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February 27, 1998

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

Dear Sir/Madam:

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

In compliance with our Technical Specifications reporting requirements, enclosed is one copy of the 1996-97 University of Florida Training Reactor Annual Progress Report.

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

Please advise if further information is needed.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

WGV/dms
Enclosure

Copy: J. Powers

Sworn and subscribed this 27 day of February 1998.

Diana L. Dampier
Notary Public

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Report: DOE/ER/04014-27 &
Report: DOE/NE/38152-1

UNIVERSITY OF FLORIDA TRAINING REACTOR ANNUAL PROGRESS REPORT

SEPTEMBER 1, 1996 - AUGUST 31, 1997

Submitted by
Dr. William G. Vernetson
Director of Nuclear Facilities

Department of Nuclear and Radiological Engineering
College of Engineering
University of Florida
Gainesville, Florida

February 1998

U.S. Department of Energy
Award #DE-AC05-76ER04014 &
Award #DE-FG02-96NE38152

UNIVERSITY OF FLORIDA
TRAINING REACTOR
ANNUAL PROGRESS REPORT

SEPTEMBER 1, 1996 - AUGUST 31, 1997

Submitted By
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Director of Nuclear Facilities

Department of Nuclear and Radiological Engineering
University of Florida
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TABLE OF CONTENTS

FOR 1996-97 ANNUAL REPORT

Page Number

I. INTRODUCTION I-1

II. UNIVERSITY OF FLORIDA PERSONNEL ASSOCIATED WITH THE REACTOR II-1

III. FACILITY OPERATION III-1

IV. MODIFICATIONS TO THE OPERATING CHARACTERISTICS OR CAPABILITIES OF THE UFTR FACILITY IV-1

V. SIGNIFICANT MAINTENANCE, TESTS AND SURVEILLANCES OF UFTR REACTOR SYSTEMS AND FACILITIES V-1

VI. CHANGES TO TECHNICAL SPECIFICATIONS, STANDARD OPERATING PROCEDURES AND OTHER DOCUMENTS VI-1

VII. RADIOACTIVE RELEASES AND ENVIRONMENTAL SURVEILLANCE VII-1

VIII. EDUCATION, RESEARCH AND TRAINING UTILIZATION VIII-1

IX. THESES, PUBLICATIONS, REPORTS AND ORAL PRESENTATIONS OF WORK RELATED TO THE USE AND OPERATION OF THE UFTR IX-1

APPENDICES:

APPENDIX A: NRC LETTER WITH ATTACHMENTS APPROVING UFTR TECHNICAL SPECIFICATIONS AMENDMENT NUMBER 21

APPENDIX B: SUBMITTAL DOCUMENTATION FOR UFTR TECHNICAL SPECIFICATIONS AMENDMENT NUMBER 22

TABLE OF CONTENTS
(CONTINUED)

APPENDIX C: DOCUMENTATION FOR UFTR SAFETY ANALYSIS REPORT REVISION 10

APPENDIX D: UFTR STANDARD OPERATING PROCEDURES MAJOR REVISIONS GENERATED FOR 1996-97 REPORTING YEAR:

1. UFTR SOP-A.1, "PRE-OPERATIONAL CHECKS" (REV 16, 2/97)
2. UFTR SOP-B.4, "FLOOD" (REV 2, 8/97)
3. UFTR SOP-C.3, "FUEL INVENTORY PROCEDURE" (REV 4, 8/97)

APPENDIX E: UFTR EMERGENCY PLAN REVISION 10 DOCUMENTATION

APPENDIX F: REQUALIFICATION AND RECERTIFICATION TRAINING PROGRAM DOCUMENTATION

APPENDIX G: FINAL REPORT TO NRC ON POTENTIAL TECH SPEC VIOLATION ON IMPROPER STACK MONITOR CALIBRATION

APPENDIX H: INSPECTION REPORT NO. 50-83/97-201

I. INTRODUCTION

A. Overall Utilization

The University of Florida Training Reactor's overall utilization for the past reporting year (September 1996 through August 1997) 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 among the best in the history of the facility, especially considering that availability this year was reduced to 66.20%. Unlike in years prior to 1990-91, this availability accounts for lost availability for administrative reasons as well as for repair and maintenance related reasons. Otherwise, availability for this year would be near 68.0%.

The University of Florida Training Reactor (UFTR) continues to experience a high rate of utilization in a broad spectrum of areas with total utilization continuing near the highest levels recorded in the early 1970's and most usage indicators moving upscale with quality usage occurring whenever system and operator availability permits. This broad-based utilization has been supported by a variety of usages including research and educational utilization by users within the University of Florida as well as by other researchers and educators around the State of Florida through the support of the Department of Energy (DOE) Reactor Sharing Program and several externally supported usages. A number of science fair projects were also accommodated. Less effort than usual has also been devoted to facility enhancement except when necessary; a key ingredient accounting for this situation has been the lack of a full-time Reactor Manager/SRO in place for all but three months of the year when in interim acting manager was in place along with one part-time Senior Reactor Operator (SRO). A second part-time SRO was licensed in early March but the

interim full time manager was lost as of March 28, 1997. Personnel associated with the UFTR are listed in Section II; this does not include NAA Laboratory personnel except where also involved with UFTR operations. The loss of all experienced NAA laboratory personnel at the beginning of the reporting year has presented a challenge throughout the reporting year for research usage of the facility. Facility operations for all usage's are delineated in Section III indicating the diversity of usage.

The yearly total energy generation of 16.904 Megawatt-hours for the 1996-97 reporting year represents a decrease of 20.81% from the previous reporting year. However, although this value ranks last in energy generation in the last ten years, it would still rank 7 out of 14 in the first 14 years of UFTR operational history licensed at 100 kW during which time energy generation has averaged somewhat over 23 Megawatt-hours per year. The decrease in energy generation this year is significant and was primarily due to the lack of any mega-projects requiring lengthy irradiations as the number of projects was comparable with the previous year with a number of extensive research operations completed or in progress at year's end as well as the forced outage time more than doubling from the previous year to over 102 days. The planned unavailability decreased by even more with contributions due to performing and upgrading the annual nuclear instrumentation calibration checks and completing work to install a new roof dominating this relatively small category of outage time at just under 17 days.

The run time, time when the reactor is running at any power level, has decreased by 25.05% from the previous year. This decrease is again attributed to decreased numbers of lengthy irradiations in favor of educational usages and the lack of any single mega-project plus the forced outage time. On a positive note, this decrease coupled with a smaller decrease in experiment time

(13.85%) is still indicative of the large amounts of time used to run classes and other educational activities as well as research projects, 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 research or training activity, as well as for University of Florida classes. The extended low power usage for education, as well as for neutron transmission and radiography analyses contributes significantly to total reactor operation time but in a limited way to total energy generation during the year.

Additional significant time and resource commitments were made for efforts related to conversion of the UFTR from high enriched uranium (HEU) to low enriched uranium (LEU). A total of 1200 SPERT fuel pins were transferred for shipment to Oak Ridge National Laboratory (ORNL) on May 17, 1990; subsequently, the "storage only" license was revised and the fuel moved to a new location in the Nuclear Research Field Building involving considerable upgrade of the new facility as well as commitments of time for assuring decontamination and security requirements were met. This year weekly facility checks and continued efforts to request permission to ship the fuel to a secure Department of Energy facility along with preliminary review of final fuel drawings following completion of renewal with receipt of the new SNM-1050 license for storage only in June 1995 involved over 61 hours of experiment time including some time to address the effects of building experiments on the fuel storage facility.

With the one extended outage this year, periodic failures and repairs related to surveillances and the need for modifications caused lost availability at the highest rate in the last ten years. Because there was one large outage during this year, plus several others of significant length, the total time spent on maintenance activities is much larger but still manageable; the primary forced

outages were for addressing failure of the compensated ionization chamber(CIC) with movement of the uncompensated ion chamber(UIC) to operate in the CIC mode, installation of a new UIC and replacement of all cabling (72 7/8 days), for addressing the failure of the recirculation pump on the shield tank demineralizer system (20 7/8 days) and for addressing the failed primary coolant level trip reed switch (2 ¾ days) plus a number of other much shorter outages. With the two largest outages accounting for over 93 days forced down time, these and a number of other failures caused lost facility usage and hence negatively affected energy generation and run time. Because of unscheduled shutdowns due to repeated failures in the blade position indicator system circuits in previous years, a new system utilizing light emitting diodes was implemented in June 1994 with the result there was no outage time from this source during the 1994-95, the 1995-96, or the 1996-97 reporting years.

As indicated above, the total run time for the facility was decreased about 25.05% from the previous year. With the resignation of the permanent Reactor Manager as of August 9, 1996, availability of operating personnel was limited for most of the year as there was a full time interim reactor manager for about three months in the middle of the year until his resignation effective March 28, 1997 with one new SRO licensed but another working less hours than anticipated. The availability of operating personnel for the upcoming year will be just as limited as it takes time to hire and license new personnel with several possible personnel identified at the end of the reporting 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 good high energy generation continuing from the previous four years are attributable to continuing supportive conditions as in the

last year. As noted previously, the continuing refurbishment of the Neutron Activation Analysis Laboratory has impacted favorably on all areas of utilization from research projects using neutron activation analysis (NAA) to training and educational uses for students at all levels. With successful implementation of an improved remote sample-handling "rabbit" facility, efforts to advertise availability and encourage usage of the UFTR (especially for research) have proceeded in a favorable light, though always less quickly than hoped. Implementation of the standard rabbit capsule size with larger carrying capacity has further supported use of the facility. The additional implementation of two state-of-the-art PC-based spectrum analysis systems with complete ORTEC software packages for spectrum analysis and data reduction has been a key factor supporting reactor utilization during the last ten 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 1987-88 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 1987-88 reporting year and in the 1988-89 year saw implementation of a 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 1989-90 year, the previous year saw implementation of the new ORTEC OMNIGAM software and spectrum analysis package to speed up as well as simplify spectrum analysis. During the 1991-92 reporting year, additional computer storage capacity and a new monitor were added along with a new spectroscopy system and multichannel buffer. In addition, an integral shield was added for one detector and a desiccator station was added for storage of standards and processed samples, as every effort is being

made to supply accurate and reliable trace element analysis for a wide range of projects from high school students working on science fair projects to doctoral students using trace element analysis for their research.

During the 1992-93 reporting year, an entire new spectroscopy system was obtained and implemented to include an integral shield and detector as well as the computer-based analyzer system with University of Florida funding to provide three complete systems. The result of these various improvements has been an easier, more reliable and faster turnaround of samples submitted to be irradiated for neutron activation analysis with a resultant increase in interest by potential users. The implementation of these facilities has given UFTR management the capability to promote it among University of Florida users and among researchers at other universities and colleges around the State of Florida. As the availability of this high technology facility becomes better advertised through its users, its usage continues to increase, limited realistically by the unavailability of full-time personnel committed to the analytical laboratory facility. Staffing is clearly a key limiting factor in the total throughput as well as the rate of processing of samples for trace element analysis after irradiation in the UFTR. Though this situation was improved at the end of the 1992-93 reporting year with the hiring of a recent graduate to work in the NAA Laboratory and expand programs, the situation again reverted to a limitation when insufficient funding was available to keep this person in spring 1994. Nevertheless, during the 1993-94 reporting year, a new nimbin and sodium iodide spectroscopy system was added to the analytical laboratory along with a freeze dryer for sample preparation. In addition, one HPGe detector was completely refurbished at ORTEC and all the floor tile in the laboratory area was replaced to restore appearances.

Despite the lack of a DOE Instrumentation Grant, a number of NAA Laboratory improvements

were implemented during the 1994-95 reporting year. First, two HPGe detectors were sent off for refurbishment with one returned. Several donated scaler-based counting systems were set up for use in half-life measurement demonstrations and laboratory exercises for visiting students. In addition, the poster display on trace element analysis of cannabis sativa samples to support a legal case presented at the New Orleans American Nuclear Society meeting in July 1994 was mounted on the NAA Laboratory hallway wall to enhance facility tours. Finally, the rabbit system was subjected to a major overhaul and modification to replace old tubing, to upgrade the exhaust fan for increased flow out of the shield box for the receiver station, and to replace and upgrade the HEPA filter system to assure long-term availability.

During the 1995-96 reporting year, one of the NAA Laboratory computers and the upstairs office (secretary) computer were upgraded. The upstairs computer can now run Windows compatible software such as WordPerfect 6.1 for Windows and Quattro Pro for Windows. The NAA Laboratory could then perform sample analyses at a much faster rate.

During the 1996-97 report year, a new Pentium NAA laboratory computer was obtained along with the latest ORTEC software packages for collecting and analyzing gamma spectra as well as a complete library of gamma ray energies to be used for reference purposes. It has been proposed to replace another computer in the upcoming year.

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

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, thirty-eight different outside academic institutions and entities ranging from high schools to universities around the State of Florida and the Southeast made use of this program to utilize the UFTR for research (primarily via neutron activation analysis to determine trace element composition), for reactor facility demonstrations, experiments and course work related to various aspects of operation. Further usages include training of students in various community college programs such as nuclear medicine technology, natural sciences and radiation protection technology and for research and training programs for community college and high school students for which a number of senior level science fair projects are still in progress. Again this year, several of these projects received local and regional awards with a number of these outstanding students from previous years now attending upper division programs in the College of Engineering here at the University of Florida. Indeed, one of the emphases in recent years has been to pre-college institutional use of the UFTR under the Reactor Sharing Program.

At year's end, several unsupported research projects were still awaiting availability of the UFTR under the Reactor Sharing Program as UFTR usage attributable to this DOE-sponsored program continues to grow. Despite considerable cost-sharing by the University of Florida, all of the reactor sharing funds allocated by the Department of Energy for this reporting year were fully utilized. Indeed, the funds were all utilized by the ninth month. This program had been increasing

as it had been renewed with 8%, 11% and 7% increases for three years and then a 22% reduction for the 1994-95 reporting year. With nearly a 23.7% increase for the 1995-1996 reporting year, further significant expansion of this usage was enthusiastically undertaken. Despite a decrease of 20% for the 1996-1997 reporting year, broad-based usage of the Reactor Sharing program has continued. However with a further decrease of over 8% for this next year, further significant expansion may not be possible to any great extent for the 1997-98 reporting year. 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 three now operating 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 and other courses to the Physics Department at the undergraduate level to the Chemistry Department in a graduate level radiochemistry laboratory course and the Geology Department in a graduate level isotope course. Another new and frequent user is the freshman Introduction to Engineering course for introducing new prospective engineering students to various areas of engineering. Of course, the biggest single user department remains the Nuclear and Radiological Engineering Department (previously the Nuclear Engineering Sciences Department, but renamed this year) 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 several again this year, each directed to provide some improvement in the physical facility, in the reactor experimental capabilities or in NAA Laboratory operations. This year a group of four

students completed a major project to characterize the trace metals in sediments around Lake Alice on the University of Florida campus. Another student completed a project to quantify trace elements in roadway runoff sediments. 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 saw work concluded on elemental analysis of zeolites for the Chemistry Department, and several other small projects such as trace element analysis of silicon nitride samples. Other continued research projects this year included transmission studies on utility spent fuel pool absorber coupons for Holtec International, Inc., copper activation for the Pharmacy Department, NAA of rare earth materials for isotope identification for the Armed Forces Radiobiology Research Institute and several projects for trace element analysis on sediments for Reactor Sharing users at other schools. Additional new experiments are planned for the upcoming year to include sediment analyses for researchers at Savannah State University and continuation of trace element analysis of surface canal water samples for a researcher in Civil Engineering at the University of Miami. 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 and other science courses at St. Petersburg Community College, St. Johns River Community College, Valencia Community College, Pensacola Junior College and Santa Fe Community College. There has also been interest expressed by researchers in the Materials Science and Engineering and the Nuclear and Radiological Engineering Departments on campus along with a small business in the Gainesville area in using the UFTR for a seed project to support boron neutron capture therapy (BNCT)-related research into neutron absorbing and penetration

characteristics for various materials and chemicals.

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, though at a decreased level, facility utilization and energy generation for the upcoming year should show continued growth in diversity. The latter augmentation is particularly possible because the UFTR utilization under the DOE Reactor Sharing Program has spread publicity on the availability of the UFTR so that a number of investigators on the University of Florida campus and elsewhere around the state continue to indicate interest in using the reactor facility and its experimental systems. Several other statewide users are in the process of preparing proposals hopefully to provide funded usage of the UFTR within the next year. Large previous usages for groups at Florida State University, another at the University of Wisconsin at Eau Clair/Southeast Missouri State University and another at the University of Miami brought to an intermediate conclusion this year are primarily to demonstrate capabilities to support proposals seeking external support as an outgrowth of the DOE Reactor Sharing Program support while some usages such as those conducted in 1994-95 for the Florida Institute of Technology are partially supported already. 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.

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 and a backup reactor safety channel in previous years. During the 1991-92 year it supported acquisition of a high speed chart recorder to facilitate certain UFTR console surveillances and thereby reduce personnel time commitments as well as a portable neutron survey meter essential to support neutron

transmission and radiography as well as other experiments but the acquisition of an electronic maintenance tool kit was the key item of support as it has facilitated much facility maintenance. The electronic maintenance tool kit along with the NAA Laboratory items such as the integral shield have greatly facilitated facility response to potential users by improving reactor availability and laboratory results.

During the 1992-93 reporting year, the grant was used to obtain a new multipoint temperature recorder for the reactor, a new telescoping high dose rate instrument and a microR survey meter. The new area radiation monitoring system bought on this grant is on a delayed schedule for implementation along with the temperature recorder since currently installed instrumentation has operated without significant problems during this year. Both the temperature recorder and the area radiation monitoring system will require considerable effort to be implemented in the next year as this effort has been delayed by the lack of failures in these systems during the latest reporting year.

During the 1993-94 reporting year, this grant supported obtaining such items as the new freeze dryer for the NAA Laboratory as well as a boroscope and lead blankets to reduce dose commitment in outages along with an ultrasonic flow meter to allow improvements in the annual nuclear instrumentation calibration. Unfortunately, the instrumentation Grant was not renewed for the 1994-95, 1995-96 or the 1996-97 reporting years, nor for the next year, though the AMS[4] air particulate detector bought under the grant for the 1992-93 year was finally officially implemented in August 1995 following incorporation of several facility installed features so this source of outage time has been eliminated. It is hoped that such DOE Instrumentation Grants will be re-instituted for use in the 1998-99 reporting year.

B. Facility Improvements

For facility enhancement, the neutron radiography facility was available during the last six years. Attempts at further optimization have not been successful during the last two reporting years. 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 1988-89 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 many 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. The facility will be well used in new NRE undergraduate curriculum laboratory courses emphasizing uses of radiation for non-destructive testing.

Plans have also been formulated for installation of a prompt gamma analysis facility at the UFTR to complement the NAA Laboratory capabilities. This is a multiyear enhancement project; some work to date has included characterization studies on a suitable beam port to complement a preliminary design of the facility performed as a summer research project by a high school student

several years ago. During the upcoming year funds will again be solicited to support equipment purchases for this facility with installation and initial implementation possible by late in the next reporting year provided the necessary funding and a student to work on it are obtained. There is already one researcher at the University of South Florida (Tampa) and one industrial firm who would use such a facility as well as one researcher in the Materials Science and Engineering Department on our campus. Indeed, several users have gone to other facilities for such usage during the last few reporting years. This facility too could be a major asset in the newly revised undergraduate curriculum within the Nuclear and Radiological Engineering Department emphasizing nondestructive testing and imaging techniques.

Another area of enhancement receiving considerable attention in recent years has been 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. One small student class research project (CHS-5110L) was completed in this area during the 1995-96 year. As indicated above, some of this work has supported the preliminary efforts for design of a prompt gamma analysis facility. It had been hoped that a master=s level student would be able to bring this program to fruition during the last year, though data to date has been sufficient to support continued plasma kinetics research for the space power reactor program at the University of Florida and for research on radiation effects on dielectric materials for a researcher at Florida State University. Further work is needed to support interests expressed by several users in performing radiation damage studies on electronic components, including one group at the University of Florida. This work is also needed to support the planned UFTR HEU-to-LEU fuel conversion and may be needed for any BNCT-related work.

Other significant facility enhancements implemented during the 1993-94 year resulted from the DOE Instrumentation Grant to include the boroscope, the lead blankets and the ultrasonic flow meter as well as a freeze dryer for the analytical laboratory. Another enhancement has been in the NAA Laboratory facility for the installation of an automatic sample changer, developed as part of a senior project. At the end of the 1989-90 reporting year, the device was completed but would only change a single sample. During the last five years, the timing circuit and computer software system have been in the process of being modified and redesigned to provide a fully automated sample changer to allow counting multiple samples without technician attention. This improvement promises to improve laboratory throughput and assure the laboratory remains competitive with other facilities but is not yet ready for implementation at year's end as the facility depends on the NRE Department electronics engineer support group for this work. 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 1990-91 year to improve the speed with which analysis is performed. Enhancements in the NAA Laboratory facility during the 1991-92 reporting year included a new spectroscopy system and the external multi-channel buffer to speed data processing. Finally, the implementation of a low background integral lead shield has greatly improved sample counting efficiency as well as reduced counting time and improved element sensitivity. During the 1992-93 reporting year the biggest enhancement in the NAA Laboratory was the acquisition of a complete new spectroscopy system to include the detector and integral shield assembly as well as the computer-based analyzer to give two such systems. During the 1993-94 year, the biggest improvements were the freeze dryer and the new tile floor for appearances. During the 1994-95 year, the biggest improvement was the overhaul and modifications

to upgrade the rabbit system. Technically, however, the ongoing work to implement a full-scale quality assurance program for laboratory data begun in the 1993-94 year was continued with good progress during the year and is the most significant laboratory improvement for the long term, though the loss of one long time and one newer NAA Laboratory worker, the second except for occasional consulting work, severely restricted NAA Laboratory improvements during the 1995-96 year. The upgrading of one of the NAA Laboratory computer systems plus upgrading of the upstairs (secretary) computer system promises to promote the processing of samples in the laboratory as a new NAA Laboratory worker was being sought to supplement the one remaining part-time worker. Replacements were identified and training conducted early in the 1996-1997 reporting year but these workers were lost late in the year with new personnel in place again near the end of the reporting year requiring still further training.

Laboratory upgrades during the 1996-1997 report year included continued work on the Quality Assurance Program as one project neared completion by a student now employed by the Department of Energy. In addition a complete new Pentium II based computer system was implemented late in the reporting year along with newly released ORTEC software for performing gamma spectroscopy along with a complete library of gamma ray energies and other software to modernize laboratory analysis and generation of reports. Finally, the facility obtained fourteen (14) new self-reading dosimeters with a self-powered charger to allow dosimeters to be assigned to all visitors in most classes visiting the facility to facilitate the educational experience.

All of these improvements increase laboratory throughput while enabling facility staff to spend more time addressing experiment design as well as student and faculty training. These improvements will further enhance the reputation of the facility and our effectiveness in serving

users of the facility, not only for University of Florida students and researchers but also students and faculty from other educational institutions as part of the Reactor Sharing Program as well as for occasional industry users.

C. Staffing Considerations

After the loss of the full time SRO/Reactor Manager and the Acting Reactor Manager for all but consulting purposes in the 1990-91 year, two new part-time student SROs were licensed early in the 1991-92 reporting year. As a result, staffing conditions during the 1992-93 year were generally supportive of the considerable broad-based increases in facility usage for education and training of students as well as research by faculty at the University of Florida and other schools. Nevertheless, all staff personnel had been part-time employees, which always necessitates detailed planning for some usages of the facility. Near the end of the 1992-93 reporting year, one of the new SROs was appointed as a full-time Reactor Manager and a new student part-time SRO-trainee hired in the previous year was near to being licensed to further alleviate personnel problems. This full-time SRO/Reactor Manager was available for the full year with the new SRO licensed and certified in February 1994. One long time part-time RO fully retired and relinquished his license in June 1994. For the 1994-95 reporting year, the full-time Reactor Manager was maintained for the full year as were two part-time SROs, though one had a much reduced work schedule. With the part-time personnel availability combined with careful planning of activities, impact on facility operations by availability of licensed operators was minimized during the 1994-95 reporting year resulting in the relatively high usage numbers for that year.

For the 1995-96 reporting year, the full-time Reactor Manager was available until his resignation effective August 9, 1996 to go to medical school. Unfortunately, his efforts to complete

his Master's degree plus family illness during the 1995-1996 year restricted his availability somewhat as one new part-time SRO-trainee was hired in January 1996 and was nearing completion of his training at the end of the 1995-1996 reporting year. Operations staffing was considerably improved midway through the 1996-1997 reporting year with the hiring of one part-time SRO to be the interim full-time Reactor Manager upon his graduation in early December 1996. Overall, personnel availability was barely acceptable during the year though the biggest limitation was trained personnel for the NAA Laboratory. The new- hire operator trainee was finally licensed and certified in March 1997. Unfortunately, with the loss of the interim full time manager, as of March 28, 1997, the situation reverted to that present at the beginning of the reporting year. It is hoped to hire several part-time personnel as operator trainees in the new year to alleviate the restrictions on operators. As the new NAA Laboratory personnel are trained, the availability of both types of personnel should improve in the next reporting year.

D. Administrative Commitment of Resources

Activities in response to NRC regulations as well as various efforts to maintain facility compliance and responsiveness occupied significant facility management and staff time during the reporting year. Previously a health physics/emergency response emphasized inspection in May 1996 by two inspectors, the facility was cited for one violation for failure to submit annual reports to meet Technical Specification time limitations and an inspection follow-up item was opened concerning updating the Emergency Plan agreement letters. NRC Inspection Report No. 50-83/96-01 dated June 21, 1996 and the facility's reply to the notice of violation dated July 19, 1996 are contained in Appendix E of the 1995-1996 annual report along with documentation of NRC acceptance of the reply.

As a result of the Notice of Violation, UFTR management also submitted a request for Technical Specification Amendment 21 allowing two additional months for submission of a routine annual report covering the activities of the reactor facility during the previous calendar year. The request was submitted by letter dated August 2, 1996 as contained in Appendix A of the 1995-1996 report with no response from NRC by the end of the reporting year on August 31, 1996. In a letter dated October 10, 1996, the NRC issued license Tech Specification Amendment 21 which was implemented in October 1996. The NRC letter with attachments approving the Amendment 21 including the Safety Evaluation Report is contained in Appendix A of this report.

