an annual operations test to demonstrate proficiency in startup, changing powers and shutting down the reactor.

C. Grade Requirements

All operators are required to complete each examination satisfactorily according to the following requirements:

1. A grade higher than 80% requires no additional training.
2. A grade in the range of 65%-79% requires additional training in those areas or topics where weaknesses or deficiencies are indicated. This training shall be completed within 60 days from the date the examination was administered.
3. With a grade of less than 65%, the individual shall be placed in an accelerated retraining program in those areas where weaknesses or deficiencies are indicated.

   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.

D. Accelerated Training

Accelerated training programs shall be completed within four months following the grading of the examinations. 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. An oral exam may also be given to aid in the evaluation. Regardless of the score, if the individual's test indicates a deficiency in a critical area that affects safety, a training program shall be administered to correct the deficiency promptly.

E. 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.

F. Additional Evaluation

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 shall be noted in his/her Requalification Folder to aid later evaluations.

VII. REQUALIFICATION RECORDS

A. 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 folder 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 activities such as fuel handling by the individual operator, shall also be logged in the applicable Requalification Folder.

B. Requalification Training Manual

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.

C. Facility Records

Required documents and records pertaining to the Requalification Program shall be maintained at the UFTR as part of the facility records for a period of five years.

VIII. REQUALIFICATION DOCUMENT REVIEW AND AUDIT

The individual Requalification Folders or Notebooks shall be reviewed on a semi-annual basis by a designated Senior Reactor Operator and shall be noted by the inclusion of the SROs 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 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.

References:

10 CFR 55
American National Standard ANSI/ANS-15.4 - 1977 (N380)

APPENDIX A

UFTR REQUALIFICATION TRAINING SCHEDULE

1991-1992

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	(L) Design & Operating Characteristics	EMERGENCY DRILL	(P) Emergency Equipment Training	(L) Nuclear Theory & Principles of Operation	*EMERGENCY DRILL
			(P) Special Equipment Training (Rabbit System, Overhead Crane)	(S) Annual Report Review	(L)Security Plan
					ANNUAL OPERATIONS TEST

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
	(L) Normal, Abnormal and Emergency Procedures	EMERGENCY DRILL	(I) Reactor Protection System	(I) Operator Walk-throughs	EMERGENCY DRILL
	(P) Fuel Handling Training		(P) Emergency Equipment Training		

* = INVOLVES POLICE, FIRE DEPARTMENT, ETC.

(P) = PRACTICAL TRAINING (S) = STAFF TRAINING (I) = INDIVIDUAL TRAINING (L) = LECTURE

UFTR REQUALIFICATION TRAINING SCHEDULE 1992-1993

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
(L) Instrumentation & Control Systems	(L) Radiation Control and Safety	EMERGENCY DRILL	(L) Technical Specifications	(S) Annual Report Review	(L) Emergency Plan
			(P) Emergency Equipment Training		*EMERGENCY DRILL
			(P) Special Equipment Training (Rabbit System, Overhead Crane)		ANNUAL OPERATIONS TESTS

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
	(I) Operator Walk-throughs	EMERGENCY DRILL	(L) Normal, Abnormal Emergency Procedures		EMERGENCY DRILL
			(P) Emergency Equipment Training		BIENNIAL COMPREHENSIVE EXAMINATION

* = INVOLVES POLICE, FIRE DEPARTMENT, ETC.

(P) = PRACTICAL TRAINING (S) = STAFF TRAINING (I) = INDIVIDUAL TRAINING (L) = LECTURE

APPENDIX G

DOCUMENTATION FOR QUALITY ASSURANCE
PROGRAM APPROVAL FOR RADIOACTIVE
MATERIAL PACKAGES NO. 0578, REVISION 1

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

RECEIVED NOV 0 9 1987

NOV 0 5 1987

SGTB:0578
71-0578

University of Florida
ATTN: Mr. W. G. Vernetson
Nuclear Reactor Facility
Nuclear Reactor Bldg.
Gainesville, FL 32611

Gentlemen:

Enclosed is Quality Assurance Program Approval for Radioactive Material Packages No. 0578, Revision No. 1.

Quality Assurance Program Approval No. 0578, Revision No. 0 has been revised to reflect the appropriate conditions of your approval.

Sincerely,

Charles E. MacDonald

Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and
Transportation, NMSS

Enclosure:
As stated

FORM 311

U. S. NUCLEAR REGULATORY COMMISSION

QUALITY ASSURANCE PROGRAM APPROVAL
FOR RADIOACTIVE MATERIAL PACKAGES

1. APPROVAL NUMBER	REVISION NUMBER
0578	1

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and Title 10, Code of Federal Regulations, Chapter 1, Part 71, and in reliance on statements and representations heretofore made in item 5 by the person named in Item 2, the Quality Assurance Program identified in Item 5 is hereby approved. This approval is issued to satisfy the requirements of Section 71.101 of 10 CFR Part 71. This approval is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

NE
University of Florida, Nuclear Reactor Facility

3. EXPIRATION DATE
October 31, 1992

EET ADDRESS
Nuclear Reactor Bldg.