Though there was no visit by NRC resident inspectors from Crystal River this year, the facility did receive one NRC inspection during the reporting year. During an operations/ health physics-emphasized inspection this year in June/July 1997, the facility was cited for no violations. The violation concerning annual report submissions and the follow-up item on Emergency Plan Agreement Letters were able to be closed out with this June/July 1997 inspection per NRC Inspection Report 50-83/97-201 which is contained in Appendix H of this report. In addition, the facility did receive one non-cited, facility-identified violation for failure to have licensed operators undergo physical examinations within the required two year interval. To implement corrective action for the non-cited violation, the semiannual check of the requalification training program records (S-12 Surveillance) was amended to include an additional check of the status of physical examinations for all operators.

During the 1996-1997 reporting year, the facility also submitted a request for Technical Specification Amendment Number 22 to delete references to submitting reports to NRC Region II since all NRC inspection and licensing functions for non-power reactors are now controlled and

directed from the Non-power Reactor Directorate at NRC Headquarters in Rocksville. In addition, Amendment 22 requests updating the Technical Specification to reflect the name change of the Nuclear Engineering Sciences Department to the Nuclear and Radiological Engineering Department which is a name change only for the same entity remaining in the UFTR administrative structure. The request for Amendment 22 was submitted by letter dating August 21, 1997 as contained in Appendix B of this report with no response from NRC by the end of the reporting year on August 31, 1997.

The total time devoted to NRC communications was similar or even higher than most previous years especially with one promptly reportable event occurring during the 1996-97 reporting year for a potential Tech Spec violation to include the improper calibration of the stack radiation monitor discovered on January 13, 1997 with a final report on the occurrence and corrective action submitted with a letter dated January 27, 1997 as contained in Appendix F. Some time was also spent to submit Revision 10 to the UFTR Safety Analysis Report in March 1997 as contained in Appendix C and to develop and submit an extensive Revision 10 to the Emergency Plan which was submitted in April 1997 but only approved based on the facility submittal by NRC letter dated August 22, 1997. Since the approval was not received until August 28, 1997, Emergency Plan Revision 10 will be implemented early in the next reporting year. A renewal of the Operator Requalification and Recertification Training Program with several minor changes was also submitted in May 1997 and approved by the NRC in a letter dated July 9, 1997. In addition, the SNM-1050 Spent Fuel License (Storage Only) had previously been renewed on June 8, 1995 for five years after a submittal in the previous year was updated in May 1995 following a visit by NRC NMSS licensing representatives to check out the SPERT fuel (SNM-1050) storage facility so there was no work in this area except

to answer questions on occasion.

Though no new Standard Operating Procedures (SOP's) were generated during the year considerable administrative efforts were involved in developing procedure revisions in response to staff review of procedures, with three revisions of SOP-A.1 (Pre-operational Checks), SOP-B.4 (Flood) and SOP-C.3 (Fuel Inventory Procedure) implemented during this reporting year. However, considerable effort was also expended in making twenty-nine minor changes (temporary change notices) to a total of twenty-one different procedures to correct minor errors or update changes to assure consistency in the procedure manual especially based on the Biennual Evaluation of the UFTR Standard Operating Procedures (B-4 Surveillance) completed near the end of the reporting year.

The documentation for NRC approval of UFTR Technical Specifications Amendment 21 is in Appendix A of this report. The documentation submitted for UFTR Technical Specification Amendment 22 is in Appendix B of this report. The UFTR Safety Analysis Report Revision 10 documentation is in Appendix C. Copies of the three revised standard operating procedures are in Appendix D. The documentation for Emergency Plan Revision 10 to include the NRC approval letter subject to verifying no decrease in effectiveness is contained in Appendix E. The submitted documentation for the revised Requalification and Recertification Training Program and NRC approval letter are contained in Appendix F. The 14-day report for the potential tech spec violation for failure to properly calibrate the stack radiation monitor is contained in Appendix G while the documentation for NRC Inspection Report No. 50-83/97-201 is in Appendix H.

No additional time was spent updating the estimated cost of decommissioning to meet the new requirements of 10 CFR 50.33 and 50.75 first promulgated in the 1990-91 reporting year. As

required, the updated cost was produced and documented in a memorandum dated August 28, 1996 to the UFTR Decommissioning Information File showing the estimated decommissioning cost had been increased to $2.437 million at the end of the reporting year and a new update was pending as the 1996-97 year ended. These special responses to and communications with NRC were in addition to the usual information supplied periodically via telephone calls, these include the quarterly safeguards reports, the updated HEU to LEU Conversion Proposal submitted in March 1997 to meet the requirements of 10 CFR 50.64(c)(2), as well as the responses to several NRC advisories, to NRC movement of Region II offices and to the movement of non-power reactor inspection activities to the NRC Non-power Directorate in Rockville. In general, these various submittals and communications with NRC resulted in a commitment of as much time in the 1996-97 reporting year as in most previous years.

Other regulatory agencies also affected the UFTR in the reporting year as there was an inspection by the fire marshal and by American Nuclear Insurers (ANI). A response to ANI was required to show the facility will control and store its records with a commitment made to assure ANI that a separate facility subject to fire protection will be utilized in the adjacent Nuclear Sciences Center. Considerable time was also spent to follow-up the annual facility audit by the Reactor Safety Review Subcommittee and to respond to the annual laboratory safety survey by the University Environmental Health and Safety Division.

During the 1996-97 reporting year, some effort was spent in following up the decision made not to utilize the pin type SPERT fuel for conversion of the UFTR from HEU to LEU fuel. Efforts continued to arrange shipment of this unneeded fuel to a secure DOE facility like Oak Ridge National Laboratory without success as the Department of Energy apparently has no room for the

SPERT fuel. 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 past year. Since it was not, the hope is now to do so in the next reporting year since the QA Program was renewed in October 1992 effective for five years. In addition, with the previous completion of static neutronics calculations and production of a Master=s project, as well as near completion of thermal hydraulics analysis as a 14-plate fuel bundle of standard silicide fuel plates was selected as the final design for the LEU core, the thermal hydraulic analysis was essentially completed during the 1992-93 year. Some calculations remain as does documentation of proper evaluation of selected fuel design as well as generation of a final report. Another extension for the submittal of the safety analysis to NRC was noted in the proposal submitted in March 1996 to NRC. One other area requiring considerable time was for partial review of the final fuel drawings and other EG&G Idaho design documents. The unique difficulties involved in trying to check the UFTR core and sub-core connections and dimensions due to the unstacking of shielding and the removal of fuel requirement may necessitate making a complete dummy core. Finally, two years ago, on May 31, 1994, the submission was made for storage-only renewal of the SNM-1050 license which involved considerable effort to prepare; even more effort was required during the 1994-95 reporting year before the storage-only license renewal was approved on June 8, 1995 for five years as contained in Appendix F of the 1994-95 annual report.

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 continuous efforts to update the UFTR SAR and the Emergency Plan will continue as will review and evaluation of SOPs and other facility documents. A revision of the Security Plan will also be submitted early in the next

reporting year. 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. It is planned to use a visiting professor in this next year to produce the amendment package. 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 likely be reduced but may even be increased during the next reporting year though directed to somewhat different areas in some cases.

The considerable test, maintenance and surveillance activities required by the facility license, Technical Specifications and other regulatory requirements also contributed significantly to usage and personnel commitments. Details on these surveillance and maintenance usages are presented in Section V of this report, while any associated modifications or evaluations of potential unreviewed safety questions are tabulated in Section IV. This contribution has been considerably increased from the last reporting year with several significant outages, especially those related to the failed compensated ionization chamber and the failure of the shield demineralizer system pump with the forced outages for these two occurrences accounting for close to 100 days during the year, and despite elimination of some previously recurring problems such as console two-pen recorder and blade position indicating system failures. The total outage time spent on maintenance activities is significant and larger than in any recent year, especially for addressing replacement of the compensated ionization chamber in September-December 1996 (72 7/8 days), for addressing replacement of the failed shield tank demineralizer system pump (20 7/8) and for addressing the

failed primary coolant level trip switch (2 ¾ days). Most of these outages were lengthened in part because of unavailability of personnel to address the failure on a full time basis. There was also considerable "planned" unavailability throughout the year for completion of roof work (4 ¾ days) as well as for completing the annual calibration check of the nuclear instrumentation (A-2 Surveillance) in March 1997 (10 days). It should be noted that there was no outage time due to failure of the blade position indicating (BPI) system following implementation of a modification to install light emitting diodes for the BPI circuits in the 1993-94 year. There was also significant time spent on corrective and much preventive maintenance and surveillances with most problems not recurring to demonstrate effective corrective action for most failures.

E. Facility Summary Overview

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

The description of various projects associated with the UFTR is given in Section VIII; the

listing of projects continues to be quite extensive. Although several projects are listed without having associated reactor use, all had some level of staff and/or facility involvement during the year. The same is true of the list of publications and reports associated with the UFTR; the listing given in Section IX of this report is not intended to be all inclusive but 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 eleven reporting years (1986-1997). The Reactor Sharing Program began in late 1983 and is directly responsible for the generation of a number of these proposals. As more of these proposals are submitted and funded, further increases in UFTR usage can be expected. In any case, on-campus research and service usage of the UFTR is also increasing because of the visibility generated via the Reactor Sharing Program. Each year more faculty utilize the reactor for a significant class-related usage or a research project. Continuity of Reactor Sharing Program funds but at a decrease for the next year after an increase for 1995-96 and then a decrease in 1996-1997 provides a challenge to the facility to increase external usage especially since the full-time permanent Reactor Manager resigned near the end of the year on August 9, 1996 to enter medical school and a full-time interim Reactor Manager hired in December 1996 resigned on March 28, 1997. In general, the level of interest in the facility is high though expanded on-campus usage for funded research is a continuing objective. Nevertheless, the role of the facility in attracting quality high school students to seek careers in science and engineering at the University of Florida should not be ignored.

Finally, it is hoped that more direct industry training will be accomplished in the upcoming year. The last such usage was nine years ago and none is scheduled for next year; 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 DOE Instrumentation Program funding and possible research funding from other agencies, expansion and diversification in facility usage are realistic expectations and could be significant, especially if an increased number of licensed Senior Reactor Operators can be realized during the next reporting year. Implementation of a prompt gamma facility is perhaps two years away but it too could make a significant impact on usage as several individuals would like to use such a facility. Some interest in using beam time for research related to boron neutron capture therapy has been expressed by several on-campus researchers and by one off-campus company so this is a real growth possibility.

The expectations for the 1997-98 reporting year are positive. Significant opportunities for expanded education and research usages are apparent. The possibilities for continued growth in existing and new program areas are a challenge that must be addressed vigorously in light of having no permanent Reactor Manager and the loss of much part-time graduate student expertise in the NAA Laboratory. Nevertheless, with sufficient support, there is no limit to possibilities for growth in facility usage.

II. UNIVERSITY OF FLORIDA PERSONNEL ASSOCIATED WITH THE REACTOR

A. Personnel Employed by the UFTR

W. G. Vernetson	-	Associate Engineer and Director of Nuclear Facilities and Senior Reactor Operator (September 1996 - March 28, 1997)
	-	Associate Engineer and Director of Nuclear Facilities and Acting Reactor Manager (March 29, 1997 - August 12, 1997)
D. Cronin	-	Student Senior Reactor Operator and Acting Reactor Manager (1/2 time) (September 1, 1996 - December 1996)
	-	Senior Reactor Operator and Acting Reactor Manager (full-time) (December 1996 - March 28, 1997)
J. Powers	-	Student Technician and Senior Reactor Operator Trainee (1/3 time) (September 1996 - March 1997)
	-	Student Senior Reactor Operator (1/2 time) (February 27, 1997 - August 12, 1997)
	-	Student Senior Reactor Operator and Acting Reactor Manager (1/2 time) (May 30-June 5, 1997; June 18-19, 1997; July 18-22, 1997; July 26-August 10, 1997; August 13-31, 1997)
J. Wolf	-	Student Senior Reactor Operator (1/10 time) (September 1996 - August 1997)
J. Harrison[1]	-	Student Radiation Control Technician (1/3 time) (September 1996 - December 1996)
R. Widargo	-	Student Technician/Radiation Control Technician (1/4 time) (September 1996 - August 1997)

[1]As of January 1996, J. Harrison worked in the NAA Laboratory but remained qualified and occasionally served as a radiation control technician until his resignation in May 1997.

Personnel Employed by the UFTR (continued)

B. Uhlmer	-	Student Technician/Radiation Control Technician (1/30 time) (June 1997 – August 1997)
D. Seifert	-	Secretary (1/2 time) (September 1996 – August 1997)

B. Radiation Control Office

D. L. Munroe[2]	-	Radiation Control Officer (September 1996 – August 1997)
C. Guincho	-	Radiation Control Technician (September 1996 – August 1997)
C. Wells[3]	-	Nuclear Technician (September 1996 – August 1997)
B. Beck[3]	-	Nuclear Technician (January 1997 – August 1997)
J. Scaglione[3]	-	Nuclear Technician (September 1996)

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 such as fuel inspection activities or core area maintenance activities. 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, especially when entry into the core area is required.

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[2]The specified alternates for the Radiation Control Officer position are Ms. K. Hintenlang and Mr. G. Rawls.

[3]C. Wells, B. Beck and J. Scaglione had relatively low involvement with UFTR activities in their role as nuclear technicians for the Radiation Control Office.

C. Reactor Safety Review Subcommittee (RSRS)

M. J. Ohanian	-	RSRS Chairman (Associate Dean for Research and Administration, College of Engineering, and Professor, Department of Nuclear and Radiological Engineering)
W. G. Vernetson	-	Member (Director of Nuclear Facilities)
J. S. Tulenko	-	Member (Chairman, Department of Nuclear and Radiological Engineering)
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 and Radiological Engineering
W. G. Vernetson	-	Director of Nuclear Facilities (September 1996 - August 1996)
D. Cronin	-	Acting Reactor Manager (September 1, 1996 - March 28, 1997)
J. Powers	-	Acting Reactor Manager (May 30-June 5, 1997; June 18-19, 1997; July 18-22, 1997; July 26-August 10, 1997; August 13-31, 1997)

E. Line Responsibility for the Radiation Control Office

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

III. FACILITY OPERATION

The UFTR continues to experience a high rate of utilization as total utilization continues at or near the highest levels recorded in the early 1970's in most areas; some indicators are up, some down for the year but with good results considering reduced availability of licensed operations staff during the reporting year as well as a relatively high forced outage rate. This continuation of a high rate of UFTR facility usage has been supported by a variety of usages ranging from research and educational utilization by users within the University of Florida to research, educational and training utilization by users around the State of Florida through the support of the Department of Energy Reactor Sharing Program with over half of the costs of this latter usage not covered by Reactor Sharing. Again this year, several externally supported usages have also continued to impact reactor utilization and support the continued diversification of facility activities and capabilities, especially through the hiring of part-time laboratory assistants for support work in the analytical laboratory and to provide funding for facility improvements. For the third year in a row, however, there was no Department of Energy Instrumentation Grant to provide support for instrumentation upgrades during the year.

As noted over the last twelve years, the continuing 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 twelve years. Implementation of the standard rabbit capsule size with larger carrying capacity, the subsequent additional implementation of two state-of-the-art PC-based spectrum analyzer systems with complete ORTEC software packages for spectrum analysis and data reduction, the installation of an independent sample and standards drying facility as well as improved shielding around the pneumatic sample insertion (rabbit) system are all improvements that have been key factors in supporting facility usage by assuring an easier and faster turnaround of samples submitted to be irradiated for Neutron Activation Analysis.

The experimental neutron radiography facility was also upgraded during the 1988-89 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 reached a level of mature application with much reduced installation time and more reliable results. Not only has it been used for several demonstrations, exercises and experiments for university classes, as well as for visitors from other educational institutions (Reactor Sharing) and for two senior projects to document implementation, but, perhaps more significantly, it has been used extensively for one externally funded user with reasonably consistent results over the past few years. Further improvements were implemented in the radiography facility during the 1990-91 reporting year to improve the beam quality in an attempt to reduce the exposure times needed for various types of radiography with further improvements planned to improve beam quality, reduce installation time and standardize exposure

time during the upcoming year. This work was at a much reduced level in the last five years due to the need for funding to support the effort as well as efforts to train new personnel in radiography techniques which were completed during the 1994-95 reporting year as a number of good quality radiographs were obtained.

During the 1989-90 reporting year, a senior project was completed to design an automatic sample changer for the NAA Laboratory. This device had been partially implemented but its timing circuit would only allow it to insert a single sample. During the 1992-93 reporting year, plans were finally implemented to redesign the timing circuit to provide a fully automated sample changer to eliminate technician time to change samples overnight, thereby greatly increasing the sample throughput in the analytical laboratory. This redesign is only partially complete at year's end as the effort has been refocused to complete software development for the attached computer system and to redesign the segmented shield for this detector to assure samples are properly counted and the data stored for later analysis. This effort was nearly complete in the 1995-96 reporting year but with no work effort during this reporting year some work remains to be completed on the timing circuit to make the software and the sample changer compatible.

During the 1990-91 reporting year, the new ORTEC software package (OMNIGAM) was implemented in the NAA Laboratory. This software package enabled the laboratory to produce efficient and accurate reports on trace element analysis of many different sample matrices.

During the 1991-92 reporting year, further NAA Laboratory improvements were made. First, additional storage capacity was obtained for the laboratory computers to improve the speed with which analysis is performed along with a new monitor to replace a failed one. A 92X Spectrum Master spectroscopy system was obtained to provide computer-controlled gamma spectroscopy with user friendly, yet sophisticated capabilities. A model 919 Spectrum Master multichannel buffer was also obtained for high performance data acquisition in nuclear spectroscopy applications. It interfaces with a personal computer and up to four (4) HPGe detectors for data processing, giving the laboratory the capacity for future expansion. An analysis upgrade package was also obtained. The SyncMaster 3 is a key multifaceted analysis upgrade package to provide extensive graphics capabilities, high resolution, easy-to-read commands, and the ability to alternate back and forth between programs during analysis. The most important was an integral shield for one of the PC-based detector-analyzer systems to improve the sensitivity that can be reached in analyzing samples by reducing interferences from external radiation sources, lowering detection limits and reducing counting time. In addition, a desiccator station was obtained for the NAA Laboratory as a donation from another researcher to increase the capacity to store both standards and samples with the added assurance of preventing moisture intrusion. All of these improvements were designed to increase laboratory throughput while enabling laboratory workers to address experiment design, improve student laboratory experiences and generally assure better results with optimal effort.

Several other significant items were also obtained in the 1991-92 year to include an electronic maintenance repair tool kit which has saved hundreds of hours of maintenance effort over the past three years as well as a high speed chart recorder to facilitate time allocated to

several surveillances. Acquisition of a portable neutron-sensitive survey meter has also reduced delays when the previously borrowed instrument was not available.

During the 1992-93 reporting year, a new area radiation monitoring system as well as a new multipoint temperature recorder were obtained under a DOE Reactor Instrumentation Grant. Both are still in the process of being prepared for installation at year's end though on a delayed schedule since previous repairs on these systems have resulted in near zero outage time attributed to these systems in the 1994-95 through 1996-97 reporting years. In addition, a new telescoping high dose rate survey instrument as well as a MicroR low level survey instrument were obtained under the same DOE grant, the first to replace a frequently failing teletector, the second to provide in-house environmental survey capability. Other acquisitions and facility improvements in the 1992-93 reporting year included asbestos removal and installation of a new main air handler in the reactor building, installation of a touchtone telephone in the Emergency Support Center plus the delivery and implementation of a complete new detector system in the NAA Laboratory including an HPGe detector, integral shield, PC-based analyzer and complete software package. This acquisition gives the NAA Laboratory three detector systems, though one is in need of replacement. Finally, a staff computer for use by the Reactor Manager was obtained to simplify report generation.

Additional improvements during the 1993-94 year included development and implementation of a spill kit for addressing radiological contamination incidents to include training, partial implementation of a used whole body counter for the UFTR Bioassay program developed in draft form as well as acquisition of a new nimbin and implementation of a NaI well detector for spectral analysis training and demonstrations in the analytical laboratory as well as reinstallation of a HPGe detector following rework at ORTEC. Old asbestos-based tile was removed from the entire NAA Laboratory facility and replaced with new tile as part of the University's continuing effort to preserve facilities. Equipment acquired and implemented through another DOE Instrumentation Grant included a boroscope to reduce dose for UFTR fuel and control blade inspections, lead blankets to limit dose rates at key points around the facility and a freeze dryer for processing samples in the NAA Laboratory without losing volatile trace elements. Finally an ultrasonic flow meter was also acquired with plans to implement it as part of the UFTR Nuclear Instrumentation Calibration Check and Calorimetric Heat Balance in the next reporting year, though this has not yet occurred.

Although there was no DOE Nuclear Instrumentation Grant for the 1994-95 reporting year, a number of significant facility improvements and upgrades were implemented during the reporting year. Implementation of the new AMS^4 air particulate detector obtained through DOE support in the previous year was finalized near year's end after attaching a computer printer, establishing DAC levels and incorporating its operation into facility procedures. Other significant upgrades and improvements included obtaining and implementing several simple, scaler-based GM counting systems for use with classroom and tour groups in performing half-life measurements which have been supporting a popular classroom/laboratory experimental exercise in measuring half-lives for nearly three years. In addition, two HPGe detectors were returned to ORTEC for refurbishment and have been operating well subsequently. The poster session display board depicting the research project involving trace element analysis of cannabis sativa samples to

support a legal case was mounted in the laboratory access area to provide a unique source of discussions with visitor groups at all levels. Finally, following several tube failures the rabbit system was subjected to a major overhaul and modification to replace old tubing, to upgrade the exhaust fan for increased flow and to upgrade the HEPA filter system to assure long-term implementation of this experimental facility.

During the 1995-96 reporting year, one of the NAA Laboratory computers and the upstairs office (secretary) computer were upgraded. The upstairs computer will now run common windows compatible software such as WordPerfect 6.1 for Windows and Quattro Pro 6.0 for Windows.

During the 1996-97 reporting year, additional facility upgrades were implemented. First, the NAA Laboratory hardware used for neutron activation analysis was upgraded in July 1997. A Gateway 2000 G-5 200 computer was purchased. This computer has a 3.7GB hard drive and a 200-MHz pentium processor. The software installed includes Windows 95, Microsoft Office 97, Microsoft Bookshelf, and McAfee Virus Scan. Software was also ordered from EG&G ORTEC to update the older software being used in the laboratory. New Gammavision software, the software used to determine and analyze NAA spectra, was also purchased. This software allows for more accurate and efficient analysis, and increases the proficiency and throughput of the lab. Software that includes a complete chart of all of the elements and each isotope was also installed on the computer. This nuclide library allows for quick access to all of the radionuclide half-lives, the energy of the gamma rays emitted by each, the neutron cross sections for each and the naturally occurring abundance. The computer was received on July 18 with the software received on August 11, 1997. Both the computer and the software are operational at the end of the 1996-97 reporting year. All of the upgrades will lead to a smoother running laboratory and better overall performance for production of trace element analysis. The larger monitor is especially useful for demonstrations for class and group presentations in the NAA Laboratory.

In addition, the facility was supplied with fourteen 0-200 mR self-reading pocket dosimeters (SRPDs) plus a hand-held self-powered charger in June 1997. All fourteen SRPDs were checked for calibration in June and are now in use at the facility making it possible to give nearly every class visitor a personal dosimeter for more interactive utilization of the facility.

With the continued support of the DOE Reactor Sharing Program in the 1994-95 reporting year (at a significant 24% reduced level from the 1993-94 grant year), there was continued significant usage by a wide variety of users from a broad spectrum of schools for educational as well as research purposes; again, several proposals for separate research funding were in progress. Despite the large reduction in funding, significant and even increased usage in some areas was undertaken under Reactor Sharing. During the 1994-95 reporting year, there was also continued reactor usage for both educational and research programs sponsored by the University of Florida but spurred by Reactor Sharing users. In 1992-93 one relatively large funded project from the Endodontics Department in the Dental School completed utilizing the reactor and NAA Laboratory to examine mercury content of laboratory rat brain and kidney tissues following bone implantation of mercury amalgam. Another smaller project in the pharmacology department continues to use the UFTR to generate radioactive copper-64 for calibration of its positron-emission tomography

(PET) scanner. Indeed, a second scanner obtained in late 1996 has resulted in more frequent need for copper-64, especially for research purposes. New funded projects for the 1993-94 year included activation analysis to determine the role of citrates containing metabolite in the genesis of renal calculi for a researcher at Shands Hospital, trace element analysis of cannabis sativa plant tissues to support a criminal prosecution in Polk County, Florida, plus trace element analysis of NiA1 alloys for materials science researchers serving as expert witnesses at the University of Florida.

In the 1994-95 reporting year, research on benchmarking and implementing a Quality Assurance Program in the NAA Laboratory proceeded at a good pace. Other new research programs included NAA on rare earth materials (Dy_2O_3, Dy and In_2O_3) for isotope identification in tracing weapons effects for the Armed Forces Radiobiology Research Institute. Other projects included continuing analysis of zeolite and then carbonaceous supports for the Chemistry Department as well as a number of new Reactor Sharing projects including analysis of Gulf of Mexico sediments for Dr. John Trefry at the Florida Institute of Technology and NAA on geological quartz for Dr. Roy Odom's group at Florida State University for an EPR Dating project. The research area shows several other projects with proposals awaiting funding and/or demonstration of feasibility using UFTR facilities including one at the University of Miami to look at surface water contaminants. Many other projects were undertaken to determine feasibility. There were also several commercial research irradiations and related projects in that year with one utilizing the radiography facility and beam transmission facilities for over 40 hours.

In the 1995-96 reporting year, the benchmarking and implementation of a Quality Assurance Program continued, though at a slow pace due to loss of laboratory personnel and the need to train new personnel. The University of Miami project to look at surface water contaminants was finally begun. In addition, several projects were undertaken for the Chemistry Department including continuing analysis of zeolite plus other new seed projects to look at filtered particulates from a controlled salt water environment, analysis of prepolymer precursor material for tin content and trace element analysis of silicon nitride samples. A large student project was also begun to perform trace element analysis of Lake Alice sediments. Again, there was one commercial research project to utilize the beam transmission facilities for over 25 hours and the production of copper-64 for the hospital positron-emission tomography (PET) scanners continued periodically. When combined with the computational analysis capabilities for NAA, it had been hoped more such usages would be forthcoming during this last year to complement UFTR research and educational utilization activities whether supported by the University of Florida, Reactor Sharing or externally funded sources.

In the 1996-97 reporting year, loss of NAA Laboratory personnel and the need to train new personnel limited efforts in implementation of a Quality Assurance Program though some work was accomplished by visits of a part-time student working on a project. This work will serve as a good basis for the NAA Laboratory QA Program.

In addition, the University of Miami project was brought to an interim stopping point. Again, several seed projects were undertaken for the Chemistry Department as some trace analysis was performed on silicon nitride samples and on zeolite samples. A funded project was conducted

for the Armed Forces Radiobiology Research Institute (AFRRI) reactor facility to determine detection limits for dysprosium and other rare earth metals and look at trace elements in wood and lead samples. Another project was conducted to look at prehistoric manganese secretions for assessment of the Cactus Hill Archeological Site in Virginia. Some discussions were held for possibly conducting some tests using UFTR beams for BNCT-related research, but this is only in the discussion stages as yet. Again, there was one commercial research project to utilize the beam transmission facilities for over 30 hours and the production of copper-64 for the Shands hospital positron-emission tomography (PET) scanners continued at an increased rate (over 40 usage hours) as they acquired a new machine and conducted research on it periodically. When combined with the computational analysis capabilities for NAA, it is still hoped more such usages will be forthcoming during this next year to complement 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. The facility received only one NRC inspection during the reporting year, an operations and health physics inspection on June 30-July 3, 1997, where the only facility violation was for a non-cited violation due to licensee self-identification of the failure to have operator physical examinations within the required two-year period (See Appendix H). Some considerable administrative effort was expended to update the surveillance data sheet for the Semiannual Review of Requalification Program Training Binders (S-12 Surveillance) which was expanded to track annual physicals for operators as discussed as acceptable with the NRC inspector. There were also a number of suggestions on improving operations that were addressed and involved some considerable facility manpower to implement. Previously, in the 1995-96 reporting year, there had been one NRC inspection where the facility was cited for one Level IV violation for failure to submit annual reports in a timely fashion. As a result, the facility developed Technical Specification Amendment 21 to allow a longer time to submit annual reports. This submittal was finally approved with NRC documentation dated October 10, 1996 and received on October 15, 1996 (see Appendix A). During the June/July 1997 inspection, this violation for failure to submit annual reports in a timely fashion was finally closed out. In addition to receiving approval for Tech Spec Amendment 21 and implementing it, the facility also developed Tech Spec Amendment 22 submitting it by letter dated August 22, 1997, to update the name of the Nuclear Engineering Sciences Department to the Nuclear and Radiological Engineering Department and to delete requirements for submittals to NRC Region II since all submittals are now sent to NRC Headquarters to the Document Control Desk (see Appendix B). There has been no approval from NRC on Amendment 22 at year's end. In addition to this, the facility also submitted and implemented a small Revision 10 to the UFTR Final Safety Analysis Report (see Appendix C) as well as submitting an extensive Revision 10 to the Emergency Plan in April 1997 and finally received tentative approval by NRC letter dated August 22, 1997 (see Appendix E). A slightly revised Requalification and Recertification Training Program was submitted in May, 1997 with approval by NRC letter dated July 9, 1997 (See Appendix F). In addition, Revision 14 of the Physical Security Plan was in preparation at year's end. All this administrative effort involved considerable commitments of time and resources.

Activities in response to NRC regulations as well as various efforts to maintain facility compliance and responsiveness occupied significant facility management and staff time during the reporting year. The total time devoted to NRC communications was similar or even higher than most previous years especially with one promptly reportable event occurring during the 1996-97 reporting year for failure to have properly calibrated the stack radiation monitor (see Appendix G). Considerable time was also spent reviewing various other documents including the Emergency Plan for Revision 10 which was submitted with a letter dated April 10, 1997 with the NRC's noncommital acceptance of it received on August 28, 1997 with a letter dated August 22, 1997. Revision 10 will be implemented and distributed early in the next reporting year.

Some additional time was also to be spent updating the estimated cost of decommissioning to meet the new requirements of 10 CFR 50.33 and 50.75 first promulgated in the 1990-91 reporting year. However, the updated cost was not produced and documented during the reporting year as this is one of the surveillances carried over to be completed early in the next reporting year with information distributed to the UFTR Decommissioning Information File showing the estimated decommissioning cost has been increased above the previous $2.437 million. These special responses to and communications with NRC were in addition to the usual information supplied periodically via telephone calls, the posting of information advisories, the quarterly safeguards reports and the updated HEU-to-LEU Conversion Proposal submitted in March 1997 to meet the requirements of 10 CFR 50.64(c)(2). With the submission of one 14-day report on the improper stack monitor calibration in January 1997, the commitment of time and resources to address NRC requirements has been at least as extensive in the 1996-97 reporting year for responses and communications with NRC as in most previous years, especially with the posting of frequent advisories and the NRC periodic requests for various kinds of information to support its licensing and inspection function, especially for movement of the Region II offices and the movement of all non-power reactor inspection and licensing functions to the NRR Non-Power Reactor Directorate in Rockville, Maryland.

Other regulatory agencies also affected the UFTR in the reporting year as there was an American Nuclear Insurers inspection in May 1997 requiring a response as well as the annual RSRS audit in March 1997 and an annual safety survey by an inspector from the Environmental Health & Safety Division as well as a DOE Funding Submittal Information survey and several DOE fuel surveys.

During the 1992-93 reporting year, considerable effort was spent in following up the decision made some four years earlier not to utilize the pin type SPERT fuel for conversion of the UFTR from HEU to LEU fuel; this SPERT fuel is now stored in a westerly room attached to the Nuclear Research Field Building. In the 1993-94 reporting year and again in 1994-95, this effort was reduced to about 70 hours though some administrative effort was expended in attempting to arrange shipment of this unneeded fuel to a secure DOE facility like Oak Ridge National Laboratory without success. Similar efforts were expended in the previous several years with no success as the Department of Energy apparently has no room for the SPERT fuel and had even requested to be allowed to return 1200 pins temporarily shipped to ORNL in 1990. This latter request was denied in the 1991-92 year as the current storage facility does not have sufficient room for accepting the 1200 pins back. The effort in this area in the 1995-96 year was reduced

to about 55 hours, but this year the effort has involved over 61 hours as several Field Building activities required addressing non-impact on the stored fuel.

After the loss of the student performing the neutronics safety analysis for the UFTR HEU-to-LEU conversion at the end of the 1988-1989 reporting year, there was also considerable management effort involved in training a new student and then rechecking the computational methodology and essentially starting from scratch on the actual core calculations to support the HEU-to-LEU conversion. Although this project had been further delayed, real progress was made in the 1990-91 reporting year in essentially completing the static neutronics calculations based on efforts in the previous year to assure the computational methodology is adequate to analyze the existing core as a benchmark for further calculations. With the previous completion of static neutronics calculations and production of a master's project, efforts during the 1991-92 reporting year were directed toward thermal hydraulics analysis as a 14-plate fuel bundle of standard silicide fuel plates was selected as the final design for the LEU core with near completion of calculations and beginning of the documentation package by one student who left the university. Completion of final calculations and documentation of the analysis for the license submittal has not been completed this year. Another no-cost extension of funding for this work was submitted to DOE during this reporting year. One other area requiring time in 1991-92 was for Eileen Yokuda from EG&G Idaho to visit for two days in December 1991 to see the unique difficulties involved in trying to check the UFTR core and sub-core connections and dimensions due to the unstacking of shielding and removal of fuel required plus review of fuel drawings sent by Ms. Yokuda in August 1992. It now appears a complete dummy core may be necessary to assure the fuel will fit in the core. Little progress was made in this area in the 1993-94 reporting year though potential corrosion problems were identified by Iowa State in April 1993 with new LEU fuel on a close pitch. This corrosion is apparently only a problem when water is dumped off the core and capillary action keeps the plates wetted. The final UFTR conversion fuel drawings were delivered in April 1993 as well but have not yet been signed and returned to DOE as another extension for the submittal of the safety analysis to NRC was noted in the proposal submitted in March 1996 to NRC.

Shown in Table III-1 is a summary breakdown of reactor utilization for this reporting period. The list delineates UFTR utilization divided into seventy-nine (79) different educational, research, training, tests, surveillances and facility enhancement operations and general tour/demonstration and educational activities. The total reactor run time was just over 301 hours while various experiments, surveillances, maintenance and other projects used just over 1943 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 decrease of about 25.1% from last year due primarily to several lengthy outages and the lack of any large research project requiring multiple long irradiations and somewhat to availability of operators, as well as qualified NAA Laboratory personnel; the availability of a full-time Reactor Manager for only about three months in the middle of the year represented a significant administrative and operational burden. The significantly reduced value of run time is in agreement with the low availability of 66.20% as it is considerably below the 1993-94 availability (89.69%), 1994-95 availability (88.15%) and 1995-

96 availability (75.68%), despite continuing to account for lost availability for administrative reasons. Otherwise, the availability value would be up to nearly 68%, still a rather low value.

With the large commitment of administrative activities and the usual large educational component of facility usage not requiring or involving only minimal reactor operation, the value of run time is reasonable. Actually, the experiment time also represents a somewhat smaller decrease of 13.85% without accounting for over 428 hours of concurrent experiment time in a variety of areas. This concurrent time is reduced significantly from last year but about the same as the 1994-95 year and remains one of the higher ever values showing good use of facility personnel when they are available, especially for educational activities, many involving the Reactor Sharing Program. The maintenance of experiment time is primarily attributed to the relatively low reactor availability (66.20%) for the year coupled with all the time applied for maintenance and surveillances plus effective utilization of part-time personnel and expansion of activities involving only part-time use of the reactor as for external educational programs. The sustained level of experiment time is also attributed to continued improvement in record-keeping of project times using the facility or its staff but not the reactor, such as tour groups, and over 61 hours for project work with the LEU SPERT fuel for checks at the Nuclear Research Building including implementing temporary covers for the fuel racks.

With one large forced outage lasting over two months early in the reporting year, the total time spent on maintenance activities related to forced outages is significantly increased due to a number of lengthy outages—especially for three maintenance projects related to efforts to replace a failed compensated ionization chamber by switching chambers, replacing the uncompensated ionization chamber and associated cabling (72⅞ days) during September-December 1996; to replace a failed pump in the shield tank demineralizer system with flow circuit modification (20⅞ days) in July-August 1997; and to replace a failed primary coolant level trip reed switch (2¾ days) in July 1997. Other than these outages, the remainder of the year saw relatively little forced outage time, especially no outages to repair the blade position indicating circuits since the nixie tube circuits were replaced with light emitting diode circuits in the 1994-95 year to correct a large source of outage time in the 1993-94 reporting year. As expected, the work on the blade position indicating circuits has reduced forced outage time significantly in the 1995-1997 reporting years. As also expected, the overhaul and upgrade of the rabbit system along with implementation of the AMS[4] air particulate detector in the 1994-95 reporting year has provided similar reductions in unavailability of the laboratory and/or the reactor in the last two reporting years. In addition, there was much less planned unavailability (16⅝ days) to include 10 days for adjustments and reworking of the annual calibration of nuclear instrumentation in March 1997 and 4¾ days for continued, intermittent roof replacement/repair work throughout the year with final closeout of the project in August 1997.

The significant decrease in run time along with a smaller decrease in experiment time are directly attributable to the combination of relatively low reactor availability (66.20%) for the year coupled with the limited availability of operators despite continued high interest in the usage of the UFTR for education, training, research and service activities. The outlook is somewhat favorable for increased run time in the next year although there is no full-time Reactor Manager

following the resignation of the permanent Reactor Manager as of August 9, 1996 and then resignation of an interim full-time Reactor Manager as of March 28, 1997.

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 many areas and increased in some areas partially limited by unavailability of a full time permanent Reactor Manager for most of the year and overall availability at 66.20% including administrative shutdowns. 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. The donation by Rhone-Poulenc of various vacuum cassettes and gadolinium screens was used effectively during the year to acquire several sets of quality radiographs. Of course, the Reactor Sharing Program is planned to continue to play a key overall support role in encouraging facility usage in all categories as this support has been renewed again, but this time with a decreased level from $30,000 for the 1995-96 reporting year, down to $24,000 for the 1996-97 reporting year and only $22,000 for the 1997-98 reporting year. This decrease is unfortunate considering that the past few years have seen the most diverse facility usage in the last twenty-five years, primarily due to the synergistic effect of the Reactor Sharing Program as it causes others to also investigate usage of the facility. As in the current year, the facility expects to utilize the UFTR facilities for reactor sharing supported activities for well over twice and perhaps three times the usage time covered by program funding at only $24,000 this year; the remainder is essentially an inducement to support future growth in facilities utilization among those who can be made cognizant of its unique capabilities. Indeed, researchers on campus have begun to discuss boron neutron capture therapy (BNCT)-related experiments at the UFTR facility precisely because they have observed good educational and NAA research activities occurring over the past few years.

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 or so years ago; efforts continue periodically to interest utilities in usages and will continue during the upcoming year but there is little interest by utilities in training programs. This is not a likely area for large scale increases in facility usage, especially with the installation of multimillion dollar simulators at all power reactor sites and the inability of utility training departments in Florida to include such minimal training costs at the UFTR in their budgets.

College course utilization involved over 20 different courses, some many times to account for nearly 90 hours of actual run time, a small increase from the previous 1995-96 year, which had itself shown a large increase from the previous reporting year. The research utilization consisted of some 23 projects using nearly 130 hours of actual reactor run time exclusive of internal research into reactor characteristics. The number of projects is relatively constant but the hours are significantly decreased primarily because of the lack of any single mega-project

requiring extended irradiations as well as large time commitments for facility personnel to meet requalification program training requirements for operators (with one trainee licensed midway through the year) as well as various UFTR facility administrative, surveillance and maintenance efforts, especially several large maintenance activities mentioned previously. All of these categories include considerable concurrent usage to optimize personnel utilization still further. As noted, there are decreases in several areas from the last reporting year, especially in the research area. As indicated earlier, there was not a large increase in the maintenance, testing and surveillance activities combined, though maintenance activities themselves involved considerably more forced outage time than in any recent years.

Though there were two rather lengthy forced outages over a week (72⅞ and 20⅞ days each) in length, maintenance and surveillance efforts continue to require large commitments of time and resources, much of it related to assuring long-term availability of the facility. The effectiveness of the maintenance in general is demonstrated by the decreasing number of recurrences of failures in systems such as the area monitoring system and the blade position indicating system which gave problems in previous years. An especially good case in point was the recurrence of failures in the blade position indicating circuits which were replaced prior to the end of the 1993-94 reporting year and caused no forced outage time for the past three years. The same results have held true following the large maintenance efforts to repair the automatic flux controller, the linear (red) pen and the Safety Channel 2 high voltage sensing circuit completed during the last 1995-96 reporting year. The same expectation is held for the work on the CIC/UIC nuclear instrumentation, the shield tank demineralizer system and pump and the primary coolant level trip reed switch as well as for the nuclear instrumentation generally via the A-2 Surveillance plus the replaced roof all completed during this reporting year.

The HEU-to-LEU fuel conversion related efforts also involved relatively low though significant levels of efforts involving reactor facility time as shown in Table III-2; nevertheless, continuing analysis efforts were expended in advancing this project with plans in place for a visiting professor to continue this work in the next reporting year. Finally the last category of reactor tours and demonstrations in Table III-2 showed another significant increase as the number of university-sponsored groups as well as pre-college classes visiting the facility for substantive demonstrations and experiments continues to increase.

Of course, the training and operational programs supported under the DOE Reactor Sharing Program, the large amount of internally supported usage for education and research plus several service activities all contribute to maintain the total facility utilization at high levels especially since growth in University of Florida course usage continues at a slower rate. With many educational and several large research projects (including several sponsored by Reactor Sharing and several others possibly deriving from within the university) already scheduled for the upcoming year, this next year promises to produce facility utilization at a higher level than that experienced during this most recent reporting year, again dependent on availability of licensed personnel as well as personnel trained to work in the NAA Laboratory to support reactor operations. A single utility operator training program could also produce a substantial increase in usage time by itself, though this is unlikely. With several significant maintenance projects completed and performed during past years, replacement of the two-pen recorder five years ago

plus significant maintenance on the nuclear instrumentation circuits and the thermocouples in the core outlet cooling lines in the 1992-93 year and the blade position indicating circuits in the 1993-94 year and then the rabbit system during the 1994-95 year, the autoflux controller, linear (red) pen and Safety Channel 2 high voltage sensing circuit repairs during the 1995-96 year, and the CIC/UIC circuit, the shield tank demineralizer system and pump, the PC level trip reed switch, the annual nuclear instrumentation calibration check upgrades plus completion of the new roof during this year, this high usage expected for the 1997-98 reporting year is realistic especially in the areas of educational usage for college courses and for research and service activities, both on and off campus.

Table III-3 contains a breakdown delineating the 38 schools and other educational entities and their 123 usages of the UFTR facilities which were sponsored under the Department of Energy Reactor Sharing Program Grant DE-FG02-96NE38152. These Reactor Sharing usages account for over 70 hours of run time in Categories 1, 2 and 6 in Table III-2 with nearly 2 additional hours of concurrent run time, exclusive of the even larger quantities of non-run, facility usage experiment time involved, especially for visiting classes in categories 1 and 6 of Table III-2. Reactor Sharing usages have resulted in maintaining and fostering improved visibility for the UFTR around the State of Florida and also among researchers and other users at the University of Florida, many of whom now recognize the unique capabilities of the UFTR facilities per the interactions with the Chemistry Department and interest in BNCT-related research. The total experiment time for Reactor Sharing usage, not counting concurrent usages, was over 325 hours with nearly 24 hours of additional concurrent usage which makes the renewal of the Reactor Sharing grant funds at a decreased level for this next year somewhat discouraging. 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 123 usages represent a constant level from the last two years despite a nearly 27% decrease in grant funds over the two years; this is balanced by large increases in diversity and length of individual usages with the total of 127 participating faculty being one of the highest ever. The total of 478 students involved is also among the highest ever, exceeded only by the record numbers generated in the previous two years and with the diversity of groups involved again demonstrating the broad-based role of the Reactor Sharing Program as a key factor in UFTR utilization and education in nuclear science and engineering around the State of Florida.

Much of the continued 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 eighth straight year resulting in six 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 (2261 versus 2604 last year and 2804, 2418, 2053, 1432 and 1067 in the previous five years) of all types who toured the facility again this year; this is probably the second largest number of visitors in facility history and accounts for much of the facility usage in the sixth category in Table III-2 for substantive demonstrations, experiments and tours, many of which occupied a half day or more even when the reactor was not available for irradiations. By maintaining and possibly even increasing further the number of visitors this next 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 interest in 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 in the NAA Laboratory and elsewhere in the facility are simply spinoffs from the various expressed needs of those visiting the facility in conjunction with staff interests in diversification of capabilities and can only serve to increase opportunities for new usage. The ability and willingness to tailor experimental usages and demonstrations also plays a significant role in fostering interest among high school and college groups. Similarly, as the neutron radiography facility has become functional, though some optimization and final design efforts continue, plans are continuing to investigate the feasibility of implementing a prompt gamma analysis facility at the UFTR. Interest has been expressed in such a facility by researchers at the University of Florida Materials Science and Engineering Department, at the University of South Florida (Tampa) and by several industry users, all of whom could use such a facility. It would clearly complement the normal NAA capabilities and facilitate further growth and diversification of usage. Again, funding support and facility personnel time for design work are the limiting factors. The current interest in investigating boron neutron capture therapy-related research is also encouraging from on-campus researchers.

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 16.904 MW-hrs during this twelve-month reporting period, down about 20.81% from last year due primarily to a combination of forced unavailability, operator and NAA Laboratory personnel unavailability; nevertheless, this value is the twentieth highest value in the last twenty-eight years. The energy generation in this reporting year relative to previous years is still indicative of high facility usage, especially when compared to years prior to initiation of the DOE Reactor Sharing Grant in the 1983-1984 reporting year. This fact is emphasized by the high numbers of hours of educational facility usage for which licensed personnel are involved in other than reactor operation and for which reactor operation is only a small but integral part. Since there were several research usages such as Neutron Radiography projects and transmission work as well as extensive operations laboratories and other education-related sessions 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 66.20% availability factor for the year, the real limitation on usage has been a combination of personnel unavailability, licensed personnel unavailability, lack of funded support for desired usages especially for some of the reactor sharing projects and time lost for maintenance as well as scheduled surveillances and inspections of all kinds (NRC, ANI, RSRS, etc.) as well as for responses to regulatory agencies (NRC, ANI, EPA, DOE, IAEA, etc.) for which time commitments continue to increase, especially for the NRC component.

Described in Table III-5 is a monthly breakdown of usage and availability data. As noted in Section I of this report, there was increased outage time during the year with three relatively large individual forced outages and a number of smaller ones. The largest forced outages were for replacement of a failed compensated ion chamber (72⅞ days), for replacement of a failed pump in the shield tank demineralizer system (20⅞ days) and for replacement of a failed primary coolant level trip reed switch (2¾ days). No other forced outages exceeded even two days in length though there were several short outages during the year, so the overall availability was the

lowest in about ten years at 66.20%. Though only quoted as 66.20% availability in Table III-6, this availability accounts for 10 days planned unavailability for adjustments and performance of the Annual Nuclear Instrumentation Calibration Check (A-2 Surveillance) including upgrade thereof for conservatism, as well as lost availability for administrative reasons (4½ days) plus other hardware problems. At 4½ days of administrative shutdown (1.23%) for vacations, absences of personnel and evaluations of records, this contribution is small. If not counted, availability would only be a little over 67% since forced and planned unavailability for maintenance was relatively high increasing from 36¾ days to 118⅞ days with 102¼ days forced unavailability and 16⅝ days planned unavailability primarily for the A-2 Surveillance and some roofing work. For the year the availability is considerably below the historically high level of 91.5% recorded in the 1987-1988 reporting year.

Similarly, Table III-6 contains a detailed breakdown of days unavailable each month with a brief description of the primary contributors. The overall availability of 66.20% in this table is based on days per year and is well below the average of over 80% over the last six years; however, this value would also be 1.23% higher if administrative shutdowns were not included. Significant improvement is expected in the upcoming year as several outages were utilized to perform corrective and preventive maintenance projects on various components such as the compensated (CIC) and uncompensated (UIC) ion chambers and electrical connections including a swap of the UIC to run as a CIC and implementation of a new UIC, and the shield tank demineralizer system including pump replacement. In addition, since it was finally finished at year's end, the roofing project should not be a contributor to unavailability in the next 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; although funds were previously allocated under the DOE Reactor Instrumentation Grant to replace the temperature recorder as well as the area monitoring system, these modifications have received low priority this year as these systems have not continued to be significant contributors of unavailability during the 1994-95, 1995-96 and now the 1996-97 reporting years, especially with the limited number of certified operators.

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 1996-97 reporting year after having two trips during the 1995-96 reporting year, two trips in the 1994-95 year, no trips in the 1993-94 year, two trips in the 1992-93 year, and three trips in the 1991-92 year which were the first trips since the trips on September 7 and 15, 1989 and the trip on November 29, 1989. The first trip on November 16, 1995 was due to a building electrical transient indicated by dimming of lights resulting in a full trip as the reactor was running at full power to perform an irradiation. Following completion of a successful daily checkout, the reactor was returned to normal operations with no further problems with the event evaluated to have no impact on health and safety of the public or reactor personnel and negligible effect on reactor safety. The second trip occurred on April 4, 1996. In this case, the full trip was caused by a failure in the high voltage sensing circuit for Safety Channel 2 and resulted in considerable outage time (11½ days) to effect repairs to the circuit and assure proper operation of the circuit to avoid such spurious trips. This event was also promptly reported in the previous 1995-96 reporting year because the

failure may have resulted in operation with the trip setting on loss of high voltage to the Safety Channel 2 detector (Uncompensated Ion Chamber) somewhat above the 10% loss of voltage required by technical specifications for as much as two months. Following completion of maintenance and successful checkouts and evaluation of the incident as having no impact on the health and safety of the public or facility staff and negligible effect on reactor safety, the reactor was returned to normal operations with no further problems and no trips for the succeeding sixteen months to include all of the 1996-97 reporting year.

Table III-7B also contains no entries for scheduled trips. The last scheduled trip was on December 1, 1995 and was conducted to obtain data for an inverse kinetics class project with all systems operating properly. In this case, the general lack of scheduled trips is primarily due to the lack of utility training programs where such trips are part of the training exercises. It is expected that some trips will be included in the Reactor Operations Laboratory course for the upcoming year as well as for some of the operations demonstrations for other advanced classes in nuclear engineering.

Several additional incidents (one promptly 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 eight (8) such unusual occurrences with relatively brief descriptive evaluations of each. All of these occurrences were reported to NRC Region II in their periodic checks over the telephone, some on more than one occasion. Several of these occurrences, as the more significant entries, were promptly reported or otherwise directed to be promptly reported though some were called in promptly simply to assure good NRC communications.

Entry 1 addresses a series of spurious security alarms until near mid-month during August of the last reporting year when there was a partial failure of the security system. Though some repairs were implemented, others remained in progress at the end of that reporting year with only one further spurious security alarm. The security system was restored to be fully operational on September 17, 1996 with proper compensation throughout the series of events. Details of this item are withheld from public disclosure.

Entry 2 addresses failure of the compensated ionization chamber (CIC) in the nuclear instrumentation system which feeds the linear (red) pen which was found to be failed downscale prior to a daily checkout on September 18, 1996. Various checks were performed to assure the two-pen recorder was functioning properly and to isolate the problem to a failure of the CIC or connecting cables feeding the linear channel in the nuclear instrumentation system. The CIC was determined to be failed in September and two spares acquired for shipping costs were found to be unusable in this cable configuration with no company willing to guarantee their operability if the cables were reworked. Subsequently, the uncompensated ionization chamber (UIC) feeding Safety Channel 2 was also removed since its cables were in the same cable trace. Its integrity was confirmed. It was finally decided to move the existing UIC to the CIC location and operate it in the CIC mode; in addition a new available UIC was obtained from IST Technology. Subsequently, all the cabling to the two detectors was upgraded and the necessary modification packages completed. The necessary pre-calibration checks and circuit modifications were

implemented with a final calibration run on November 27, 1996, whereupon the reactor was ready to resume normal operations. Since the measurement of the temperature coefficient of reactivity (A-3 Surveillance) became overdue at the end of November, completion of this surveillance delayed restart for normal operation until December 3, 1996. The event was evaluated to have negligible effect on reactor safety or radiological conditions with this event responsible for a lengthy forced outage.