4. DOCKET NUMBER
71-0578

Y
Gainesville

STATE
FL

ZIP CODE
32611

LITY ASSURANCE PROGRAM APPLICATION DATE(S)
September 2, 1987

DITIONS

Activities authorized by this approval are use and maintenance applicable to shipment of SPERT F-1 fuel pins in DOT Specification 6M Shipping Containers. It shall remain the responsibility of the licensee-user that all transportation activities meet the requirements of 10 CFR 71 Subpart H.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

ANSPORTATION BRANCH
OF SAFEGUARDS AND TRANSPORTATION
F NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

NOV 0 5 1987

DATE

APPENDIX H

OFFICIAL NRC SUBMITTAL ESTIMATING UFTR DECOMMISSIONING COSTS AND DELINEATING MEANS OF FUNDING WITH 1991 UPDATE OF ESTIMATED DECOMMISSIONING COSTS

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

...Director
...R REACTOR BUILDING
...ville, Florida 32611
(904) 392-1429 - Telex 56330

July 19, 1990

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

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

Gentlemen:

Decommissioning report information is supplied for the University of Florida modified Argonaut-type reactor(the University of Florida Training Reactor - UFTR) in accordance with the requirements of 10 CFR 50.33 and 50.75 as follows:

1. The estimated cost for the complete decommissioning of the UFTR modified Argonaut-type reactor facility is $2.02 million. This cost estimate is a conservative value based upon consideration of the detailed cost estimate provided by the University of Washington in their decommissioning plan for a similar 100 kW Argonaut-type reactor facility. Our cost estimate assumes most work for the decommissioning will be performed by contractors as was the assumption by the University of Washington for their facility; however, our cost estimate also includes a site specific cost estimate (lower than the Washington case) for asbestos removal from the UFTR facility as well as certain other survey activities to be performed in house at lower cost. These conditions result in a somewhat lower estimated decommissioning cost than the comparable facility at the University of Washington but this cost estimate is still considered to be conservative.

2. The University of Florida is a state institution and thus, according to the provisions of 10 CFR 50.75(e)(2)(iv), the funds needed for decommissioning will be requested from the State of Florida Legislature if and when a decision to decommission the University of Florida reactor facility is made.

3. The cost estimate for decommissioning the UFTR reactor facility for years 1991 and beyond will be adjusted for inflation by the consumer price index and the new estimate kept on file at the facility.

Document Control Desk
U.S. NRC
July 19, 1990

Facility License R-56 for the University of Florida modified Argonaut-type reactor expires on August 30, 2002. In accordance with the requirements of 10 CFR 50.82, the University of Florida Licensee will either submit an application for renewal of the license or a formal decommissioning plan two years or more prior to this date.

Sincerely yours.

William G. Vernetson
Director of Nuclear Facilities

Notary Date 7/19/90

Approved:
M. Jack Ohanian, Chairman
Reactor Safety Review Subcommittee

Approved: Gene Hemp
Gene Hemp, Vice-Provost

Enclosure
WGV/p

cc: John V. Lombardi, President
Winfred M. Phillips, Dean, College of Engineering
J.S. Tulenko, Chairman, Nuclear Engineering Sciences Dept.
D.L. Munroe, Radiation Control Officer
P.M. Whaley, Acting Reactor Manager
W.E. Bolch, RSRS Member

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida

...rnetson, Director
...R REACTOR BUILDING
...ille, Florida 32611
(904) 392-1429 - Telex 56330

July 30, 1991

MEMORANDUM

TO: UFTR Decommissioning Information File

FROM: W.G. Vernetson

SUBJECT: Updating Cost Estimate To Decommission the UFTR(R-56 License) per letter to NRC Dated July 19, 1990.

Based on a telephone conversation with the Reference Section of the Gainesville Library on July 29, 1991 the Consumer Price Index has values as follows:

June, 1990:	129.9
June, 1991:	136.0
Percent Increase:	4.7%

Additional information as backup is that, for the year ending May, 1991, the Consumer Price Index is at 134.1 with a 4.5% increase from the previous year.

To meet the requirements of 10 CFR 50.33 and 50.75 the estimated cost to decommission the UFTR must be adjusted based on the Consumer Price Index(CPI). The values to be used will be the June, 1991 CPI value referenced to the June, 1990 as the last month before submittal of the July 19, 1990 letters to NRC. Using the 4.7% increase in the Consumer Price Index from June, 1990 to June, 1991, the cost estimate for decommissioning the UFTR reactor facility is adjusted upward from $2.02 million to $2.115 million and is being kept on file as the current cost estimate per NRC requirements.

cc: R. Piciullo
RSRS