Entry 3 addresses investigations following it being noted on January 10, 1997 that the adjustable stack monitor was reading considerably higher than the fixed stack monitor. Subsequently, the review and comparison of the Stack Monitor Calibration procedure (on the Q-2 Surveillance Data Sheet) and Radiation Control Technique (RCT) #37 procedure showed inconsistencies between the two with neither including a step to match calibration of the adjustable stack monitor meter with the fixed stack monitor. Several other discrepancies were also noted. Nevertheless, only minor adjustments were needed in performing a new calibration check on the stack monitor on January 13, 1997. Subsequently, the full-power reactor run on January 14 showed that recent stack monitor indications prior to January 13 were conservative, as expected, since only minor adjustments were needed in the calibration performed on January 13, 1997. Basically, the UFTR Technical Specifications require calibration checks of the stack radiation monitor on a quarterly basis. Although always performed in a timely manner, the use of a flawed procedure that failed to correct for the decay of the Cs-137 calibration source led to a monitoring system that was not properly calibrated, at least for some periods of time prior to January 13, 1997. Improper calibrations would have only had a small (~3%) effect per year which is part of the reason why the improper calibration was not noted earlier, though some jumps in the steady-state count rates were noted in the operations logs. It is also possible that the decay corrections were made in the earlier years from mid-1990 because such corrections would be clearly needed and only later were consistently overlooked until the calibration check on January 13, 1997. A revised Q-2 Surveillance Data Sheet was approved on January 13, 1997 and is installed in the applicable UFTR document manuals. The key change was to call out that the expected results from the RCT #37 data sheet are to be used in calibrating/checking the fixed stack and the adjustable stack monitors. This event was treated as promptly reportable. The 14-day report on this event as submitted to NRC is in Appendix F of this report along with the NRC reply questioning the facility identification of a root cause as part of corrective action. Although not in the report to NRC, several management-oriented changes were initiated to require better control of such procedure changes and generally noting the need to review all changes carefully including a walk-through where applicable. These changes were formally implemented on March 14, 1997 to close out this specific concern with corrective action directed at the root cause of the problem. This occurrence was not considered to have involved any significant reduction in reactor safety margins, and it was not considered to have involved any significant effect, potential or real, on the health and safety of facility personnel or the public.

Entry 4 addresses discovering during an alarm test for training on June 28, 1997, that the source alarm did not actuate until 100 watts versus the expected 10 watts stated in SOP-A.2 and SOP-A.3. The only other mention of the source alarm is a short reference (page 7-1 of the FSAR) to its existence as a piece of control and indicating instrumentation on the Reactor Control Panel. It was subsequently concluded that the only significance of the 10 watt setpoint value is that it is

less than the 1 kW limit without the vertical port plugs being in place and hence the required limit for removal of the sealed Pu-Be source to prevent running to power with it installed. Since the procedure recommends removal at 10 watts and states it shall be removed before exceedng 1 kW, it makes sense to have the alarm at 100 watts. Combined with a regular weekly verification of the alarm function operation, which had not been done in the past, this function is now checked regularly. Two procedures (SOP-A.2 - Reactor Startup and SOP-A.3 - Reactor Operation at Power) were updated to change the reference source alarm setpoint to 100 watts. Additionally, to ensure the source alarm setpoint is checked on a regular basis, SOP-A.1 (Preoperational Checkout) was revised to add the source alarm setpoint as a check performed for the weekly checkout. All of these changes were implemented by February 17, 1997. This occurrence was not considered to have involved any significant reduction in reactor safety margins, and it was not considered to have involved any significant effect, potential or real, on the health and safety of facility personnel or the public.

Entry 5 addresses failure of the automatic flux controller potentiometer discovered to be freely spinning as it was being adjusted in preparation for setting the controller prior to raising power from 10 watts on March 31, 1997, whereupon a required unscheduled shutdown was performed. Subsequently, it was determined that it was not possible to adjust the servo potentiometer since it is a self-contained unit. A new identical servo potentiometer was obtained and installed and the necessary checks and retests performed satisfactorily with the reactor subsequently returned to normal operations on April 2, 1997 with no further problems noted. Again, this event was evaluated as having no impact on reactor safety, facility personnel or the health and safety of the public.

Entry 6 addresses breakage of the rupture disk on May 20, 1997 during a reactor operations laboratory class following closure of the dump valve immediately upon starting the primary coolant pump. No operator error was involved as the disk in place had apparently developed a crack and broke upon occurrence of the small pressure change caused by starting the PC pump. Approximately 35 gallons of primary coolant were dumped to the equipment pit which was cleaned up following characterization for radioactivity content. Since the reactor had not r for the week, the pit water sample and weekly primary coolant sample were essentiall equivalent. Subsequently, a duplicate rupture disk was removed from inventory, installed in the system and leak checked satisfactorily. This occurrence was evaluated as having no impact on reactor or personnel safety with the reactor returned to normal operations on May 21, 1997.

Entry 7 addresses failure of the Safety-3 control blade drive motor noted during performance of a daily checkout on May 21, 1997. An on-hand spare drive motor was removed from inventory, its shaft modified to accept the shear pin per previously implemented changes and then installed in the Safety-3 control blade drive system with measurements of Safety-3 drop times as well as controlled insertion and controlled removal times all noted to be normal with the motor and control blade noted to be operating smoothly over the full range. This occurrence, discovered during a daily checkout, was evaluated to have little impact on reactor safety and no impact on personnel safety with the reactor returned to normal operations on the afternoon of May 23, 1997 with no further problems noted.

Entry 8 addresses failure of the primary coolant level trip to actuate during a daily check on July 2, 1997. The failed level reed switch was replaced with an equivalent spare and the requisite scram check performed satisfactorily as the reactor was returned to normal operation on July 3, 1997 as this occurrence is not considered to have had any effect on reactor safety or the health and safety of reactor facility personnel or the public.

None of these eight (8) events are considered to have compromised reactor safety or the health and safety of the public. Only occurrence #3 (inadequate calibration of the stack radiation monitor) is considered a potential tech spec violation and treated as promptly reportable. The most significant occurrence was the failure of the compensated ion chamber (occurrence #2) which involved a detector replacement and a detector switched as well as cables replaced accounting for the largest outage in a number of years (72⅞ days). One other event involved an equipment failure that resulted in an unscheduled shutdown (occurrence #5) due to loss of the auto flux controller function. In terms of effect, the most significant occurrences would be the failure of the auto flux controller servo potentiometer resulting in an unscheduled shutdown (occurrence #5) and the failure of the PC level trip reed switch discovered during a pre-operational checkout (occurrence #8) plus the failure of the compensated ion chamber (occurrence #2) because it resulted in a lengthy forced outage (72⅞ days). In terms of forced outage time, occurrence #2 (72⅞ days) and occurrence #8 (2¾ days) were the most significant of the unusual occurrences. All were reported in periodic conversations with the NRC Region II office, sometimes on the same day as the occurrence. They are all officially reported via this report. In some cases they 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 1996-97 reporting year have been maintained at a low yearly level, with no significant doses received. Even in the previous 1995-96 reporting year, doses were relatively low considering there were two occasions requiring unstacking of the biological shielding—one in December 1995 to complete the five-year surveillance inspection of mechanical integrity of the control blade and drive systems internal to the biological shielding (V-1 Surveillance) and one in August 1996 to conduct the biennial inspection of incore fuel elements (B-2 Surveillance). There was also no waste or special nuclear material shipped from the reactor this year. Although waste was expected to be shipped to prepare the facility for the HEU-to-LEU fuel conversion activity to commence within the next few years, this has been delayed indefinitely. It was also expected that the remainder of the LEU SPERT fuel would be shipped in the past several years under the SNM-1050 license after 1200 SPERT fuel pins were transferred for shipment on May 17, 1990, but this has not occurred. Because of difficulties in getting DOE to accept the fuel, it will probably not occur in this next year. This activity will be directed and controlled by UFTR personnel assisted by personnel from the Radiation Control Office. Quality Assurance Program Approval Number 0578, Revision 1 will be available for this transfer to assure meeting all shipping requirements as it was renewed prior to expiration on October 31, 1992. The submittal for renewal was dated September 30,

1992. The new Program Approval dated and approved as of October 20, 1992 does not expire until October 31, 1997 in the next reporting year.

Environmental radioactivity surveillances continue to show no detectable off-site dose attributable to the UFTR facility as noted in Section VII. Although environmental film badges (now removed) and TLDs record occasional exposure, this dose is not 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. 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 1996 – August 1997)

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

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
**ENU-5176L - Dr. W.G. Vernetson and Reactor Staff, University of Florida	Independent Reactor Operations Laboratory Course for Undergraduate and Graduate Nuclear and Radiological Engineering (NRE) Students – Taught Two Times	43.68 (1.68)	116.46 (10.33)
**EGN-1002 - Introduction to Engineering - Dr. M. Hoit, Dr. W.G. Vernetson, Reactor Staff, University of Florida	Series of Lectures, Tours and Demonstration Exercises/Laboratory Experiments on Half-Life Measurements, and Trace Element Analysis and Inverse Square Law and Shielding Measurements for Freshman Interested in Engineering – Taught Three Times	13.47 (0.50)	96.60 (3.92)
**EES-3000 - Environmental Science and Humanity - Dr. Lynda Tyson, Dr. Steve Dougherty, Environmental Engineering Sciences, University of Florida	Lecture, Tour and Demonstration of Reactor Operations with NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC-Based Analyzers – Taught Two Times	1.92	9.33 (0.25)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
**IDH-2931 - Interdisciplinary Honors Program Energy Studies - Dr. Eugene Dunnam, Physics Dept., University of Florida	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Operations with Discussions of Capabilities Including NAA for Trace Element Analysis and Neutron Radiography	0.00	1.33
**ENU-6935 - Nuclear Seminar - Prof. J.S. Tulenko, University of Florida	Detailed Lecture, Tours and Discussion of Reactor and Facility Operations Including Radiation Worker Training and Discussion of Trace Element Analysis and Facility Capabilities for Possible Research Projects for New Nuclear and Radiological Engineering Graduate Students	0.00	3.17
**GLY-6268 - Isotope Geology - Dr. Paul Mueller, Dr. Ann Heatherington, Geology Dept., University of Florida	Detailed Lecture, Tour and Discussion of Reactor and Facility Operations Including NAA Laboratory with Demonstration of Trace Element Analysis Techniques and Capabilities	1.00	3.33
**PHY-1033 - Discovering Physics - Dr. Steve Detweiler, Mr. John Mocko, Physics Dept., University of Florida	Irradiation of Short Half-Life Standard Pure Materials Such as Aluminum and Calcium for Half-Life Measurements and Demonstration Exercises	0.75	1.50
**PHM-3042 - Ethics and Ecology - Dr. W.G. Vernetson, Nuclear and Radiological Engineering Dept. (NRE), and Paul Lewis, University of Florida	Tour of Reactor Facility to Discuss Capabilities and Usage of Non-power Versus Power Reactors to Support a Presentation on Energy Production and Usage	0.00	0.42

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
**CHS-5110/5110L - Radiochemistry/Radiochemistry Laboratory - Dr. K. Williams, Dr. L. Muga, TA Larry Land, Dr. W.G. Vernetson, University of Florida	Preparation for Senior and Graduate Level Radio-chemistry Laboratory Exercises and Experiments Including Lecture, Tour and Demonstration of Facility Operations, Irradiation of Ag, I and AgI for Half-Life Measurements Plus NAA for Trace Analysis of Dried Milk Samples	0.00	0.17
*CHS-5110/5110L - Radiochemistry/ Radiochemistry Laboratory - Dr. K. Williams, Dr. L. Muga, Dr. W.G. Vernetson, University of Florida	Graduate Level Research Special Project to Characterize Trace Elements in Zeolite Samples Extended Throughout the Year	1.92	3.08
**ENU-4505L/ENU-5516L - Nuclear Engineering Laboratory I/II, Dr. G.R. Dalton, Dr. W.G. Vernetson and Mr. D. Cronin, University of Florida	Senior and Graduate Level Nuclear Engineering Laboratory Exercises and Experiments Including Radiation Worker Instructions, Second Person Qualification, Donning Anti-Contamination Clothing, Foil Irradiations, Flux-Mapping, Spectral Measurements, Hot Channel Factors, Reactor Calorimetry, Blade Reactivity Worth Calibration, Diffusion Length in Graphite, 1/M Approach to Critical, Neutron Activation Analysis and Neutron Radiography	11.99 (0.93)	39.17 (6.42)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
**ENU-4612L/ENU-5615L - Nuclear Instrumentation Laboratory - Dr. W.E. Bolch, Mr. T. Wagner and Mr. L. Thomsen, University of Florida	Lecture, Tour and Laboratory Experiments to Demonstrate the Principles of Gamma Ray Spectroscopy Using the Rabbit System for Irradiations and PC-Based Analyzers with HPGe Detectors to Perform Trace Element Analysis from Gamma Ray Spectra Including Trace Analysis of Orange Juice Plus Additional Mixed Field Dosimetry Measurements	1.97	26.01 (10.76)
**ENV-6215L - Health Physics Measurements - Dr. Emmett Bolch, Environmental Engineering Science Dept., Dr. W.G. Vernetson, NRE Dept., University of Florida	Lecture, Tour and Demonstration of Reactor Operations Emphasizing Radiation Monitoring and Protection Features of the Facility Including Setup of HPGe Detectors and Demonstration of Trace Element Analysis Techniques Using an Irradiated Hair Sample	1.25 (0.58)	2.42 (0.83)
**EML-4450/6451 - Energy Conversion - Dr. Yogi Goshwami, Mechanical Engineering Dept., Dr. W.G. Vernetson, NRE Dept., University of Florida	Series of Lectures Comparing Power and Non-power Reactors Plus Tour and Demonstration of Reactor and NAA Laboratory Operations Including Use of Rabbit System and Trace Element Analysis of Irradiated Hair Sample	0.62	8.50
*ENU-6905 - Individual Work in Nuclear Engineering - Dr. W.G. Vernetson, Mr. D. Henderson and Mr. T. Downing, University of Florida and Mr. R. Ratner, PNL Laboratories	Project to Continue Work to Evaluate and Implement an Extended and Streamlined Total Quality Management Program in the NAA Laboratory for Mr. D. Henderson	8.40 (0.50)	9.17 (0.75)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
*Research on Properties of Materials - Dr. S. Turner, Mr. J. Wallis, Holtec, International, Inc.	Use of Neutron Radiography, Transmission and Scattering Experiments and Other Analytical Techniques to Examine and Characterize Used and Unused Boraflex and Boral Absorber Liner Samples and Coupons Plus Unused Holtite Coupons for Use in Utility Spent Fuel Pools With Checks/Observation by Various Utility QA Personnel	19.88 (0.92)	30.58 (2.42)
*Copper-64 Production for PET Scanner - Dr. John Kuperus, Radiopharmacy Dept., and Dr. W. Drane, Mike Nicole, Radiology Dept., Shands Hospital, University of Florida	Irradiation of Pure Copper to Generate Copper-64 for Positron Emitting Source Production for Positron Emission Tomography (PET) Scanner Calibration in the Radiopharmacy Department at Shands Teaching Hospital	34.50 (4.55)	64.09 (12.17)
*ENU-4905 - Special Problems in Nuclear and Radiological Engineering for NAA Research on Roadway Runoff Sediment - Dr. W.G. Vernetson, Ms. K. Van Reken, NRE Dept., University of Florida	NAA Evaluative Research to Identify Key Trace Elements in Roadway Runoff Sediment to Evaluate Elemental Contaminants Derived from Vehicular Activities for Senior Research Project (K. Van Reken)	8.32 (0.77)	20.41 (3.91)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
*NAA Research - ENU-4905 - Special Problems in Nuclear and Radiological Engineering - Dr. W.G. Vernetson, Mr. K. McKenna, Mr. Richard Bowles, Ms. N. Mascarella and Ms. C. Gregory, NRE Dept., University of Florida	Project to Perform Organized Trace Element Analysis of the Lake Alice Biosphere on the University of Florida Campus as an Application of Design Methodology and Project Management (K. McKenna, R. Bowles, N. Mascarella, C. Gregory)	10.96	18.00 (1.00)
*NAA Service Research for Isotope Identification - Dr. K. Williams and Dr. W. Winefordner, Chemistry Dept., University of Florida	Neutron Activation Analysis to Perform Trace Element Identification in Silicon Nitride Samples as Part of a Materials Evaluation of Bearings for Doctoral Student Scott Baker	0.80	1.33
*NAA Service Research to Establish Limits and Capabilities for Identifying Rare Earth Elements as Tracers - Mr. Mark Moore, Mr. Chris Pitcher, Armed Forced Radiobiological Research Institute, Bethesda, MD	NAA Research on Various Tracer Standards, Archeological Wood and Lead Samples to Establish Limits and Capabilities for Detecting Rare Earth and Other Elements	7.53 (1.00)	20.50 (3.50)
CHM-4910 Senior Research (Chemistry) - Dr. K. Williams, Chemistry Dept., Dr. W.G. Vernetson, NRE Dept., University of Florida	Special NAA Senior Research Project to Investigate Magnesium Levels in Foodstuffs to Include Sample Preparation, Run Request Development and Discussion (Ben Killian)	0.00	2.42 (0.83)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
SPERT Low-Enriched Fuel Conversion Related Efforts - Dr. W.G. Vernetson and Reactor Staff	Radiation/Contamination Surveys, Property Surveys, Facility Checks, Fire Alarm System Maintenance, LEU SPERT Fuel Security System Checks, LEU Fuel Inventory and Visual Inspection Efforts and Responses to Security and Fire Alarms as Well as Implementation of Wooden Rack Covers and Subsequent Removal	0.00	61.57 (3.51)
**Central Florida Community College (CFCC) Radiation Protection Technology Co-op Work Program - Mrs. R. Rawls/Mr. S. MacKenzie - Reactor Sharing	One Semester Long Reactor Operations-Based Radiological Control and Protection Training Programs of Cooperative Work Exercises	3.80 (0.50)	83.33 (7.58)
**Santa Fe Community College SUCCEED Program Student Training Project in NAA Research Techniques - Dr. Angelo Ferrari, Santa Fe Community College - Reactor Sharing	Series of Practical Training Exercises in Trace Element Analysis and Other Techniques Using Neutron Activation Analysis Including Radiation Concepts, Sample Preparation and Use of PC-Based Analyzers for Element Identification to Support Delineation of Nuclear Research Techniques for Students Expressing Potential Interest in Engineering and Research in the Nuclear Area (John Swenson, Brian Uhlmer)	5.77	31.25 (0.75)
*NAA Research on South Florida Canal and Ground Water - Dr. Helena Solo-Gabriele, University of Miami Civil Engineering - Reactor Sharing	Suspended Sediment Multielement Analysis of South Florida Canal and Ground Water Using Neutron Activation Analysis	3.40	4.58

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
***Florida Foundation of Future Scientists 34th Annual Junior Science, Engineering and Humanities Symposium - Dr. M.J. Koroly, Mrs. D. Paulin - Reactor Sharing	Series of Lectures, Tours and Demonstrations of Reactor and NAA Laboratory Facility Operations, Capabilities and Applications for Honors Group of High School Junior Level Students and Teachers	0.58	4.00
*Physics of Superconducting Materials Properties Research - Dr. Halinea Niculescu, Physics Dept., Florida State University and Dr. Peter Gielisse Mechanical Engineering Dept., FAMU/FSU - Reactor Sharing	Neutron Irradiation of Polycrystalline High Temperature Superconductor Material (YBaCuO: 1:2:3:7) to Increase Pinning Site Density of Fluxoids to Increase Critical Current Density Which Influences Shielding Characteristics of the Superconducting Material (Sample Preparations)	0.00	0.50
**Santa Fe Community College Nuclear Medicine Technology Program - Mr. S. Marchionno, Ms. Beth Shultzaberger and Mrs. Rochelle Sturm, Santa Fe Community College - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Isotope Identification and Trace Element Analysis Technique Using the Rabbit System and PC-Based Analyzers Plus Demonstration of Gas Flow Proportional Counter for Contamination Surveys as Well as Later Makeup Tour	1.50	5.59

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

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, Hillsborough Community College - Reactor Sharing	Lecture, Tour and Demonstration of Facility Operations with Radiation Surveys and Exercise in Use of Rabbit System for Trace Element Analysis of Irradiated Hair Samples Using NAA Techniques and Demonstration of Neutron Radiographic Techniques, Production of Radioisotopes and Use of Gas Flow Proportional Counters	0.85	3.50
**Crystal River High School AP and Honors Chemistry Classes - Mrs. A. Butler, Mrs. Lisa Moore, Crystal River High School - Reactor Sharing	Lectures, Tours and Demonstrations of UFTR Operations with Radiation Surveys and Exercises to Measure Half-Life of Irradiated Elements and in Using the Rabbit System and PC-Based Analyzers for Trace Element Analysis of Irradiated Hair Samples Using NAA Techniques Plus Contamination Control Exercises Using Anti-Contamination Clothing	1.43	4.67
***Talent Identification High School Program - Dr. M.J. Koroly, Mrs. D. Paulin, University of Florida - Reactor Sharing	Series of Lectures, Tours and Demonstration Exercises on Reactor Operations, Trace Element Analysis Using the Rabbit System, Robotics and Contamination Control Using Anti-Contamination Clothing for High School Talent Identification Program Participants	0.40	5.67
**Pensacola Junior College Usage - Prof. Joseph M. Zayal, Physics Dept., Pensacola Junior College - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and Exercises to Measure Half-Life of Irradiated Elements and in Using the Rabbit System and PC-Based Analyzers for Trace Element Analysis of Irradiated Hair Samples Using NAA Techniques Plus Contamination Control Exercises Using Anti-Contamination Clothing	0.67	3.08

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
**Center for Precollegiate Education and Training (CPET) Summer Science Training Program for High School Students - Dr. M.J. Koroly/Ms. Angie Brown, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Lectures, Tours and Demonstration of Reactor Facility Operations and Experimental Capabilities Along with Research Possibilities for Training and Familiarization in Utilization of Neutron Activation Analysis Plus Summer Research Project Selection for Two (2) CPET Summer Program High School Students (Jeff Knott of Hillsborough High School and David Beek of Stuyvesant High School)	3.83 (0.52)	25.25 (7.42)
**Teacher Research Update Experience (TRUE) Program for Updating Science Teachers on Current Technology and Research - Mrs. S. Ingram, Mrs. D. Paulin, CPET - Reactor Sharing	Lecture, Tours and Demonstrations of Reactor and NAA Laboratory Capabilities to Produce Radioisotopes and PC-Based Analyzers for Trace Element Analysis of Hair Samples as Well as Half-Life Measurements for Science Teachers as Part of Teacher Research Update Experience (TRUE) Program, Especially Emphasizing UFTR Availability for Class Visits for Experiments and for Supporting Science Fair Projects by Students	0.78	3.92
***Florida Foundation of Future Scientists - Mrs. Sylvia Ingram/Dr. W.G. Vernetson - Reactor Sharing	Lecture and Demonstration on Reactor Operations and Usage for Assembled Summer Science Research Training Program Participants (High School Students) and Teacher Research Update Experience Participants (High School Science Teachers) with Subsequent Facility Tours for a Number of Participants	0.00	2.75

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
**Palatka High School Chemistry/Science Classes - Mrs. Nancy Thompson, Palatka High School - Reactor Sharing	Lecture, Tour and Demonstrations of UFTR Operations with Radiation Surveys and Exercises to Measure Half-Life of Irradiated Elements and in Using the Rabbit System and PC-Based Analyzers for Trace Element Analysis of Irradiated Hair Samples Using NAA Techniques Plus Contamination Control Exercises Using Anti-Contamination Clothing	0.88	5.08
**Valencia Community College Philosophy of Science Students - Dr. Deborah Green, Valencia Community College - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Facility Operations Including Use of the Rabbit System and PC-Based Analyzers to Conduct Half-Life Measurements and Trace Element Analysis of Hair Samples Plus Contamination Control Exercise Using Robots and Anti-Contamination Clothing for Science Teachers	0.83	5.00
***Florida State University Biology Dept. - Ms. Emily Rothstein, FSU Biology Dept., Dr. W.G. Vernetson, NRE Dept., University of Florida - Reactor Sharing	Detailed Walk-through Tour and Discussion of Reactor and NAA Laboratory Capabilities and Usage for Possible Future Use for Biology Student Visitor	0.00	1.17
*NAA Research to Study Trace Elements in Canal Water Fish in the Miami Area to Support Science Fair Project - Mr. Mark Margolis, West Miami Middle School - Reactor Sharing	NAA Evaluation of Mercury and Other Trace Element Content in Various Fish Taken at Different Levels from Canals in Miami to Support Science Fair Project (Pedro Carvajal)	5.08	6.17

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
***Nuclear Energy Project Support for Central Florida Community College Student - Ms. R. Rawls/ Mr. S. MacKenzie, CFCC - Reactor Sharing	Two Walk-through Tours and Demonstrations of Reactor and NAA Laboratory Facility Operations to Explain Capabilities and Usage for a Project on Radioactive and Hazardous Waste Generation and Disposal (Paul Scott Plus Coauthor)	0.00	2.83
*NAA Research to Perform Trace Element Analysis on Various Meat and Fish Samples - Mrs. Renae Allen, Union County High School - Reactor Sharing	NAA Evaluation of Trace Element Content of Various Kinds of Commercially Available Fresh Meat and Fish to Evaluate Variations in Trace Element Level for Health Purposes for Science Fair Project (Joel Cerdan and Chris Polhill)	9.49	24.00 (0.50)
*NAA Research to Perform Trace Element Analysis of Various Treated Various Wood Samples - Mrs. Renae Allen, Union County High School Reactor Sharing	NAA Evaluation of Various Brands and Types of Commercial Treated Wood to Evaluate and Quantify Trace Element Content of Treatment Chemicals Containing Cu, Cr and As for Science Fair Project (Paul McMillan and Terry Parish)	4.55	20.25 (1.92)
Savannah State University Science Faculty - Dr. K. Sajwan, Prof. of Biology, Dr. G. Ghuman, Prof. of Earth Sciences and Dr. K. Chandra, Savannah State University - Reactor Sharing	Detailed Walk-through Tour of Reactor and NAA Laboratory Facilities to Discuss Usage and Capabilities Plus Presentation of Non-power/Power Reactor Comparison and Information on UFTR Usage in Workshop on Teaching Radiation, Energy and Technology to Precollege Teachers	0.00	5.00 (1.00)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
*Center for Precollegiate Education and Training Hillsborough High School NAA Research on Effects of Cooking on Trace Element Content of Different Types of Rice - Ms. Pamela Allison, Mr. Alan Zale and Ms. Sandra Snow, Hillsborough High School, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Extension of Summer 1996 Student Research Program Project - Evaluation and Quantification of the Effects of Cooking on the Trace Element Content of Different Types of Rice for Use in Regional Science Fair Including One Additional Visit with Fellow Student (Chris Hoelle Plus Chris McCoy)	4.92	7.50
*Center for Precollegiate Education and Training Stuyvesant High School NAA Research on Trace Element Content of Bottled Water Products - Mr. S. Teitel, Mr. R. Rothenberg and Mr. J. Biegleson, Stuyvesant High School in Manhattan, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Summer 1997 Student Research Program - Evaluation and Quantification of Trace Elements in Various Bottled Water Products (David Beek)	5.65 (0.10)	15.09 (0.50)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
*Center for Precollegiate Education and Training Hillsborough High School NAA Research on Hormesis Effects in Plants - Ms. Pamela Allison, Mr. Alan Zale and Ms. Sandra Snow, Hillsborough High School, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Summer 1997 Student Research Program - Neutron Activation Analysis for Investigation of Possible Hormesis Effects and Elemental Changes in Certain Plants (Arabadopsis Thaliana) Grown from Variously Relatively Low Level Irradiated Seeds (Jeffrey Knott)	0.00	12.67 (2.08)
*NAA Research to Quantify Certain Trace Elements in Fresh Shrimp Samples - Mr. Ron Worthington, Lecanto High School - Reactor Sharing	NAA Evaluation of Certain Trace Elements (Hg, Zn, Fe) in Fresh Shrimp Samples for a Class Science Project and Possible Extension to a Science Fair Project (Darren Nichter)	1.50	2.00
**Scout Merit Badge Activities - Scoutmaster K. Hutchinson and Assistant Scoutmaster K. Portier, BSA - Reactor Sharing	Lecture, Tours and Demonstrations of UFTR Operations with Hands-On Radiation Surveys and Half-Life Measurements Plus NAA Training Exercises Demonstrating Trace Element Analysis of Hair Samples Using the Rabbit System and PC-Based Analyzers Plus Waste Handling Exercise Demonstrating Use of Survey Meters and Anti-Contamination Clothing for Scout Troop	0.83	2.75

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
Gator Engineering Outreach Program for At-Risk Minority Leon County/Tallahassee High School Students - Dr. J. Earle/Ms. L. Lauter, University of Florida - Reactor Sharing	Outlook Broadening Lecture, Tour and Demonstration of Trace Element Analysis and Use of Survey Meters and Anti-Contamination Clothing for Contamination Control Exercises	0.00	1.50
***Demonstration of Reactor Facility Operations for NASA Summer Research High School Apprenticeship Program - Dr. W.G. Vernetson/Mrs. D. Paulin, University of Florida - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations and Facility Capabilities with Trace Element Analysis of Hair Sample Plus Radiation Surveys and Demonstrations of Contamination Control Using Anti-Contamination Clothing and Robotics for NASA Summer Research High School Apprenticeship Program Participants	0.47	2.83
***St. Petersburg Community College Science Dept. - Dr. Robert Davie, Mr. Robert Vaughn, Science Dept., St. Petersburg Community College - Reactor Sharing	Lectures, Tours and Demonstrations of UFTR Operations with Radiation Surveys and Exercises to Measure Half-Life of Irradiated Elements and in Using the Rabbit System and PC-Based Analyzers for Trace Element Analysis of Irradiated Hair Samples Using NAA Techniques Plus Contamination Control Exercises Using Anti-Contamination Clothing	1.20	4.42
***Demonstration Walk-through for Corpus Christi State University Student - Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Walk-through Tour with Discussion of Reactor and NAA Laboratory Usage and Capabilities for Visiting Corpus Christi State University Student	0.00	1.33 (0.50)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
***Demonstration of Reactor and NAA Laboratory Facility Operations for 4H Congress High School Science Students - Ms. Jessica Clackum, Ms. Debbie Lancaster, IFAS, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations and Facility Capabilities with Trace Element Analysis of Previously Irradiated Hair Sample Plus Radiation Surveys and Demonstration of Inverse Square Law Measurements for 4H Congress High School Students	0.00	1.75
**Demonstration of Reactor and NAA Laboratory Operations for Ben Steep, Buchholz High School, for Career Shadowing Day - Ms. L. Lauter, Dr. W.G. Vernetson, University of Florida - 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 Previously Irradiated Hair and Other Samples with Participation in Facility Activities for Buchholz High School Student Ben Steep for Career Shadowing Day	0.00	4.08
***Demonstration of Reactor/NAA Laboratory Facility Education Usage for Visiting Turkish Scholar Precollege Teachers - Dr. W.G. Vernetson/Dr. T.B. Vernetson, University of Florida - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Facility Operations Including Use of the Rabbit System and PC-Based Analyzers to Conduct Half-Life Measurements and Trace Element Analysis of Hair Samples Plus Contamination Control Exercises Using Robots and Anti-Contamination Clothing as Typical Precollege Student Activities	0.82	7.33

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
***North Florida Counties High School Guidance Counselors - Ms. L. Lauter/Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Two Lectures, Tours and Demonstrations of Reactor Facility Usage and Facility Capabilities for Guidance Counselors from North Florida High Schools	0.00	1.83
***Pensacola High School IB Program - Ms. Kathy Johnson, Pensacola High School - Reactor Sharing	Detailed Walk-through Tour of Reactor and NAA Laboratory to Demonstrate Operations and Capabilities to Support a Science Fair Project Paper on Nuclear Energy Utilization (Lindsay Johnson)	0.00	2.08
***Florida/Georgia Alliance for Minorities - Dr. J. Earle, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Detailed Walk-through Tour of Reactor and NAA Laboratory Facilities to Demonstrate Operations and Capabilities for Minority High School Students to Support Continued Interest in Science and Education	0.00	2.00
***St. Johns River Community College - T. Avery, St. Johns River Community College - Reactor Sharing	Detailed Walk-through Tour of Reactor and NAA Laboratory Facilities to Demonstrate Operations and Capabilities Including Demonstration of Trace Element Analysis to Support Interest in Applications of Nuclear Energy and Majoring in Nuclear Engineering	0.35	2.00
**Santa Fe Community College SUCCEED Program Student Training Project in NAA Research Techniques - Dr. Angelo Ferrari, Santa Fe Community College, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	SUCCEED Research Project to Evaluate Detection Limits and Methodology for Detecting Cn, Cr and As Used as Additives to Treated Wood (Brian Uhlmer)	7.84	15.09 (1.00)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
**Rickards High School and Lakeside Christian School (Science Students) - Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Operations Including Radiation Surveys of Everyday Objects and Use of the Rabbit System and PC-Based Analyzers to Determine Trace Element Content of Volunteer Hair Samples Plus Contamination Control Exercises Involving Dress Out in Anti-Contamination Clothing	1.00	3.04
**Howard Bishop Middle School, Keystone Heights Elementary School and McRae Elementary School Science Students - Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Operations Including Radiation Surveys of Everyday Objects and Use of the Rabbit System and PC-Based Analyzers to Determine Trace Element Content of Volunteer Hair Samples Plus Contamination Control Exercises Involving Dress Out in Anti-Contamination Clothing	1.08 (0.50)	3.04 (0.67)
PEEK High School Student Workshop - Ms. L. Lauter, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Operations Including Radiation Surveys of Everyday Objects and Use of the Rabbit System and PC-Based Analyzers to Determine Trace Element Content of Volunteer Hair Samples Plus Contamination Control Exercises Involving Dress Out in Anti-Contamination Clothing and Use of Robots for Demonstration Purposes	0.98	4.08

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
*NAA Research on Prehistoric Manganese Secretions - Dr. Michael Jordan, Fairfax County Chief Archivist, Mr. Mark Moore, Volunteer Consultant - Reactor Sharing	NAA Research to Perform Trace Element Analysis on Prehistoric Manganese Secretions for Assessment of Cactus Hills Site in Suffolk County for Education Purposes	2.17	5.58
*NAA Research Considerations - Dr. W.G. Vernetson, University of Florida	Tour with Discussions for Possible Research Project for Two Senior Level NRE Students (B. Beck and C. Wells)	0.00	0.83
Support Services for INSPI Projects - Dr. S. Anghaie, INSPI, University of Florida	Removal and Return of Lead Bricks for Shielding INSPI Experiment Plus Training in Removal of Liquid Nitrogen to INSPI Dewar	0.00	0.91 (0.17)
Boron Neutron Capture Therapy Considerations - Dr. C. Batich, Materials Science and Engineering Dept., Dr. W.E. Bolch, NRE Dept., University of Florida	Tour with Discussions of UFTR Potential for Use in Non-human Boron Neutron Capture Therapy Related Experiments	0.00	0.33

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
***Miscellaneous Tours and Demonstrations - Dr. W. G. Vernetson	Miscellaneous Tours Involving Facility Demonstrations for Various Visitors Including Groups of Students Representing Various Special Interests, Alumni, Potential New Staff Members, Potential New Nuclear and Radiological Engineering (NRE) Students, NRE Seminar Speakers, University Police Department Officers, Members of Print and Other Media, NRE Dept. Advisory Committee Members, NRC Visitors, Visits by Potential or Actual Facility Users, Visitors for the 40th NRE Dept. Anniversary Celebration Including ANS President Stan Hatcher, 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 as Well as Their Supervisors	1.09 (1.09)	35.92 (5.49)
**Licensed Operator Requalification and Recertification Program Training Including Staff Planning/Review Meetings - Dr. W.G. Vernetson/Reactor Staff/ Radiation Control 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	4.23 (0.25)	270.31 (18.39)
**Reactor Operator Qualification and Certification Training - Dr. W.G.Vernetson/ Reactor Staff/ Radiation Control Staff	Qualification and Certification Training Requirements Including Formal Lectures, Examinations and Practical Training for Ex-Navy SRO-trainee Candidate Including NRC Administered Examination and Certification	15.65 (12.94)	86.42 (65.75)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
**Special Training for UFTR Facility Support Staff, External Support Groups and Contractors - Dr. W.G. Vernetson/ Reactor Staff	Training on Radiation Worker Instructions (10 CFR Part 19) for Support Staff Including Radiation Control Personnel, Contractors, Physical Plant Division Personnel and Non-Licensed Facility Staff, Training as Radiation Control Technician for One Radiation Control Staff Member and Two UFTR Staff Members, and Second Person Qualification Training for Radiation Control and Other Support Personnel, Training on Chemical Hazards and Right-To-Know for All Facility Personnel, Training on Waste Handling, Training on Emergency Response and Security for University Police Department and Other Personnel, Rabbit System Training for Four Staff Members	13.77 (11.92)	134.96 (64.94)
NRC, DOE, ANI, EH&S and Other Inspections, Questionnaires and Surveys - Dr. W.G. Vernetson, Mr. D.L. Munroe, Reactor and Radiation Control Staff	Reactor Safety Review Subcommittee Annual Audit, NRC Operations and Radiation Safety Inspection, Implementation of NRC Information Advisories, Preparation of DOE Fuel Status Report Plus Later Report on Fuel Shipment Characteristics, University Environmental Health & Safety Division Laboratory Safety Survey and Asbestos Inspections Plus Cataloging and Removal of Chemicals, Annual UF Property Inventory, Tours and Changeout of Liquid Nitrogen Vendor, American Nuclear Insurers Inspection, Annual Physical Security Walk-through for NRE Department Chairman and Radiation Control Officer and ALARA Program Review with Radiation Control Officer	0.42 (0.42)	73.68 (16.99)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
Upgrade of License-Related Documents - Dr. W.G. Vernetson, Reactor Staff	Insertion of Tech Spec Amendment 21 Giving Extension of the Date for Annual Report Submittal Each Year Plus Development of Amendment 22 Deleting References to NRC Region II and Changing NES to NRE Department, Development and Submittal of Emergency Plan Revision 10, Preparation of HEU to LEU Conversion Proposal to NRC, and Updating SAR Copies with Revision 10 Plus Updating State of Florida Emergency Procedures Manual	0.00	15.67 (1.33)
Emergency System Surveillances - Dr. W. G. Vernetson, Reactor Staff, Physical Plant Division Personnel, University Police Dept. Personnel	Scheduled Surveillances of Facility Fire Protection Equipment, Quarterly Fire Alarm System Checks and Annual Check of Fire Alarm System and Inspections by Physical Plant Representatives and State Fire Marshall Plus Periodic Responses to Security and Fire Alarm Actuations	0.00	24.33 (7.17)
Test, Surveillance and Checkout Activities - Dr. 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 to Include the Biennial Fuel Inspection	58.08 (7.74)	292.44 (49.26)
Maintenance Activities for Replacement of the Reactor Building Roof - Dr. W.G. Vernetson/ Reactor Staff	Maintenance Activities and Checks Related to Lancaster Roofing Company and then Perry Roofing Company to Complete Replacement and Repair the Reactor Building Roof	0.00	98.59 (25.84)

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours
Maintenance Activities to Address Failed Compensated Ion Chamber - Dr. W.G. Vernetson/Reactor Staff	Maintenance Activities to Move Uncompensated Ion Chamber to Replace Failed Compensated Ion Chamber, to Acquire and Install New Uncompensated Ion Chamber and Install New Cabling on Detectors	11.70	99.50 (17.66)
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 as Well as Various Housekeeping and Related Activities Especially Maintaining Logs and Status Boards and Facility Appearance	2.57 (0.25)	348.67 (71.11)
TOTAL		**349.12 (47.66)**	**2371.70 (428.62)**
TOTAL ACTUAL		**301.46**	**1943.08**

NOTE 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 1996-97 reporting year is 301.46 hours, a decrease of about 25.05% from the previous year. The actual experiment time for the 1996-97 reporting year is decreased from 2255.58 hours to 1943.08 hours, a decrease of 13.85% indicating significantly reduced but good utilization of staff time this year for reactor usage and other projects including good record keeping of project times and other activities using the facility but not the reactor, especially maintenance and support-related efforts. The decrease in run time is primarily because of lack of qualified NAA Laboratory staff plus reduced licensed operators. In addition, over 61 hours of experiment time were 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 assuring optimal application of available staff time acknowledging the unavailability of a full-time SRO Reactor Manager for all but three months. The resignation of the Reactor Manager effective August 9, 1996 was expected to impact the level of operations in the reporting year and it did. Of course, the experiment time continues to include

TABLE III-1

SUMMARY OF FACILITY UTILIZATION
(September 1996 – August 1997)

Project and User	Type of Activity	Run Time Hours	Experiment Time Hours

considerable reactor usage for corrective maintenance and surveillance activities; nevertheless, the numbers this year continue to indicate high levels of quality facility usage directed to research, education, training and service, especially as driven by the Reactor Sharing Program usages. The other driver this year was a large increase in reactor operator training as there was one new operator certified in midyear prior to loss of the full-time interim Reactor Manager on March 28, 1997.

NOTE 2. Experiment 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 1996 – August 1997)

Utilization Categories	Run Time Hours		Experiment Time Hours	
1. College Courses and Laboratories (23)	92.09	(4.19)	459.74	(41.84)
2. Research Activities (23)	136.91	(7.84)	285.08	(30.75)
3. UFTR Operator Training and Requalification for Recertification Plus Support Staff and Other Training (3)	33.65	(25.11)	491.69	(149.08)
4. UFTR Maintenance, Testing and Surveillance Activities, Plus Various Extended Inspection Activities and Upgrading of Licensing Documents (7)	72.77	(8.41)	952.88	(189.36)
5. HEU-to-LEU Fuel Conversion Related Efforts Including SPERT Fuel Checks (1)	0.00		61.57	(3.51)
6. Reactor Tours and Demonstrations Including High School Classes (22)	13.70	(2.11)	120.74	(14.08)
TOTAL	**349.12**	**(47.66)**	**2371.70**	**(428.62)**

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 schools and other external educational entities to have 123 usages of the UFTR facilities as delineated in Table III-3. This usage by over 38 different schools continues to be 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, state and international science fairs.

NOTE 4: Routine preoperational checks are generally excluded from this Utilization Summary but are estimated to account for about 20 hours additional utilization per month or approximately 240 additional hours per year with much of it concurrent.

TABLE III-3

REACTOR SHARING PROGRAM
SUMMARY OF USAGE OF UFTR FACILITIES
(September 1996 – September 1997)

School	Usages*	Faculty	Students
1. Buchholz High School (BHS)	1	1	1
2. Central Florida Community College (CFCC)	18	2	4
3. Corpus Christi State University (CCSU)	1	0	1
4. Crystal River High School (CRHS)	2	2	40
4. Fairfax County Chief Archivist	1	1	0
5. FFFS Science Engineering & Humanities Symposium (High School)	2	8	27
6. Florida A&M University (FAMU)	1	1	1
7. Florida/Georgia High School Alliance for Minorities	1	1	3
8. Florida State University (FSU)	1	1	1
9. Gainesville Schools Scout Troop (High School)	1	2	17
10. Gator Engineering Minority Outreach (GEMO)	1	2	15
11. High School 4H Congress (4H)	1	1	11
12. Hillsborough Community College (HCC)	1	1	8
13. Hillsborough High School (HHS)	7	3	3
14. Howard Bishop Middle School (HBMS)	1	1	4
15. Keystone Heights Middle School (KHMS)	1	1	7
16. Lecanto High School (LHS)	1	1	1
17. Lakeside Christian School (LCS)	1	1	10
18. McRae Elementary School (MES)	1	2	6
19. NASA Summer Research High School Apprenticeships	1	1	32
20. North Florida High School Guidance Counselors	2	10	1
21. Palatka High School	1	2	17
22. PEEK High School Students Environmental Workshop	1	1	26
23. Pensacola High School (PHS)	1	1	1
24. Pensacola Junior College (PJC)	1	1	9
25. Rickards High School (RHS)	1	1	11
26. St. Johns River Community College (SJRCC)	1	1	1
27. St. Petersburg Community College (SPCC)	1	2	14
28. Santa Fe Community College (SFCC)	23	5	20
29. Savannah State University (SSU)	2	5	19
30. Stuyvesant High School (SHS)	9	2	1
31. Summer Science Research Training Program (High School)	8	5	76
32. Talent Identification Program Ceremony Participants (High School)	3	4	74
33. Teacher Research Update Experience (TRUE) Program (HS Tchrs)	2	29	0
34. Turkish Educators/Scholars Group	2	13	1
35. Union County High School (UCHS)	15	2	7
36. University of Miami (UM)	3	1	1
37. Valencia Community College (VCC)	1	8	6
38. West Miami Middle School (WMMS)	1	1	1
TOTAL	**123**	**127**	**478**

* 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 over four (4) hours. In many cases, a school can have multiple usages but all related to the same research project or training program such as one project for Florida State University that involved long term irradiations as did others such as for Union County High School and Hillsborough High School, or the multiple usage training programs conducted for Central Florida Community College students.

TABLE III-4

MONTHLY REACTOR ENERGY GENERATION[1]
(September 1996 – August 1997)

Month	Energy Generation Monthly Ranking[2]	KW-Hrs	Hours at Full Power
September 1996	10	678.063	6.550
October 1996	12	0.000	0.000
November 1996	9	766.634	4.200
December 1996	2	2,526.996	24.799
January 1997	4	1,928.000	18.900
February 1997	6	1,500.029	14.052
March 1997	1	3,831.893	30.718
April 1997	5	1,836.237	16.683
May 1997	7	983.932	9.567
June 1997	8	816.964	7.666
July 1997	3	2,020.473	17.651
August 1997	11	14.894	0.100
YEARLY TOTAL		**16,904.115[3]**	**143.886**

1. The yearly total energy generation of 16.904 Megawatt-hours for the 1996-97 reporting year represents a 20.81% decrease from last year's total of 21.347 Megawatt-hours, while the 143.886 hours at full power represents a similar 27.04% decrease from the previous yearly total of 197.206 hours. Nevertheless, the values for the 1995-96 reporting year remain relatively high versus fifteen years ago, especially considering the lack of a full-time Reactor Manager. In addition, more outage time this year resulted in reduced facility availability, as forced unavailability was at its highest value in the last ten years at over 100 days including one outage of 72⅞ days early in the reporting year. With a full-time Acting Reactor Manager for only three months, operations were also very constrained by operator availability during most of the year.

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

3. The 16,904 kilowatt-hours energy generation is the lowest value for the past decade, ranking tenth for this period but twentieth for the last twenty-eight years. These rankings show how growth in usage has been greatest and generally well maintained over the past decade since the low value of energy generation in the 1996-97 reporting year would have been seventh during the first fourteen years of 100 kW UFTR operation.

TABLE III-5

MONTHLY REACTOR USAGE/AVAILABILITY DATA
(September 1996 – August 1997)

Month	Key-On Time	Exp. Time[1]	Run Time[2]	Availability[3]
September 1996	15.70 hrs.	160.00 hrs.	12.47 hrs.	50.00%
October 1996	3.00 hrs.	167.58 hrs.	0.00 hrs.	0.00%
November 1996	14.90 hrs.	144.92 hrs.	11.70 hrs.	6.67%
December 1996	45.90 hrs.	174.17 hrs.	40.03 hrs.	86.29%
January 1997	36.10 hrs.	171.25 hrs.	31.25 hrs.	91.53%
February 1997	38.50 hrs.	160.67 hrs.	33.83 hrs.	97.32%
March 1997	54.70 hrs.	189.17 hrs.	49.18 hrs.	63.71%
April 1997	37.20 hrs.	150.83 hrs.	33.90 hrs.	94.58%
May 1997	23.20 hrs.	129.33 hrs.	17.30 hrs.	89.52%
June 1997	26.10 hrs.	152.33 hrs.	22.37 hrs.	96.67%
July 1997	44.50 hrs.	197.83 hrs.	41.13 hrs.	78.63%
August 1997	11.40 hrs.	145.00 hrs.	8.30 hrs.	45.15%
YEARLY TOTAL	**351.20 hrs.**	**1,943.08 hrs.**	**301.46 hrs.**	**66.67%**

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 decreases over the previous year, especially those related to reactor operations. Key-on time is down 25.01% while run time is similarly down 25.05%, primarily due to decreased long irradiations for research usage and somewhat due to unavailability of personnel such as reactor operators as well as NAA Laboratory workers but primarily due to over 100 days forced outage time. Although two part-time SROs were licensed for the complete year, one had significantly reduced work hours over the year; experiment time, however, is also decreased by 13.85% but showing a continued emphasis for class usage as the experiment time is well used for research, training and education during this past year.

3. Monthly average availability is 66.67% as shown above. On a yearly basis, it is 66.20% per Table III-6. As in the previous year, this availability accounts for lost availability for administrative reasons as well as for repair and maintenance related reasons. This unavailability has contributions due to administrative unavailability caused by unavailability of personnel (4½ days or 1.23%) with forced unavailability at 102¼ days or 28.01% and planned unavailability at 16⅝ days or 4.56%. The yearly availability is reduced from the previous four years (87.33%, 89.69%, 88.15% and 75.68%) to 66.67% for this reporting year with much of the unavailability due to a single forced outage over 72 days long early in the year. Overall the availability represents a significant decrease in the average availability recorded for the past four most recent reporting years and is similar to the three years prior to the 1992-93 reporting year. This is due to having a number of forced outages, the most significant of which was for replacement of the failed compensated ionization chamber in September-December 1996 which involved 72⅞ days forced unavailability, for replacement of the failed pump on the shield tank demineralizer system in July-August 1997 which involved 20⅞ days forced unavailability and for replacement of the failed primary coolant level trip reed switch which involved 2¾ days forced unavailability in July 1997. As in the previous year, there were also significant planned outages in this year as adjustments and reworking of the annual calibration of nuclear instrumentation (A-2 Surveillance) involved 10 days planned unavailability in March 1997 while the contract work to replace and then repair the reactor building roof involved 4¾ days planned unavailability spread throughout the year. Other than these outages, the remainder of the year saw the usual variety of maintenance activities and equipment failures though much less so than in most years. Indeed, there were only 8½ days forced outage time beyond that for the three events enumerated above, a good record.

TABLE III-6

UFTR AVAILABILITY SUMMARY
(September 1996 – August 1997)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
September 1996	50.00%	15.00 days	Maintenance to repair the stack monitor alarm on auxiliary alarm panel (⅛ day). Maintenance to address failed linear (red) pen due to failed compensated ion chamber (12⅞ days). Maintenance to repair the security system (⅝ day). Maintenance efforts for roof repairs by the roofing contractor (1⅝ days).
October 1996	0.00%	31.00 days	Maintenance to address failed linear (red) pen due to failed compensated ion chamber (31 days). Maintenance efforts for roof repairs by roofing contractor (0 days).
November 1996	6.67	29.00 days	Maintenance to address failed linear (red) pen due to failed compensated ion chamber (27 days). Administrative shutdown for Thanks-giving Holiday (2 days).

TABLE III-6

UFTR AVAILABILITY SUMMARY
(September 1996 – August 1997)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
December 1996	96.29%	4.25 days	Maintenance to address failed linear (red) pen due to failed compensated ion chamber — performance of delayed surveillance to measure temperature coefficient of reactivity (2¼ days). Maintenance to replace leaking hot water valves in reactor cell air handler system (⅜ day). Maintenance efforts for roof repairs by roofing contractor (⅝ day). Administrative shutdown for Christmas Holidays (1 day).
January 1997	91.53%	2.63 days	Maintenance to correct improper calibration of stack radiation monitor and verify monitor indication with full power run (2 days). Maintenance to refill the primary coolant storage tank (⅛ day). Maintenance efforts for roof repairs by roofing contractor (⅛ day).

TABLE III-6

UFTR AVAILABILITY SUMMARY
(September 1996 – August 1997)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
February 1997	97.32%	0.75 days	Maintenance efforts for roof repairs by roofing contractor (⅝ day). Maintenance to replace temperature recorder ink pads to restore legibility (⅛ day).
March 1997	63.71%	11.25 days	Maintenance efforts for roof repairs by roofing contractor (¾ day). Maintenance to reconnect wires for the stack dilution fan to assure proper rpm indication (⅛ day). Maintenance to adjust nuclear instrumentation voltages and setpoints, confirm values, change out resistors and subsequently make adjustments to introduce conservatism into the calorimetric calibration and confirm values (A-2 Surveillance) (10 days). Maintenance to rewire the pigtail and repair the stack dilute fan coupling (¼ day). Maintenance to troubleshoot the failed servopotentiometer unit in the automatic flux controller system (⅛ day).

TABLE III-6

UFTR AVAILABILITY SUMMARY
(September 1996 – August 1997)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
April 1997	94.58%	1.63 days	Maintenance to troubleshoot, replace and retest the failed servopotentiometer unit in the automatic flux controller system (1⅝ days).
May 1997	89.52%	3.25 days	Maintenance to clean up the equipment pit and replace a broken primary coolant rupture disk (1⅜ days). Maintenance to replace failed Safety-3 control blade drive motor (¾ day). Maintenance to repair high speed recorder used to measure control blade drop times (1 day). Maintenance to adjust two settings on the north area radiation monitor to complete Q-2 Surveillance (⅛ day).
June 1997	96.67%	1.00 days	Maintenance to repair the mechanical tach-generator to assure proper dilute fan rpm indication following loss of optical tach (⅛ day). Maintenance to repair the optical tach following loss of mechanical tach generator rpm indication (⅛ day).

TABLE III-6

UFTR AVAILABILITY SUMMARY
(September 1996 – August 1997)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability
			Maintenance to refill the primary coolant storage tank (⅛ day). Maintenance efforts to secure building power for installation of surge protection as part of roof replacement contract (⅝ day).
July 1997	78.63%	6.63 days	Maintenance to troubleshoot, develop modification package, replace a failed reed switch and retest the failed primary coolant level trip switch per 10 CFR 50.59 Evaluation Number 97-05 (2¾ days). Maintenance to troubleshoot a failed shield tank demineralizer system pump (3⅞ days).
August 1997	45.15%	17.00 days	Maintenance to troubleshoot a failed shield tank demineralizer pump and to identify a replacement pump, and to obtain, install and test the replacement per 10 CFR 50.59 Evaluation Number 97-07 (17 days).

TABLE III-6

UFTR AVAILABILITY SUMMARY
(September 1996 - August 1997)

Month	Availability	Days Unavailable	Primary Cause of Lost Availability

TOTAL ANNUAL UNAVAILABILITY (Availability at 66.20%):	123.375 days	= 33.80%
1. TOTAL FORCED UNAVAILABILITY:	102.250 days	= 28.01%
2. TOTAL PLANNED UNAVAILABILITY:	16.625 days	= 4.56%
3. TOTAL ADMINISTRATIVE UNAVAILABILITY:	4.500 days	= 1.23%

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

NOTE 2. The 123.375 days unavailability were basically for forced outages (102.250 days, up from 44.875 days) and planned outages (16.375 days, down from 41.875 days) due to maintenance for repairs, delay awaiting parts arrival, trip evaluations, etc., plus an additional 4.50 days of administrative shutdown (up from 2.25 days) delineated in this table for holidays and associated personnel vacations or unavailability of management to approve operating where the reactor was or could have been made operational if needed. With a full-time Acting Reactor Manager for only three months of the year, the last category for administrative shutdowns remains excellent.

NOTE 3. It should be noted that only Category 1 and 2 unavailability values were listed under repair and maintenance related (loss of reactor) unavailability prior to the 1991-92 year. The total unavailability in these categories was relatively constant over the three years prior to last year (86.75 days versus 38.25 days, 34.63 days and 35.25 days) which had been down considerably from the previous two reporting years at 94.25 days (25.82% unavailability) and 76.50 days (20.90% unavailability) and then to 35.25 days (only 9.66% unavailability), 34.63 days (9.49% unavailability), 38.25 days (10.48% unavailability), and then back up to 86.75 days (23.70% unavailability) and now 118.90 days (32.58% unavailability). The lost availability for administrative reasons has also dropped dramatically from previous reporting years, from 23.25 days, 23.50 days, 11.50 days, to 3.50 days, 5.00 days, 2.25 days and 4.50 days for the past three years.

TABLE III-7A

UNSCHEDULED TRIPS
(September 1996 – August 1997)

After the UFTR experienced two unscheduled trips during the 1995-96 reporting year as it did in the 1994-95 reporting year after having no unscheduled trips during the 1993-94 reporting year, the UFTR experienced no unscheduled trips during the 1996-97 reporting year. After three unscheduled trips occurred in the first three months of the 1989-90 reporting year, none occurred during the 1990-91 reporting year; in the 1991-92 reporting year, three unscheduled trips occurred in November 1991, December 1991 and May 1992. It is worth noting that in the 1992-93 reporting year, the first unscheduled trip occurred in March 1993, and was the first experienced in nearly ten months, the second unscheduled trip occurred in August 1993. As with two of the three trips in the 1991-92 reporting year, one of these trips was due to an electrical transient while the other was due to inadvertent operator action as was the third trip in the 1991-92 reporting year. One of last year's two unscheduled trips was also due to an electrical transient with neither 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 with the second trip considered to be promptly reportable. It is also worth noting that the two trips described and evaluated in this table last year are the only unscheduled trips for the past two reporting years and only the second was evaluated to be due to equipment failure due to faults in the Safety Channel 2 loss of high voltage sensing circuit. Although a number of failed components were replaced to complement replacement of degraded components along with preventive cleaning and repair of circuit connections in the 1989-90 reporting year, as well as in the past six years, these efforts clearly have represented time well spent with only two trips due to facility equipment failure in almost eight years and none during the past 1996-97 reporting year.

Number	Date	Description of Occurrence
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TABLE III-7B

SCHEDULED TRIPS
(September 1996 – August 1997)

There were no scheduled trips performed for experimental or training purposes during this reporting year and only one scheduled trip performed for experimental purposes during the last reporting year. That trip was the first scheduled trip in a number of years. Part of the reason for this general lack of scheduled trips is the failure to schedule any large utility operator training programs where such trips are a designed part of the training program. It was anticipated that some training trips would be included in the ENU-5176L Reactor Operations Laboratory course offered during the 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 1997-98 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. Since there were no scheduled trips during this reporting year, there are no entries in the table.

Number	Date	Description of Occurrence
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TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

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. Unscheduled trips are also addressed though they are also included in Table III-7 along with corrective and preventive maintenance and surveillances implemented in response to the trips, though none occurred during this reporting year. Only occurrence #3 (inadequate calibration of the stack radiation monitor) was considered a potential tech spec violation and treated as promptly reportable. All of these occurrences involved some equipment failure or other event. The most significant occurrence was the failure of the compensated ion chamber (occurrence #2) which involved a detector replacement and a detector switched as well as cables replaced accounting for the largest outage in several years (72⅞ days). One other event involved an equipment failure that resulted in an unscheduled shutdown (occurrence #5) due to loss of the auto flux controller function. In terms of effect, the most significant occurrences would be the failure of the auto flux controller servo potentiometer resulting in an unscheduled shutdown (occurrence #5) and the failure of the PC level trip reed switch discovered during a preoperational checkout (occurrence #8) plus the failure of the compensated ion chamber (occurrence #2) because it resulted in a lengthy forced outage (72⅞ days). In terms of forced outage time, occurrence #2 (72⅞ days) and occurrence #8 (2¾ days) were the most significant of the unusual occurrences. Overall, none of these eight 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 with one officially reported promptly to the NRC though many were reported for information purposes on the day of occurrence or soon thereafter. All were reported in periodic updates to the NRC or, in the case of occurrence #8, directly to an NRC inspector as it was discovered.

Number	Date	Description of Occurrence
1.	13 Aug 96	There was a series of spurious security alarms until near mid-month during August of the last reporting year when there was a partial failure of the security system. Though some repairs were implemented, others remained in progress at the end of that reporting year with only one further spurious security alarm on September 15 and the security system finally restored to be fully operational on September 17, 1996 and proper compensation throughout the series of events.

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence
2.	18 Sep 96	In preparing to perform the daily checkout, the linear (red) pen was found to be not responding (failed downscale). Under MLP #96-29 preliminary checks and troubleshooting were performed to assure the two pen recorder was functioning properly and to isolate the problem to a failure of the compensated ion chamber (CIC) or connecting cables feeding the linear channel in the nuclear instrumentation system. Subsequently, RWP 96-2-I was issued on September 23 and the CIC was removed with the connectors and dielectric noted to be brittle confirming the failure. Subsequently, unsuccessful attempts were made to remove the cables from the cable trace with the boroscope used to isolate a connector obstructing the pathway from beneath the S-1 control blade pedestal. In the meantime, two spare CIC chambers were examined but cannot be used without modification of their cable connectors. On September 26, the uncompensated ion chamber (UIC) was removed since its cables were in the same cable trace and it had to be disconnected anyway. New cables were ordered under 10 CFR 50.59 Evaluation Number #96-10 and the UIC inspected on September 27 to confirm its integrity. At the end of September, attempts were under way to locate a replacement CIC or an acceptable source to rework the spare on-hand CICs as well as check their operability. During October 1996, the radiation monitor system was checked successfully and the CIC operation of the detector used as an uncompensated ion chamber (UIC) in Safety Channel 2 was checked to be able to operate in the CIC mode. Subsequently, after all cables were removed, new cables were routed and connected at the pedestal end of the lines. In addition, it was decided to move the existing UIC to the CIC location and utilize it as a CIC and to purchase a new UIC evaluated equivalent to the existing UIC from IST Technology which had one in stock. At the end of October, the new UIC was on order and it arrived early in November 1996 as all the pedestal side cable connections had been completed. During November, much time was spent

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 - August 1997)

Number	Date	Description of Occurrence
		checking circuit schematics and measuring system parameters, moving the UIC to the CIC location for operation as a CIC and installing the new UIC for Safety Channel 2, developing 10 CFR 59.59 Evaluation and Determination Number 96-12 to modify SOP-E.4 to perform the restart/calibration check following relocation of detectors, installation of connectors and testing of detectors, checkouts and installation of shield plugs, performance of modified precalorimetric and partial modified restart procedure, change of gain of linear channel picoammeter to allow calibration of the CIC, development of 10 CFR 50.59 Evaluation Number 96-14 to allow raising gain of picoammeter, removal of picoammeter to balance amplifier and verify resistance values of the calibration circuit, troubleshooting of picoammeter with replacement of resistors and balancing of components with subsequent restart to check gain with following correction of gain and restart for checking and assuring rough calibration check. Completion of the final calibration run occurred on November 27, 1996 with closeout of Radiation Work Permit 96-2-I and MLP #96-29 on November 27, 1996. Though ready to resume normal operations after November 27, the annual measurement of the temperature coefficient of reactivity (A-3 Surveillance) became overdue at the end of November, so this surveillance was completed satisfactorily on December 2, 1996 with data reduction completed on December 3, 1996 prior to restart for normal operations on December 3, 1996 with no further problems noted.

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence
3.	10 Jan 97	During reactor operation on January 10, 1997 at full power, it was noted that the adjustable stack monitor was reading approximately 1000 cps higher than the fixed stack monitor. The fixed stack monitor was reading approximately 2800 cps which was consistent with recent previous runs at full power and thus was considered normal. The Reactor Manager and Facility Director concurred that the requirements of Table 3.3 in the Technical Specifications were still being met. However, the decision was made to open a Maintenance Log Page (MLP) on the next working day and perform the stack monitor portion of the Q-2 surveillance to include calibration of the adjustable stack meter. On January 13, 1997, review and comparison of the Stack Monitor Calibration procedure (on the Q-2 Surveillance Data Sheet) and the Radiation Control Technique (RCT) #37 procedure showed inconsistencies between the two and neither included a step to match calibration of the adjustable stack meter with the fixed stack monitor. Additionally, the following discrepancies/items were noted: • No predicted stack count data sheet for the Cs-137 calibration source was included in RCT #37. • Instructions on the Q-2 surveillance data sheet were incorrect. They were apparently not updated when the RCT was changed in April 1990 to change from the tedious and subject-to-error process of moving the Cs-137 calibration source to the proper decay-corrected position within the base of the stack each time the monitor was calibration checked to moving the Cs-137 source to the same position each time and simply decay correcting the Cs-137 source-produced count rate.

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence

- Review of the Q-2 surveillance data sheets completed since March 1990 seemed to indicate that the "Expected Results" portion of the procedure had continued to be performed as it was done prior to the RCT revision in April 1990. Instead of determining the predicted decay corrected count rate at the fixed "4000 cps position" and the fixed "100 cps position," a more difficult approach of empirically determining the distance, from the stack detector, necessary to get approximately 4000 cps and 100 cps was used. at least on some occasions.

After Reactor Manager discussions with the Radiation Control Officer and Facility Director about the calibration procedure to be performed, MLP #97-01 was opened and the Reactor Manager, an SRO-trainee, and a radiation control technician walked through and then calibrated the fixed and adjustable stack monitors making necessary changes to assure a proper Q-2 surveillance data sheet as they proceeded. Only minor adjustments were needed in this calibration performed on January 13, 1997.

A meeting was convened with the Reactor Safety Review Subcommittee (RSRS) Executive Committee later on January 13, 1997 to present and discuss the problem. The determination was made that this was a potentially reportable event. Some of the items discussed during the meeting included the fact that Argon-41 releases, as indicated by a minimum of three semiannual stack grab samples, have been normal over the entire period in question. Probable causes for why this problem may have existed for so long prior to discovery included the fact that two people are required to perform this procedure with communications between the base of the stack and the control room by hand-held radios; although each had their own copy of the procedure, both procedures

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence

were from different references and both procedures were flawed. The RSRS Executive Committee also considered whether the stack readings were conservative or nonconservative over the period in question. Scenarios that would support both arguments were possible and were discussed; however, it was generally agreed that only a correct calibration of the stack monitor and follow-up operational test would provide real evidence. Therefore, the RSRS Executive Committee recommended contacting the NRC concerning a possible violation of Technical Specifications and that a one-hour operation at full power be conducted to determine how the stack monitor indication had changed following correcting the calibration.

The situation to this point concerning the improperly calibrated stack monitor including the plan for a one-hour run and the conclusion that the failure to properly calibrate the stack radiation monitor was a potentially reportable occurrence per UFTR Technical Specifications Section 6.6.2 was communicated by telephone to NRC Region II on January 14, 1997. There was also agreement to treat the event as promptly reportable. Since it was late in the day and a one-hour full-power run was planned to determine whether the stack monitor had been indicating conservatively or nonconservatively, the NRC representative agreed that the prompt one-day report confirming the telephone conversation could be delayed until January 15. Subsequently, the full-power reactor run on January 14 as authorized by the RSRS Executive Committee showed that recent stack monitor indications prior to January 13 were conservative, as expected since only minor adjustments were needed in the calibration performed on January 13, 1997. As a result, the approximate full-power steady-state stack monitor reading is now ~2200-2300 cps versus ~2700-2800 cps on previous recent full-power steady-state operations. The adjustable stack

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence

monitor meter also matches the fixed stack monitor indication. The fact that recent indicating values were conservative was conveyed to the NRC representative in a following conversation on January 15, along with iterating that all stack grab samples to measure Argon-41 levels have been normal over this entire period.

Essentially, the effort implemented in 1990 to have the Cs-137 monitor calibration source always placed consistently in the same position and be decay corrected versus trying to move the source for each quarterly calibration check of the stack monitor led to the problem as the new technique was not followed properly at some point. Essentially, it appears that the Cs-137 source was not decay corrected despite the fact that such decay corrections are, were and continue to be made consistently for the calibration checks of the reactor cell area radiation monitors which constitutes the first part of the Q-2 Surveillance (Quarterly Calibration Check of Area and Stack Radiation Monitors).

The UFTR Technical Specifications require calibration checks of the stack radiation monitor on a quarterly basis. Although always performed in a timely manner, the use of a flawed procedure that failed to correct for the decay of the Cs-137 calibration source led to a monitoring system that was not properly calibrated, at least for some periods of time including recently prior to January 13, 1997. The applicable section of the UFTR Technical Specifications requiring the quarterly calibration is Section 4.2.4(1) with the requirement for the monitor being in Table 3.3 in Section 3.4.2 of the Technical Specifications.

Some data gleaned from operations logs since 1990 show the operator-recorded stack count rate on the fixed monitor was recorded as varying somewhat for full-power runs of two

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence

hours or more after each calibration check of the stack monitor. Though the trend upward is clear in later years, it is not so in earlier years. In addition, there is some room for operator judgment in reading the meter since four orders of magnitude fit into little more than one inch of meter face. This situation (failure to properly calibrate the stack monitor) probably applied at least periodically since about mid-1990, though this is impossible to determine. Investigations of the operations logs for the period from early 1988 to the present generally show steady-state stack monitor count rates recorded at ~2000 cps for the first several years until September 1990 just after the new calibration procedure was implemented. From this point forward the full power equilibrium stack count rate varies from ~2000 cps to as high as 2800 cps but with most readings recorded at ~2000-2200 cps until mid-1992, with high values 2500-2800 cps in mid-1992 and most values since that time in the range 2100-2300 cps until the gradual rise over the past half year to the high rates noted earlier at 2600-2800 cps. Since Cs-137 has a 30.17 year half-life, discrepancies from failure to correct for decay would have occurred slowly over time. This means that improper calibrations would have only a small (~3%) effect per year which is part of the reason why the improper calibration was not noted earlier, though some jumps in the steady-state count rates are noted in the operations logs especially after the calibrations performed in August 1992 as noted above. It is also possible that the decay corrections were made in the earlier years from mid-1990 because such corrections would be clearly needed and only later were consistently overlooked until the calibration check on January 13, 1997.

Other contributing factors to this failure to calibrate the stack monitor properly are the fact that there were two procedures in existence. A full Radiation Control Technique (RCT #37) developed by the Radiation Control Officer and a Surveillance

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence
		Data Sheet (Q-2 Surveillance) with mini-procedure used to record the results of the Q-2 Surveillance at the UFTR facility certainly contributed to the problem, especially with one individual (typically a radiation control technician) performing the stack portion of the surveillance and a second individual (typically a reactor operator) performing the control room part of the surveillance and using the two procedures. The full-power reactor run on January 14 authorized by the Reactor Safety Review Subcommittee showed at least recent stack monitor indications were conservative as only minor adjustments were needed in the calibration performed on January 13, 1997 and the approximate full-power steady-state stack monitor reading is now ~2200-2300 cps versus ~2700-2800 cps on previous recent full-power steady-state operations. Operations log values of the steady-state stack monitor indications recorded were typically ~2000-2100 cps prior to 1990. Then in later years there was a gradual increase leading to the 2700-2800 cps values recorded in early January 1997. Therefore, it is possible that earlier calibrations since mid-1990 were not all conservative though it is also felt that the stack detector system is also gradually aging and hence changing, though slowly, with time since the proper steady-state full-power count rate in 1990 was ~2000 cps but today it is in the ~2200-2300 cps range, still with a constant Argon-41 level within detection and measurement limits. In addition, it should be noted that the monitor is simply a monitor (fixed) with an adjustable monitor taken off the fixed one. The actual determination and measurement of effluent are based on the semiannual stack grab samples analyzed for Argon-41 releases which have been consistently normal within detection limits.

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence
		After the Reactor Manager discussions with the Radiation Control Officer and Facility Director about the calibration procedure to be performed, MLP #97-01 was opened on January 13, 1997 and the Reactor Manager together with an SRO-trainee and a radiation control technician then calibrated the fixed and adjustable stack monitors making necessary changes to assure a proper Q-2 Surveillance was performed and documented as they proceeded. Since that date, the stack monitor has been considered to be properly calibrated to meet technical specifications. A "Coversheet/Change Request Form" (UFTR Form SOP-0.1A) was submitted to the RSRS Executive Committee to correct/update the Q-2 Surveillance Form. Similarly, copies of the Stack Monitor Source Decay Printout for the Cs-137 Source were submitted to Radiation Control for inclusion into the approved RCT #37. The revised Q-2 Surveillance Data Sheet was approved at the RSRS Executive Committee meeting on January 13, 1997 and is now installed in the applicable UFTR document manuals. The key change here is to call out that the expected results from the RCT #37 data sheet are to be used in calibrating/checking the fixed stack and the adjustable stack monitors. The change to RCT #37 has also been implemented as the RSRS Executive Committee agreed that this correction was needed as well. The RSRS Executive Committee also met on January 27, 1997 to review the report submitted to NRC on this event and concurs with its contents. Reactor Management and the RSRS Executive Committee agreed there had been no significant compromise to reactor safety in the occurrence and no impact on the health and safety of the public. The 14-day report on this event as submitted to NRC is in Appendix G of this report.

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence
		In a letter dated February 27, 1997 and received on March 3, 1997 from NRC Region II Fuel Facilities Branch Chief Ed McAlpine on the subject "Root Cause of Improper Stack Monitor Calibration," this event is summarized and proper corrective actions are acknowledged. However, the letter indicates that it appears that we did not address a major contributing factor to the root causes of the incident since we did not mention (1) management's role in and responsibility for providing adequate procedures, (2) ensuring operators and technicians are properly trained, and (3) auditing the procedures and the implementation thereof when changed. The letter from NRC is also included in Appendix G of this report. Although not in the report to NRC, several management-oriented changes were initiated to include revision of the procedures Coversheet/Change Request Form (UFTR Form SOP-0.1A) to require better control of such changes and generally noting the need to review all changes carefully including a walk-through where applicable. The changes in SOP-0.1 including Form SOP-0.1A were formally implemented on March 14, 1997 after approval at the RSRS meeting on March 13 to close out this specific concern with corrective action directed at the root cause of the problem.
4.	28 Jan 97	While performing a Reactor Operations Laboratory Course (ENU-5176L) exercise on the morning of January 28, 1997, it was noted, during an alarm test for training, that the source alarm did not actuate until 100 watts versus the 10 watts stated in SOP-A.2 and SOP-A.3. Review of the UFTR Technical Specifications and FSAR failed to turn up any mention of the 10 watt setpoint. In fact, the only mention of the source alarm at all is a short reference (page 7-1 of the FSAR) to its existence as a piece of control and indicating instrumentation on the Reactor Control Panel.

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence

From this examination and discussions between the Facility Director and Reactor Manager it was concluded that the only significance the 10 watt setpoint value has is that it is less than the absolute limit of 1 kW. The 1 kW limit is the maximum power level allowed without the vertical port plugs being in place and hence the required limit for removal of the sealed Pu-Be source to prevent running to power with it installed. The 1 kW source removal limit is also stated in the SOPs but never referenced anywhere in the Tech Specs or FSAR. Since there is apparently no safety significance to the 10 watt setpoint, or Tech Spec or FSAR reference, a 100 watt setpoint would safely provide the same function of alerting the operator to remove the source prior to raising power level above 1 kW. In fact, since the procedure recommends removal at 10 watts and states it shall be removed before exceeding 1 kW, it makes more sense to have the alarm at 100 watts, still a full order of magnitude below the required removal point of 1 kW. Combined with a regular weekly verification of the alarm function operation, which had not been done in the past, this function was to be checked at least as well as previously to assure the source is not excessively irradiated at power and not left in the core during power operations with the port closed. Therefore, two procedures (SOP-A.2 – Reactor Startup and SOP-A.3 – Reactor Operation at Power) were revised to change the reference source alarm setpoint to one of 100 watts. Additionally, to ensure the source alarm setpoint is checked on a regular basis, SOP-A.1 (Preoperational Checkout) was revised to add the source alarm setpoint as a check performed for the weekly checkout. These changes were tracked via 10 CFR 50.59 Evaluation Number 97-01 (Source Alarm Setting at 100 Watts).

The source was not used until all these SOP changes were installed in the console procedure manual. This modification package was subjected to final review and closed at the Reactor

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence
		Safety Review Subcommittee (RSRS) meeting on February 6, 1997. The changes were then implemented on February 17, 1997 to close this issue following review and approval at the RSRS meeting on February 6, 1997.
5.	31 Mar 97	During a reactor operations laboratory exercise on March 31, 1997 while at 10 watts since 1650 hours and preparing to go to higher power at 1657 hours, the automatic flux controller potentiometer was being adjusted in preparation for setting the controller for the expected higher power when the automatic flux controller assembly was noted to be freely spinning and not connected. An unscheduled shutdown was performed starting at 1657 hours with the reactor shut down and secured at 1659 hours. Subsequently, an unscheduled shutdown evaluation was performed. Completed UFTR Form SOP-0.6B (Unscheduled Shutdown Review and Evaluation) documented that this was a required shutdown due to flux controller inoperability with all safety and other control systems operating properly with no safety concerns. Subsequently, Maintenance Log Page 97-08 was opened for troubleshooting. After unbolting it was determined that it was not possible to adjust the servo potentiometer since it is a self-contained unit. A new identical servo potentiometer was obtained and installed. After replacement of the existing potentiometer with a new potentiometer, a daily checkout was performed and the reactor was started up and the servo potentiometer checked briefly at 3 kW and 10 kW. The reactor was then taken to 95 kW in manual control and, after waiting for temperatures to stabilize (~17 minutes), the automatic flux controller percent demand potentiometer was adjusted for 95 kW and placed in automatic control and checked for proper operation. Steps 7.3.4.1 through 7.3.4.4 of SOP-E.4 were performed to ensure that the Linear Range Selector Switch was in the 100 kW position with two licensed operators present for the performance of step 7.3.4.4. Further it was noted that the Linear Channel is

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence
		already calibrated per a recent calorimetric. Therefore, all that was needed was to assure that a setting on the percent demand potentiometer corresponded to the proper linear channel setting on the red pen, which it did. So, the retest procedure simply assured that the new potentiometer gave linear channel readings consistent with the one removed. The Maintenance Log Page #97-08 was closed out early in the afternoon on April 2, 1997 with the reactor subsequently returned to normal operations with no further problems noted.
6.	20 May 97	During a reactor operations laboratory class following closure of the dump valve, at 0940 hours on May 20, 1997 the rupture disk broke immediately upon starting the primary coolant pump. There was no operator error involved as the disk in place had apparently developed a crack and broke upon occurrence of the small pressure change caused by starting the PC pump. Under MLP #97-13, it was determined that approximately 35 gallons of primary coolant were dumped to the equipment pit which was cleaned up following characterization for radioactivity content. Since the reactor had not run for the week, the pit water sample and the weekly primary coolant sample were essentially equivalent. Subsequently, a duplicate rupture disk was removed from inventory, installed in the system and leak checked by closing the dump valve and starting the PC pump. A small drip leak was corrected with further tightening of the flange for the rupture disk and subsequent leak checks were negative with no further problems noted. This occurrence was evaluated as having no impact on reactor or personnel safety with the reactor returned to normal operations following successful completion of the daily checkout on the afternoon of May 21, 1997.

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence
7.	21 May 97	During a reactor operations laboratory class, during performance of step 7.2.5.5.1 of the daily checkout involving removal of the Safety-3 control blade about 40 units for a period trip check, the Safety-3 control blade position was noted to move out, then in, then out in a step fashion. Under MLP #97-14, the Safety-3 control blade drive motor was noted to be quite hot so it was removed and an on-hand spare drive motor was removed from inventory, its shaft modified to accept the shear pin per previously implemented changes and then installed in the Safety-3 control blade drive system. A successful daily checkout was then completed involving minimal control blade movements. Subsequently measurements of Safety-3 drop times and controlled insertion as well as controlled removal times were all normal with the motor and control blade noted to be operating smoothly over the full range, with measurements of the control blade drop time delayed until the afternoon of May 23, 1997 awaiting completion of maintenance under MLP #97-10 on the high speed recorder used in measurement of the control blade drop times. This occurrence, discovered during a daily checkout, was evaluated to have little impact on reactor safety and no impact on personnel safety with the reactor returned to normal operations following successful completion of another daily checkout on the afternoon of May 23, 1997 with no further problems noted.
8.	1 Jul 97	During the daily checkout with an NRC Inspector observing, the primary coolant level trip failed to actuate. Under MLP #97-21, after eliminating the field relay as the source of the failure, the float switch terminal boards were accessed where the level switch appeared to be sticking. Under RWP 97-1-I, the level switch was removed and found to be failed with contacts stuck together. On July 2, 1997, a reed switch from stock was bench tested satisfactorily and it was installed in the system under 10 CFR 50.59 Evaluation Number 97-05 since

TABLE III-8

LOG OF UNUSUAL OCCURRENCES
(September 1996 – August 1997)

Number	Date	Description of Occurrence
		the specifications on the failed reed switch were not designated anywhere. On July 3, 1997, various multiple checks and tests were performed on the level trip switch as installed to assure proper trip actuation. In addition, Step 4 of the Quarterly Scram Checks (Q-1 Surveillance) was performed satisfactorily along with requisite operational checks per UFTK SOP-A.1 Step 7.2.5.6 so the reactor was returned to normal operation with no further problems noted. Both MLP #97-21 and RWP 97-1-I were closed out on July 3, 1997 as this occurrence is not considered to have had an effect on reactor safety or the health and safety of reactor facility personnel or the public.

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 1996-1997 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 7: Addition of Secondary Water Flow Sensors (Rotameters))

- Carried over from the 1991-1992 Reporting Year:

  (Modification 92-04: Installation of New Manometers on Core Vent System)

  (Modification 92-06: Modification to the UFTR Thermocouple System: Implementation of Terminal Strips and Quick Disconnects)

- Carried over from the 1993-1994 Reporting Year:

  (Modification 93-05: Replacement of 12 Point Temperature Recorder with Digital Monitoring System)

- Carried over from the 1994-1995 Reporting Year:

  (Modification 95-02: Building 557 Roof Replacement)

1. Building 557 Roof Replacement (Permanent - Closed Item)

(Modification 95-02: Evaluation Completed 19 June 1995)

This 10 CFR 50.59 Evaluation was worked under MLP #95-25 along with 10 CFR 50.59 Evaluation #95-02. A description of this modification along with modification 95-02 is provided below:

Controlling Documents: Maintenance Log Page #95-25 (Closed 29 Aug. 1997)
10 CFR 50.59 Evaluation/Determination #95-02

Following awarding of the contract to David Lancaster (Lancaster Roofing) for reroofing the reactor building, 10 CFR 50.59 Evaluation and Determination Number 95-02 was fully approved on 14 July 1995. Subsequently, dumpsters were placed in the west fenced reactor lot and the roof replacement was scheduled for 15-17 July 1995. The south low roof over the NAA Laboratory and the north low roof over the annex were to be worked on over the weekend (15-16 July) with the reactor cell high roof not to be worked on until reactor staff could be present on 17 July 1995.

Under MLP #95-25 on 15 July 1995, most of the south low roof was replaced up to the outer level per the 10 CFR 50.59 Evaluation and Determination. It began to rain as this section was nearing completion; subsequently, there were several leaks which were repaired but, except for roof checks on the morning of 16 July 1995, no further work other than pumping water off the new roof section was accomplished due to periodic rains and other contractor commitments.

On 11 August 1995, the dumpsters (one full) were removed from the west lot to other jobs with the roof to be worked on in the near future. On 30 August 1995, a PPD technician accessed the roof to replace some nails in preparation for future work. During September, Bob Hutchinson, a supervisor with Douglas Roofing Inc., visited on 20 September and again on 21 September to assure dumpsters could be moved to the west lot and to schedule further roof work. On 22 September, Bob Hutchinson and Jim Bishop visited to check on status and secure the west gate lock and then Jim Bishop assured the proper location of a dumpster in the west lot. On 28-29 September, the roofers continued to work on the south roof over the offices to finish the last section and to replace the entire roof over the annex with the initial layers of roofing material.

On 29 September 1995, Bob Hutchinson toured the ex-cell areas of the building to assure securing power to all the fume hood blowers; these blowers along with missed ones from previous fume hood removals were removed with new ones to be installed on three fume hood lines. Considerable debris was dropped on the floor of the rabbit system area during removal of the old blowers resulting in scarring and tar on the floor around the front of the hot cave and rabbit system. At month's end it was raining. This rain resulted in multihundreds of gallons of water intrusion in the NAA Laboratory. Although there was no contamination, over eight (8) man-hours were spent cleaning up the laboratory area with the floors still unsightly but no one seemingly willing to clean them properly. On 4 October and again on 6 October, Bob Hutchinson toured the annex to check on leaks there. On 6 October 1995, Hutchinson visited to schedule roofing work for 9 October.

On 9 October, dumpsters were removed from the west lot and there was five (5) hours of work on the roof until it started to rain. Mr. Jim Bishop then removed the tar pots and ladders from the west lot on 10 October. There was no further contact until R. Hutchinson visited on 17 October to check the south section of the roof and plan repairs for the following week.

On 26 October, R. Hutchinson and two (2) assistants accessed the roof briefly to move supplies. Then on 27 October, R. Hutchinson and J. Bishop visited to tour the NAA Laboratory and upstairs office areas to plan and schedule replacement of the roof drain in the northeast corner of the NAA Laboratory area. In preparation for the drain replacement, all equipment was removed from this area of the NAA Laboratory with the roofers installing a new roof drain on 30 October 1995 as they worked most of the day on the south roof section. Subsequently, there was a gas smell in the non-cell portion of the building. After being assured by the roofers they were using no solvents, UPD was called with Gainesville Fire Rescue responding as well. A bucket of gasoline soaked rags was then discovered in the west fenced lot; these had apparently been used to clean tar from the NAA Laboratory floor that had resulted from the roof drain replacement (on October 30) and the fume hood blower removal (in September), which is why the gasoline smell was in the building. Subsequently, the rags were properly secured to conclude the month, though at month's end it was again raining after none for several weeks. This rain resulted in roof drain leaks into staff offices and the NAA Laboratory on 1 November, 1995. Again there was no contamination; however, a number of hours of staff and housekeeping personnel time were spent cleaning up the mess until 6 November 1995. Corrective work on the south (NAA Laboratory) building roof was implemented by Douglas Roofing Company (DRC) on 6 November but, subsequently, two plumbers and Mr. Bob Hutchinson accessed the roof on 7 November to unclog the roof drains.

On 8 November, there were more leaks with cleanup by housekeeping personnel and a promise by Rob Roberts that the problem would be fixed. DRC finished sealing the NAA Laboratory roof on 9 November with foreman J. Bishop inspecting the job on 9 November. On 10 November, DRC worked on the annex roof while they worked on the NAA Laboratory roof on 13 November. The cell roof was finally addressed on 17 November with supposed finishing touches applied on 18 November as Dr. Vernetson admitted the roofers to the west lot on Saturday and checked the facility several times over the weekend through 19 November. Considerable time was spent cleaning up small grit and debris in the cell on 20 and 22 November. Supervisor Bob Hutchinson visited on 27 November seeking more work time but reactor projects prevented making any commitment. Foreman J. Bishop did a little roof work on 28 November and checked the south roof and walked through the facility for a negative check on leaks with Dr. Vernetson on 29 November. Additional cell housekeeping to clean up debris was undertaken on 29 November as considerable areas remain to be cleaned at month's end. On 1 December 1995, Rob Roberts of Craig Salley and Associates visited so that they could remove ladders and tarpots from the west lot. On 6 December, Foreman Jim Bishop visited to check the roof and tour the NAA Laboratory areas to check leakage with D. Simpkins. Rob Roberts and Jim Bishop then scheduled roof work for 7 and 8 December until 3:30 p.m. Subsequently, the roofers worked a full day redoing one half of the south roof on 7 December and then worked on both the cell and south sections for one-half day on 8 December with supervisor Bob Hutchinson indicating that the north roof was finished and the reactor roof only needs flashing. On this day, several hours were spent cleaning the cell from the grit produced by the cell roofing activities. On 12 December, the roofers worked all day on the flashing on the cell roof and on the south roof.

On 13 December, R. Roberts and J. Bishop visited to have supplies moved to the roof and then the roofers worked nearly all day on 14 December with reactor staff spending about a half day continuing cleaning of the cell. On 15 December, the roofers failed to show up as committed and then on 19 December there was another major leakage of water into the building with cell leakage on the south wall causing a security alarm just prior to beginning the work day. About one-quarter day was spent cleaning up this water as well as major water intrusion in Professor Schoessow's laboratory and several places in the NAA Laboratory. This delayed work under MLP #95-40. Bob Hutchinson visited on 20 December to schedule more roof work but then R. Roberts and Mike Miller of Craig Salley and Associates toured the entire building to document water intrusion and damage and to announce that Douglas Roofing was removed from the contract and could only work that day to try to limit further leakage of water which the roofers did for about one-quarter day. David Lancaster and Bob Hutchinson of Lancaster Roofing then visited on 21 December to say they had been removed from the work and to apologize for the leaks. Subsequently, the roofers visited on 22 December to remove a tarpot and their ladders. Hopefully the final work has eliminated the leaks but at month's end the west lot grounds are strewn with debris. We can only hope the leaks are fixed as the new roofing contract is apparently in place, though at month's end it was again raining for the first time in a week. On 1 January 1996, there was again some water leakage into the NAA laboratory areas as well as upstairs above the NAA Laboratory for which considerable absorbent paper was placed.

On 2 January 1996, three representatives of Perry Roofing plus PPD technician Richard Thomas were conducted on a tour and some time was spent cleaning up water leaks. On 3 January 1996, R. Thomas pumped water off the south roof for several hours; on 4 January 1996, Mr. Thomas toured the annex and shop areas with Dr. Vernetson to check on their status. Finally, on 11 January 1996, Rob Roberts of Craig Salley and Associates visited with Perry Roofing representatives Tim McKee and Rick Owens for instructions and to plan access as well as check some of the upstairs water damage. On 12 January 1996, Roberts and McKee visited with a crew to access the west lot and spend about six hours clearing debris from the three roof sections. On 17 January 1996, PPD's R. Thomas checked the roof again. On 19 January 1996, a BFI representative finally removed the full trash dumpster from the west lot. Finally, on 29 January 1996, Tim McKee returned to check the roof status relative to where further work was needed.

On 12 February 1996, some water was noted to be dripping from the ceiling area over the cabinets and dripping over in the NAA Laboratory. On 13 February 1996, PPD supervisor Willy Hill and PPD technician Richard Thomas conducted an inspection of the roof and promised to get back on reconnecting the fume hoods in the reactor building. Nothing happened after that date, though PPD ventilation and air handling equipment technician Shawn Walton checked the laboratory leak and evaluated the leak as coming from the roof on 23 February 1996. Nothing else occurred in February though much water was left standing on the south reactor roof section at month's end.

On 1 March 1996, PPD technician R. Thomas visited the NAA Laboratory to confirm a small leak in the freeze dryer area was coming from the roof. On 18 March, PPD supervisor Don Harford visited concerning the leak in the cell outside the control room and six (6) relatively small leaks at most penetrations in the NAA Laboratory area around the hot cave. Later, Harford toured with two Perry Roofing company personnel (Kenny Streeter and Thomas Jones) who then accessed the roof to temporarily stop the leakage from the rainstorm in progress.

On 19 March, Mike Miller of Craig Salley and Associates toured the facilities to inspect and take pictures of the roof leakage. Finally, on 26 March, Perry Roofing supervisor Tim McKee accessed the roof briefly to get information on the flashing. Work was then expected to occur in April.

On 2 April 1996, Supervisor Tim McKee and Steve of Perry Roofing Company visited the facility to check on leaks and schedule roof repair times. On 4 April 1996, the west fenced lot locks were changed out to facilitate roofing company access. On 5 April, Rob Roberts of Craig Salley and Associates visited with Tim McKee and Joe L. Tate of Carlos Hope Electric Company to locate fume hood breakers, examine hoods and check out horsepower rating of removed motors to support bidding on a subcontract to install the new exhaust system. On 5 April, there was also one-half day work on the NAA Laboratory and annex roof to prevent leaks. On 8 April, Foreman Rick of Perry Roofing Company visited to set work schedules and to get supplies placed for future work. On 10 April, Tim McKee visited with another potential electrical subcontractor D. Dudeck to inspect fume hoods for a potential bid to install new motors. On 17 April and 24 April, Foreman Rick visited and the roofers spent two half-days making the NAA Lab roof and annex roof leak tight. On 29 April, the roofers moved the new fume hood motors and exhaust vents to the roof and positioned them. On 30 April, Foreman Rick and two workers from Perry Roofing Company visited along with PPD technician Richard Thomas to check on a number of leaks in the NAA Laboratory area. Perry Roofing Company then worked about ¾ day to stop the leaks which occurred during a heavy storm. Additional work is now expected to occur in May as the old work will need to be torn off the south roof section.

On 1 May, Perry Roofing Company pumped water off the roof and patched leaks in the south roof section. On 7 May, foreman Rick of Perry Roofing Company visited and work was begun on installing a new temporary roof on the south section. Rick visited again on 8 May with work continuing on the south roof section on 9 and 10 May with work also completed on the diesel generator room roof on 10 May. Foreman Rick visited again on 14 May and reported that the new tapered roof was now laid in to prevent water from building up on the roof. Foreman Rick visited again on 15 May to schedule future work with final stages of south roof section layering completed on 17 May. Supervisor Tim McKee and foreman Rick visited with a factory materials installation inspector to check the roof work to date on 20 May. Work continued on the south roof section on 21, 22 and 24 May. On 29 May, foreman Rick visited with a representative of Thompson Sheet Metal and work was begun installing flashing and fume hood vents and exhausts with a number of days of effort remaining before completion.

On 3 June, Elmer Weston of Thompson Sheet Metal and supervisor Rick of Perry Roofing Company visited to schedule some work relative to a small leak in the NAA Laboratory around the vents. On 5 June, SRO-trainee John Powers cleaned up from the leak and more roof work was accomplished on 7 June. Supervisor Rick visited again on 10 June to check out a continuing leak in the NAA Laboratory with work performed to correct the leak. Roof work, especially on vents and flashing, on the NAA Laboratory roof was accomplished on 18 and 19 June. Supervisor Rick then visited on 24 June to check on the continuing small leak in the NAA Laboratory and to schedule more work. Elmer Weston then visited on 25, 26 and 27 June to assure roof access was allowed with most sheet metal work completed to include installing permanent ladders for accessing the reactor roof from the south and north roof sections.

On 10 July, supervisor Rick of Perry Roofing Company visited and additional roof work and sheet metal work was accomplished on 10 and 12 July 1996. On 15 July, supervisor Rick visited again to schedule final detailing work which was accomplished on 16 July 1996. Rob Roberts of Craig Salley and Associates then visited on 18 July to check leakage damage and provide access to the west lot for equipment removal. At month's end there are still two small leaks in the NAA Laboratory area.

On 15 August, Acting Reactor Manager D. Cronin met with Rob Roberts of Craig Salley and Associates and PPD Supervisor Don Harford concerning scheduling repairs to correct the NAA Laboratory leak, reconnecting the fume hoods, etc. Perry Roofing Company and Thompson Sheet Metal then conducted roofing work on 15, 16 and 19 August whereupon D. Cronin met with Mr. Roberts on 19 August to discuss the project status and the need for still more work. Additional roof work was accomplished on 20 August and then Mr. Roberts visited twice on 21 August to discuss project status first with D. Cronin and then with W.G. Vernetson. Supervisor Rick Owens of Perry Roofing then visited on 23 August to indicate the NAA Laboratory roof was essentially complete and to access the annex roof where water pockets could necessitate redoing the roof. On 30 August, W.G. Vernetson called and Mr. Roberts visited to examine small leaks still occurring in Room 106 upstairs and in the outer NAA Laboratory area downstairs. Subsequently, two electricians from Dan Dudeck visited to discuss reconnecting the fume hoods. Subsequently, on 30 August, PPD Supervisor Don Harford, Craig Salley and Associates representative Rob Roberts and Wayne Handley of Reliable Painting visited to check out water damage and discuss painting needs. Handley then returned later that day to make plans for painting in Room 106 upstairs and in the outer NAA Laboratory areas.

As scheduled, Wayne Handley and six painters painted the outer NAA Laboratory walls as well as the ceiling in Room 106 upstairs to repair damages due primarily to the roof leaks with several checks on progress by the reactor director on 2 September. The roofers then worked to repair the two leaks on 3 September with supervisor Rick Owens placing equipment in the west lot on 6 September with plans to rework the annex roof on 7 September which was prevented by the reactor use schedule. Subsequently, Perry Roofing worked on the annex roof on 8 and 9 September with Dudeck Electric Inc. electricians Ken Shiver and assistant Casey Weaver plus Rob Roberts of Craig Salley and Associates checking on connecting fume hoods on 9 September. The electricians then completed connections inside and outside on 9 and 10 September to restore fume hood operation. Rob Roberts then visited on 11 September to notify of the upcoming substantial completion inspection which was then postponed. Dr. Vernetson then toured upstairs and downstairs to check the same two leaks with UPD Officer Evin Sepulveda on 11 September with T.J. of Perry Roofing checking the locations of the leaks and working to fix them on 12 September. Subsequently, James Wallace of the College of Engineering toured the facility on 18 September relative to the upcoming substantial completion inspection to check on status and damages. He visited again on 19 September to clarify damage referrals. Subsequently, Rob Roberts and Supervisor Rick Owens visited on 25 September for roof access for the substantial completion inspection. Dwayne Atkinson of Thompson Sheet Metal then visited and considerable flashing work was conducted on 26 September. Finally, on 30 September, Perry Roofing personnel performed roof work and removed most of their equipment. At month's end there was no apparent leakage with work nearly complete.

During October 1996, a tour following extensive rains on 8 October showed no signs of water intrusion. Perry Roofing personnel then installed new roof drains on 16 October with no further work during the month.

During November 1996, Mr. Ken Perlowski of Physical Plant Division called to check on fixing laboratory damage from roof leaks and repair work. Since the floor cleaners restored the laboratory floor to good condition in October 1996, he was told there was no need for further repairs. However, there were damages to books and other items as well as time and supplies used in clean up over the past fifteen months for which we would like to request reimbursement. He indicated the request should come to him, so a memorandum summarizing damages in Building 557 for which we seek compensation was in progress at month's end. We also indicated to him that we need official confirmation when work is complete.

During December 1996, Alan Kent of U.S. Test and Balance Inc., representing the Architect Engineer Craig Salley and Associates, visited on 12 December to check a non-operational classroom fume hood. Alan Kent and Gary Marianni then got the hood blower properly installed on 13 December with Mr. Kent verifying proper operation on 16 December. Subsequently, on 16 December, Mr. Tim McKee, a supervisor with Perry Roofing Company visited to check the status of the hoods and roof drains. Later on 16 December, a subcontractor performed moisture tests on the south roof section. Two DrillTec electricians then checked the hoods again on 17 December with two Perry Roofing personnel installing downspouts on the west side of the building on 18 December 1996. Following the conversation with Ken Perlowski of the UF Physical Plant Division on 20 November, a memorandum dated 11 December 1996 was sent to him outlining damages that have occurred during the roofing project and detailing costs for which reimbursement is sought. The memorandum also emphasizes that we are awaiting word that roof work is now finished. A copy of the memorandum is Attachment I to the December report.

During January 1997, Ken Godwin of Advanced Lightning Protection (Perry Roofing subcontractor) visited on 29 January to arrange roof access and then install holders for roof lightning protectors. Supervisor Tim McKee then visited briefly to arrange roof access later in the day for electricians. McKee then checked the fume hood exhausts on 29 January and reported the one not working in the NAA Laboratory had blown motor fuses twice so some additional calculations were needed on fuse sizing. Ken Godwin returned with a bucket truck on 31 January and completed installation of lightning protection on the reactor roof. In addition, telephone calls from PPD employee Dan Walker on 30 and 31 January indicated that we should receive reimbursement for some of our costs outlined in the 11 December memorandum to Ken Perlowski. We will need to generate requisitions for the items and costs quoted not to include OPS salaries which has not yet been done as of the end of February 1997.

During February 1997, Tim McKee called on 14 February to arrange for roof work on 16 February which involved supervisor Rick and four employees who replaced a ten-foot square section of the south roof where water had been detected. Supervisor Rick returned on 17 February to remove waste materials from the roof and two workers returned on 26 February to remove several tools and pieces of equipment from the roof. PPD engineer Lynn Hodge visited on 27 February and indicated work was nearing completion. Supervisor Rick then visited later on 27 February to schedule a roof walk-through which was pending at month's end.

During March 1997, Tim McKee checked the roof on 4 March and indicated about two more accesses would be needed. Thompson Sheet Metal personnel then worked on roofing flashing on 5 March. Ken Godwin of ALP, Inc. then visited on 5 March to schedule access; he returned with an assistant on 6 March and completed installation of advanced lightning protection. Subsequently, Tim McKee and four other Perry Roofing Company employees spent a half-day on 9 March working on roofing flashing and other details on all three roof sections. Finally, Thompson Sheet Metal personnel accessed the roof to complete work and move off some equipment on 17 March, hopefully completing work except final inspection.

According to communication from Denis Mercier on 16 April 1997, the roof only needs a final inspection to be certified complete per Attachment I to the April report. On 23 May 1997, Radiation Control Officer D.L. Munroe toured the facility with Jerry Hammett, President of Mid State Electric making plans to install surge protection for the building related to the previously installed lightning protection. This work was planned for some time in June 1997.

On 9 June 1997, when it was noted that electric power would be secured for the surge protection installed as a subcontract with Mid State Electric under the reroofing contract work addressed under MLP #95-25, it was decided to open a separate duplicate maintenance record for the installation of surge protection since it would be completed in a single day. This work involved securing all electrical equipment in the building including the reactor console. The surge protection was installed by Mr. Jerry Hammett, President of Mid State Electric and his assistant and overseen by PPD technicians Mike Williams and T.C. Hall after similar work was completed in the Nuclear Sciences Center. Subsequently, all equipment was returned to service, the console was returned to power and a daily checkout was performed after a warmup period. Except for the optical tachometer not being operable due to needing to be reset following loss of power, all recovery was without incident with no problems noted as this work is tracked on two maintenance log pages so that MLP #97-16 was closed on 9 June 1997.

On 18 August 1997, Supervisor Tim McKee of Perry Roofing Company visited indicating the roof was now complete and the need to access the roof for a biennial check, which he did. Subsequently, on 29 August 1997, completion of the roof was verified with Mr. Denis Mercier, General Services and Facilities Manager for the College of Engineering and with Mr. James Rarick, Maintenance Superintendent with the University of Florida Physical Plant Division to conclude this project with no problems noted in many months. (On 29 Aug 97, MLP #95-25 was closed.)

2. <u>Replacement of Failed Resistor in Security System Battery Charging System</u>
(Permanent - Closed Item)

(Modification 96-08: Evaluation Completed 22 August 1996)

This 10 CFR 50.59 Evaluation was worked under MLP #96-25 along with 10 CFR 50.59 Evaluation #96-08. Following a larger than usual number of spurious security alarms in early August, an alarm occurred on 13 August just prior to normal work hours. Under MLP #96-25 troubleshooting was conducted and an electronic component was replaced under 10 CFR

50.59 Evaluation Number 96-08. Subsequently, the system was returned to service with some malfunctions compensated and additional work required. The system was near fully functional until repairs were finalized and MLP #96-25 closed out on 16 September when a further problem occurred which was finally corrected on 17 September when MLP #96-25 was reopened the next day. (16 Sept. 1996 and 17 Sept. 1996, MLP #96-25 was closed.)

Controlling Documents: Maintenance Log Page #96-25 (Closed 17 Aug. 1996)
10 CFR 50.59 Evaluation #96-08

3. Remote Fuel Element Handling Tool Modification
(Permanent - Closed Item)

(Modification 96-09: Evaluation Completed 22 August 1996)

This 10 CFR 50.59 Evaluation was worked under MLP #96-27 along with 10 CFR 50.59 Evaluation #96-09. It was generated to address a change to the remote fuel element handling tool pulley. The old design was a hose clamp welded onto the pulley that clamped onto the crane hook. The hose clamp weld had broken while the tool was not in use. The new design uses two C-clamps that connect to the pulley and the crane hook. The new design is much more secure than the previous design and provides more even load distribution. In addition, a change to the Fuel Handling Standard Operating Procedures (SOP-C.4) was made to show the new design in the technical drawings. The new design was proven much more effective during the fuel inspection performed at the end of August 1996.

Controlling Documents: Maintenance Log Page #96-27 (Closed 20 Aug. 1996)
10 CFR 50.59 Evaluation #96-09

4. CIC and UIC Detector Cabling Replacement (Permanent - Closed Item)

(Modification 96-10: Evaluation Completed 17 October 1996)

A description of this modification along with modifications #96-11, #96-12, and #96-14 is provided under item 7, below.

Controlling Documents: 10 CFR 50.59 Evaluations #96-10, #96-11, #96-14, and
10 CF 50.59 Evaluation/Determination #96-12
Maintenance Log Page #96-29 (Closed 27 November 1997)
Radiation Work Permit # 96-2-I

5. Unsatisfactory Daily Checkout Following Satisfactory Performance of Quarterly Scram Checks (Permanent - Closed Item)

(Modification 96-11: Evaluation Completed 31 October 1996)

A description of this modification along with modifications #96-10, #96-12, and #96-14 is provided under item 7, below.

Controlling Documents: 10 CFR 50.59 Evaluations #96-10, #96-11, and #96-14, and
10 CFR 50.59 Evaluation/Determination #96-12
Maintenance Log Page #96-29 (Closed 27 November 1997)
Radiation Work Permit # 96-2-I

6. Modification of SOP-E.4 for Restart Calibration Checks Following Relocation of UIC for Use as CIC and Placement of Equivalent New UIC (Permanent - Closed Item)

(Modification 96-12: Evaluation/Determination Completed 8 November 1996)

A description of this modification along with modifications #96-10, #96-11, and #96-14 is provided under item 7, below.

Controlling Documents: 10 CFR 50.59 Evaluations #96-10, #96-11, and #96-14, and
10 CFR 50.59 Evaluation/Determination #96-12
Maintenance Log Page #96-29 (Closed 27 November 1997)
Radiation Work Permit # 96-2-I

7. Resistor Changes to Increase Gain of Picoammeter A2 Amplifier to Facilitate Linear Channel Calibration (Also Updates Special Test Procedure) (Permanent - Closed Item)

(Modification 96-14: Evaluation Completed 22 November 1996)

A description of this modification along with modifications #96-10, #96-11, and #96-12 is provided below.

Controlling Documents: 10 CFR 50.59 Evaluations #96-10, #96-11, and #96-14, and
10 CFR 50.59 Evaluation/Determination #96-12
Maintenance Log Page #96-29 (Closed 27 November 1997)
Radiation Work Permit # 96-2-I

Modifications 96-10, 96-11, 96-12, and 96-14

In preparing to perform the daily checkout on 18 Sept. 1996, the linear (red) pen was found to be not responding (failed downscale). Under MLP #96-29 preliminary checks and troubleshooting were performed to assure the two pen recorder was functioning properly and

to isolate the problem to a failure of the compensated ion chamber (CIC) or connecting cables feeding the linear channel in the nuclear instrumentation system. Subsequently, RWP 96-2-I was issued on 23 September and the CIC was removed with the connectors and dielectric noted to be brittle confirming the failure. Subsequently, unsuccessful attempts were made to remove the cables from the cable trace with the borescope used to isolate a connector obstructing the pathway from beneath the S-1 control blade pedestal. In the meantime, two spare CIC chambers were examined but cannot be used without modification of their cable connectors. On 26 September, the uncompensated ion chamber (UIC) was removed since its cables were in the same cable trace and it had to be disconnected anyway.
New cables were ordered under 10 CFR 50.59 Evaluation Number #96-10 and the UIC inspected by D. Ekdahl and D. Cronin on 27 September to confirm its integrity. At month's end, attempts were underway to locate a replacement CIC or an acceptable source to rework the spare on-hand CICs as well as check their operability.

During October, 1996. the radiation monitor system was checked successfully and the CIC operation of the detector used as a UIC in Safety Channel 2 was checked to be able to operate in the CIC mode. Subsequently, after all cables were removed, new cables were routed and connected at the pedestal end of the lines. In addition, it was decided to move the existing UIC to the CIC location and utilize it as a CIC and to purchase a new UIC evaluated equivalent to the existing UIC from IST Technology, which had one in stock. At month's end, the new UIC was on order and arrived early in November, 1996 as all the pedestal side cable connections had been completed.

During November, much time was spent checking circuit schematics and measuring system parameters, moving the UIC to the CIC location for operation as a CIC and installing the new UIC for Safety Channel 2, developing 10 CFR 50.59 Evaluation and Determination Number 96-12 to modify SOP-E.4 to perform restart/calibration check following relocation of detectors, installation of connectors and testing of detectors, checkouts and installation of shield plugs, performance of modified precalorimetric and partial modified restart procedure, change of gain of linear channel picoammeter to allow calibration of the CIC, development of 10 CFR 50.59 Evaluation Number 96-14 to allow raising of the picoammeter gain, removal of picoammeter to balance amplifier and verify resistance values of calibration circuit, troubleshooting of picoammeter with replacement of resistors and balancing of components with subsequent restart to check gain with following correction of gain and restart for final calibration run occurred on November 27, 1996 with closeout of Radiation Work permit 96-2-I and MLP #96-29 on November 27, 1996.

Although ready to resume normal operations after November 27, the annual measurement of the temperature coefficient of reactivity (A-3 Surveillance) became overdue at the end of November, so this surveillance had to be completed satisfactorily prior to restart for normal operations.

Another problem that occurred was that the daily checkout required as part of the quarterly scram checks (Q-1 Surveillance) could not be performed due to the removal of the detector supplying the linear channel. As a result of this, 10 CFR 50.59 Modification Number 96-11 was generated. After replacement of the detectors was completed, the next daily checkout

performed was completed satisfactory on 31 October 1996.

8. Security System Power Pack Replacement (Permanent - Open Item)

(Modification 96-13: Evaluation Completed December 1996)

Following one spurious security alarm on 10 November and two alarms on 11 November 1996, the security system batteries were checked and replaced (S-7 Surveillance). Under MLP #96-30 the rechargeable batteries were found to be low and were recharged. Subsequently 10 CFR 50.59 Evaluation Number 96-13 was developed to allow modification and replacement of the power pack to prevent recurrence of the problem of spurious alarms due to low voltage. Measurements were made and security system circuits checked and verified. In addition, the 6 volt batteries were recharged in mid-month. At the end of November 1996, the design and development of a new power pack per 10 CFR 50.59 Evaluation Number 96-13 was in progress; at the end of December 1996, the 10 CFR 50.59 Evaluation is complete as is the design, with installation of the new power supply on 14 January 1997 with all but one siren operational to meet requirements. Subsequently, the west lot siren was repaired on 13 January and both the west lot and journalism side siren horn drivers wiring was reterminated on 14 January 1997. Drawings and maintenance log were subsequently updated and an evaluation made that separate grounds would be needed for the security system batteries to assure proper charging and eliminate spurious alarms as the batteries discharge over time. On 10 March 1997, the power supply was removed for modification. Upon installation, various problems occurred resulting in partial and intermittent compensated outage of the security system over the period 10-21 March with circuit mapping performed for troubleshooting on 19 March and the intermittent ground finally repaired on 21 March 1997, but without installation of the modification to separate grounds, basically returning the system to its state prior to 10 March. Subsequently, the 4 volt rechargeable batteries have been replaced on 14 May 1997, 18 June 1997, 7 July 1997 and 24 July 1997 (for prevention purposes on 30 July 1997) and on 29 August 1997 as partial S-7 Surveillances. MLP #96-30 remains open.

Controlling Documents: Maintenance Log Page #96-30 (Remains Open)
10 CFR 50.59 Evaluation Number 96-13

9. Source Alarm Setting at 100 Watts (Permanent - Closed Item)

(Modification 97-01: Evaluation Completed 17 February 1997)

This 10 CFR 50.59 Evaluation was generated to address the source alarm setting being at 100 watts versus the 10 watts stated in SOP-A.1, SOP-A.2 and SOP-A.3. While performing the ENU-5176L Reactor Operations Lab exercise #4 on the morning of January 28, 1997, it was noted, during an alarm test for training, that the source alarm did not actuate until 100 watts versus the 10 watt setting stated in SOP-A.1, SOP-A.2, and SOP-A.3. Review of the UFTR Technical Specifications and FSAR failed to turn up any mention of the 10 watt setpoint. In fact, the only mention of the source alarm at all is a short reference (page 7-1 of the FSAR) to its existence as a piece of control and indicating instrumentation on the Reactor Control

Panel. From the examination and discussions between the Facility Director and Reactor Manager it was concluded that the only significance the 10 watt setpoint value has is that it is less than the absolute limit of 1 kW. This limit is the maximum power level allowed without the vertical port plugs being in place and hence the required limits for removal of the sealed Pu-Be source to prevent running to power with it installed. The 1 kW source removal limit is also stated in the SOPs but never referenced anywhere in the Tech Specs or FSAR. Since there is apparently no safety significance to the 10 watt setpoint, or Tech Spec or FSAR reference, a 100 watt setpoint would safely provide the same function of alerting the operator to remove the source prior to raising power above 1 kW. In fact, since the procedure recommends removal at 10 watts and states that it shall be removed before exceeding 1 kW, it makes more sense to have the alarm at 100 watts, still a full order of magnitude below the required removal point of 1 kW. SOP-A.1, SOP-A.2 and SOP-A.3 were revised to change the reference source alarm setpoint to 100 watts. This modification was subjected to final review and closed at the RSRS meeting on February 17, 1997.

Controlling Documents: 10 CFR 50.59 Evaluation #97-01
UFTR SOP-A.1, SOP-A.2, SOP-A.3

10. Resistor Changes to Increase Gain of Picoammeter A-2 Amplifier to Facilitate Linear Channel Calibration Under Special Test Procedure E.4 (Modified)
(Permanent - Closed Item)

(Modification 97-02: Evaluation Completed 18 March 1997)

This 10 CFR 50.59 Evaluation is similar to 10 CFR 50.59 Evaluation Number 96-14 (discussed in detail, above). Picoammeter Amplifier A-2 was modified to increase the amplifier gain to allow linear channel calibration. The amplifier was balanced after the resistors were replaced. The Special Test Procedure SOP-E.4 (Modified) was also updated to reflect this change. The modification was worked under MLP #97-06, which was closed on 18 March 1997.

Controlling Documents: Maintenance Log Page #97-06 (Closed 18 March 1997)
10 CFR 50.59 Evaluation #97-02

11. SAR Figure 7-2: Operating Range of UFTR Neutron/Power level Detectors
(Permanent - Closed Item)

(Modification 97-03: Evaluation Completed 11 April 1997)

This 10 CFR 50.59 Evaluation was generated to address the fact that figure 7-2 of the SAR was incorrect in that the "Power Level (percent)" and "Power Level (watts)" scales did not match. The figure was corrected to show the proper scales. The associated package submitted to the NRC is contained in Appendix C of this report.

Controlling Documents: 10 CFR 50.59 Evaluation #97-03

12. Upgrade of UFTR Fire Alarm System to Use Digital Voice Telephone Lines by Installation of a Digital Dialer and Line Capture RJ31X Jacks (Permanent - Closed Item)

(Modification 97-04: Evaluation Completed 11 July 1997)

This 10 CFR 50.59 Evaluation was generated to address the upgrade of the UFTR fire alarm system. This modification replaced the current single dedicated line with a Silent Knight digital dialer connected to dual dedicated lines. The modification was worked under MLP #97-11 and is completed with no problems noted.

Controlling Documents: Maintenance Log Page #97-11 (Closed 11 July 1997)
10 CFR 50.59 Evaluation #97-04

13. Primary Coolant Level Reed Switch Replacement (Permanent - Closed Item)

(Modification 97-05: Evaluation Completed 03 July 1997)

This 10 CFR 50.59 Evaluation was generated to address the replacement of the Primary Coolant Level Reed Switch. During the daily checkout on 1 July 1997 with NRC Inspector Stephen Holmes observing (as part of a routing inspection), the primary coolant level trip failed to actuate while the primary coolant was dumped from the core to the storage tank. Under MLP #97-21, after eliminating the field relay as the source of the failure, the float switch terminal boards were accessed where the level switch appeared to be sticking. Under RWP 97-1-I, the level switch was removed and found to be failed with contacts stuck together. On 2 July 1997, a reed switch from stock was bench tested satisfactorily and it was installed in the system under 10 CFR 50.59 Evaluation Number 97-05 since the specifications on the failed reed switch were not designated anywhere. On 3 July 1997, various multiple checks and tests were performed on the level switch as installed to assure proper trip actuation. In addition, step 4 of the Quarterly Scram Check (Q-1 Surveillance) was performed satisfactorily along with the requisite operational checks per SOP-A.1 step 7.2.5.6 so the reactor was returned to normal operation with no further problems noted. Both MLP #97-21 and RWP 71-1-I were closed out on 3 July 1997 as this occurrence is not considered to have had a significant effect on reactor safety or the health and safety of reactor facility personnel or the public.

Controlling Documents: Maintenance Log Page #97-21 (Closed 3 July 1997)
10 CFR 50.59 Evaluation #97-05
Radiation Work Permit #97-1-I

14. Temporary Change in Temperature Recorder Chart Paper (Temporary - Closed Item)

(Modification 97-06: Evaluation Completed 6 August 1997)

This 10 CFR 50.59 Evaluation was generated to address the temporary use of replacement

paper until the correct paper was available. In approximately mid-April, an order was placed with Honeywell to purchase chart recorder paper. As of July, the paper had not arrived and the last roll was in use on the recorder. Various ideas were discussed of what to replace the paper with. The two prevailing ideas were to either use a different type of paper whose scale would manually be changed to that of the original paper; the other idea was to use the original paper, but reverse it so that it would be printing on the blank back of the chart paper. A phone conversation with Honeywell personnel confirmed that the chart paper could be used on the back side - they had done that themselves numerous times. On 17 July 1997, the chart paper was almost used up while operating the reactor to support experiments with Holtec. The reactor was shutdown and MLP #97-23 was opened, along with 10 CFR 50.59 Evaluation # 97-06 in place to allow temporary reuse of old paper rolls. No replacement chart paper was available after a search of the entire facility. The chart paper was removed and placed so that the back side would be printed on. The chart recorder has a permanent temperature scale in addition to the one printed on the paper. The chart recorder was noted to be working properly but that extra care would be needed in recording temperatures in the operations log because the scaling lines, while visible through the paper, were somewhat faint. Also, attempts were made to locate an alternate supplier for chart paper since there was concern over the long lead time required for Honeywell to supply the chart paper. Graphics Controls was selected to supply new chart paper, which they did on 31 July 1997 - only two weeks after the order was placed. On 31 July, 1997 the chart paper was replaced with the new supply of paper received from Graphics Controls and the temporary modification was no longer needed. Honeywell eventually shipped the paper that the facility ordered from them - it arrived in August 1997, fully 5 months after the order was placed.

Controlling Documents: Maintenance Log Page #97-23 (Closed 17 August 1997)
10 CFR 50.59 Evaluation #97-06

15. <u>Operation Without Shield Tank Demineralizer System Pump (Temporary)</u>
(Temporary - Closed Item)

(Modification 97-07: Evaluation Completed 8 August 1997)

Both 10 CFR 50.59 Evaluation Number 97-07 and Number 97-09 were worked under MLP #97-24. These are discussed in detail under item number 16, below.

Controlling Documents: Maintenance Log Page #97-24 (Closed 27 August 1997)
10 CFR 50.59 Evaluation #97-07
10 CFR 50.59 Evaluation #97-09

16. <u>Pump Replacement for Shield Tank Demineralizer System</u> (Permanent - Closed item)

(Modification 97-09: Evaluation Completed 27 August 1997)

Both 10 CFR 50.59 Evaluation Number 97-07 and Number 97-09 were worked under MLP #97-24. These are discussed in detail below.

Controlling Documents: Maintenance Log Page #97-24 (Closed 27 August 1997)
10 CFR 50.59 Evaluation #97-07
10 CFR 50.59 Evaluation #97-09

Modifications 97-07 and 97-09

On 28 July 1997, while preparing to perform the weekly checkout, the operator noted that the shield pump was not running. Under MLP #97-24, the tank level was checked to be above the suction of the pump, the level trip was checked to be operable and fifty (50) gallons of demineralized water were added to the shield tank. It was noted that there was a large black stain as well as a good quantity of water pooled below the shield tank pump system skid. On 30 July 1997, blown fuses on the K4 field relay were replaced whereupon the pump was energized but noted to be very noisy, indicating bad bearings or excessive impeller/pump housing friction, so the pump was secured to prevent blowing more fuses. At month's end, plans were to approve running without the shield pump subject to proper resistivity in shield tank water. On 1 August 1997, 10 CFR 50.59 Evaluation Number 97-07 was developed to approve reactor operation without the shield pump, provided that shield tank water resistivity was acceptable. The UFTR Technical Specifications, FSAR, and SOPs were referenced during the evaluation; it was determined that there was no requirement for the shield pump to be running, rather, the only limits are on the resistivity of the water in the shield tank. Little operation was planned due to the end of summer classes and staff absences. Subsequently, two brief operations were conducted on 6 and 8 August 1997. During the weekly checkout on 11 August 1997, the shield tank resistivity was near the operating limit so no further operations were allowed until the shield pump was functional again. On 11 August 1997, the suction and discharge valves to the shield tank system were shut and the pump and integral motor were removed from the system. Inspection of the pump revealed several problems — broken impeller vanes, and no mechanical seal. The mechanical seal was expected to have failed due to the evidence of a large black stain and some water on the pump skid, which were noted on 28 July 1997 when the failed pump had been discovered. In addition, a bench test of the motor (with the pump uncoupled) revealed large amounts of noise and slow rotation - indicating that the pump bearings were bad. After checkout, the pump and motor were transferred to Gainesville Pump and Supply Company to aid in identifying an equivalent replacement. Subsequently, an equivalent pump/motor unit was identified and ordered with 10 CFR 50.59 Evaluation (and Determination) Number 97-09 developed for its implementation. The new pump/motor was determined to actually have better ratings then the old unit and was delivered on 25 August 1997, whereupon it was noted that the connections were different size diameters than the old unit — the shield tank system would have to be partly modified as well. Specifically, 1.25 inch to 1.00 inch transition pieces would be needed. As the new unit was not electrically connected, the armor ed cable sheath from the old motor was used to armor the wiring on the new motor. Because the power supply (a 3 phase, 480 Volt, 60 Hz supply) outlet was no longer in use and had not been out of production for years, a new plug could not be purchased for the new motor. It was determined that the old plug would be used on the new motor to avoid having to de-energize the entire facility to have electricians replace the entire wiring system. On 26 August 1997, the pump/motor unit were electrically ready and the piping transitions were partially installed. On 27 August 1997, the pump/motor were sized to the existing piping and installed, after a

stanchion was removed to allow the pump to be installed. The details of the piping modifications are shown in the Figure 1 on page IV-18 of this report. The entire piping system joints were checked and tightened. Subsequently, the pump and suction piping were filled and primed and the electrical rotation checks were performed, after which the system was run. Resistivity checks showed 0.85 MΩ-cm. Checks one hour later indicated the pump and motor were cool to the touch with no leaks, noisiness, or cavitation. Resistivity checks after 1.5 hours showed 1.21 MΩ-cm. Subsequently, the reactor was returned to normal operations with no further problems noted. On 27 August 1997, MLP #97-24 was closed.

17. Security System Anti-Tamper Switch Modification (Permanent - Closed item)

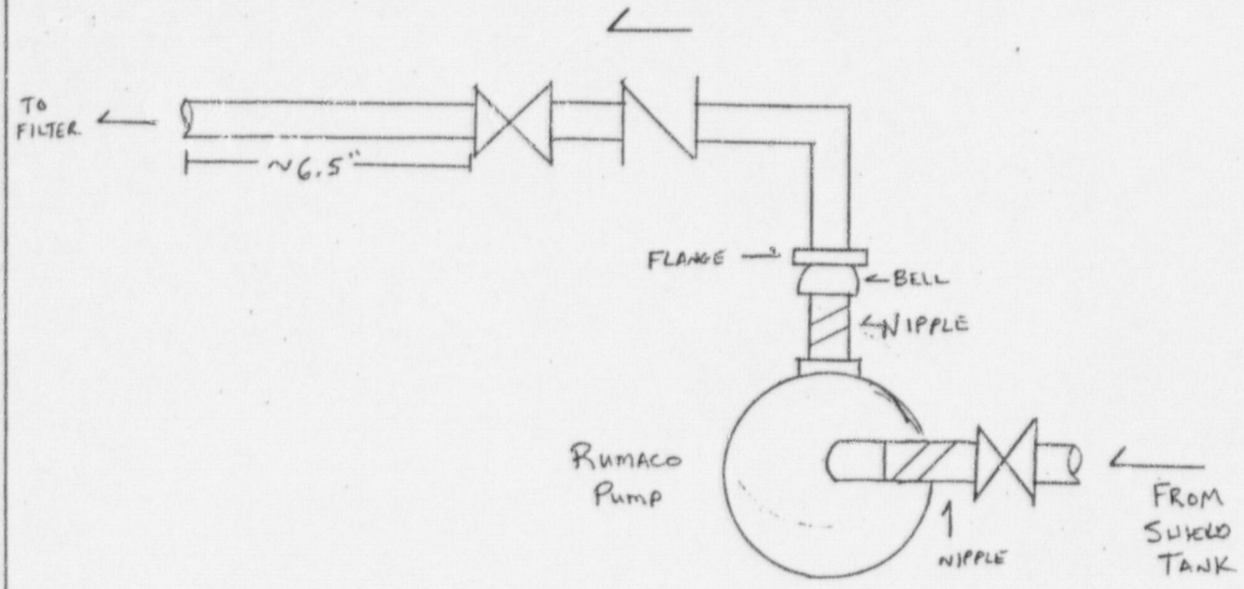
(Modification 97-08: Evaluation Completed 20 August 1997)

Following spurious security alarms on three consecutive days, under MLP #97-25, an effort was made to diagnose the possible sources of the problem. As a result, several anti-tamper switches in the outdoor security siren horns and on the door switches were found to be degraded. Since duplicate switches were no longer available, equivalent switches were approved under 10 CFR 50.59 Evaluation Number 97-08. Following delivery of replacement switches in two stages, the anti-tamper switches on the outdoor security siren horns were replaced on 14-15 August while the switches on the rear door to the west lot and on the control room door were replaced on 19 August with no further spurious alarm actuations. On 19 August 1997, MLP #97-25 was closed.

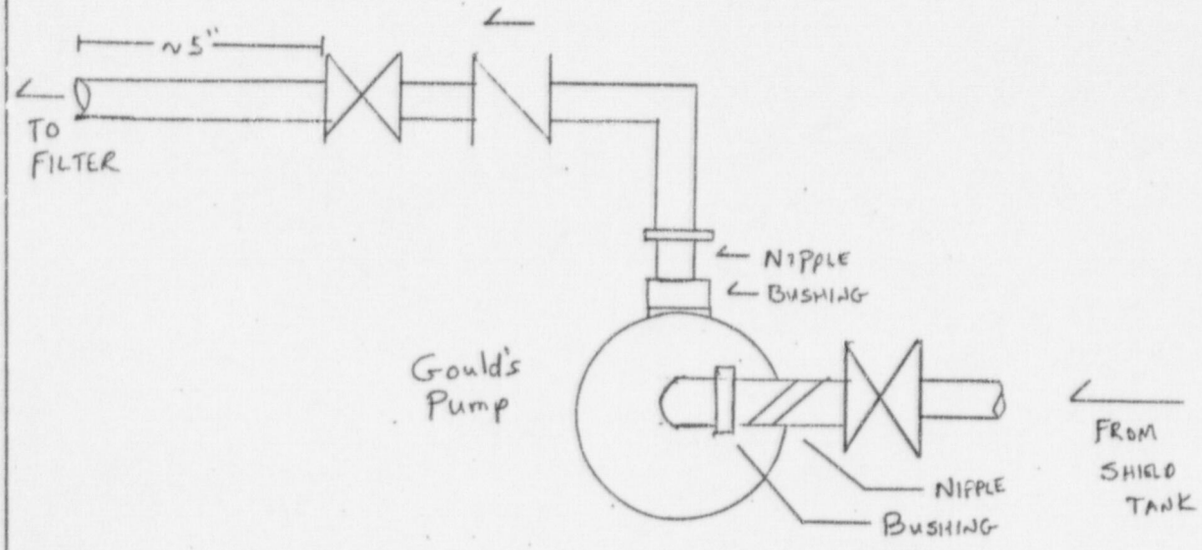
Controlling Documents: Maintenance Log Page #97-25 (Closed 19 August 1997)
10 CFR 50.59 Evaluation #97-08

Figure 1

OLD PIPING ARRANGEMENT



NEW PIPING ARRANGEMENT



8/25/97
REVIEWED / DATE

8/25/97
APPROVED / DATE

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

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

A review of records for the 1984-85 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 1985-86 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 1986-87 reporting year involving relatively little maintenance and no large maintenance projects.

For the 1987-88 reporting year, there were two dominant though manageable maintenance projects. The first large scale maintenance project during the 1987-88 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. The second large scale project involved 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). This was the largest maintenance effort since the control blade drive system maintenance performed internal to the biological shield in the 1985-86 reporting year. The 79.2% availability for the 1987-88 year indicated more or less routine maintenance and surveillance checks and tests throughout the year except for the two large projects cited above.

For 1988-89, the availability was up to 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. There was no single project dominating unavailability, though multiple maintenance tasks on the two-pen recorder and on the Radiation Monitoring System clearly 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. Certainly, the 113.75 total days unavailability (31.16% unavailability) was one of the poorer records in recent years.

Although availability in the 1990-91 reporting year was not as high as hoped, it was greatly improved as there were 93 days forced unavailability, 1.25 days planned unavailability and 23.25 days of administrative shutdown. Primary sources of forced outage time were replacement of

seals and connectors on the primary coolant system and extensive maintenance performed to complete the nuclear instrumentation calibration. These values were somewhat elevated, especially administrative shutdown time, by the lack of a full-time Reactor Manager and lack of replacement part inventory along with a shortage of licensed personnel, especially senior reactor operators over the last six months of the year.

Although no permanent Reactor Manager was able to be hired in the 1991-92 reporting year, two new part-time student senior reactor operators (SROs) were licensed and certified on October 17, 1992. Although availability in the 1991-92 reporting year was not as high as had been hoped, availability was again improved significantly as there were only 72.25 days forced unavailability, 4.25 days planned unavailability and 23.50 days of administrative shutdown. The 76.50 days total unavailability (20.90% unavailability) for maintenance is approximately average for the past decade. Again, these values for unavailability were elevated by the lack of a full-time Reactor Manager, especially early in the reporting year before certification of the two new SROs. With the appointment of a part-time Acting Reactor Manager on August 11, 1992, this situation improved in the next reporting year.

Although there were no large maintenance projects for the 1991-92 year, several major projects contributed to forced unavailability. First, and most significantly, two failures of the thermocouple connections to the south center fuel box were responsible for over 31 days of forced unavailability. Similarly, various failures related to the nuclear instrumentation system, including Safety Channel 2 trip indication, Safety Channel 2 meter circuit, Safety Channel 1 +15 volt and high voltage power supplies and the control blade position indicating circuits as well as replacement of bearings and pillow blocks for the stack diluting fan and the motor on the deep well pump were responsible for significant amounts of forced unavailability. As is indicated, these four areas account for most of the forced unavailability for the 1991-92 reporting year with the failed thermocouple connections and the safety channels meriting the most concern for preventive maintenance.

Although a permanent Reactor Manager was not hired until July 1993, the availability of part-time operators was good throughout the 1992-93 reporting year. Availability in the 1992-93 reporting year returned to a high level as there were only 22.63 days forced unavailability, 12.63 days planned unavailability and 11.50 days of administrative shutdown. The 35.25 days total unavailability (9.66% unavailability) for maintenance is one of the best in ten years. With appointment of a full-time Reactor Manager in July 1993 it was hoped this situation could be improved even further in the next year though much would depend on support for part-time personnel. Significant sources of forced unavailability for the 1992-93 reporting year were repair of deep well pump piping, adjustment and repair of Safety Channel 1 during the annual calibration and repair of the north side core area thermocouple connections and replacement of wiring following failure of temperature point #4 plus repeated small outages and several unscheduled shutdowns due to failures of the control blade position indicators/indicator circuits with an effort planned to replace these nixie tube systems in the next reporting year.

With a full-time Reactor Manager available for the full 1993-94 reporting year, good availability of other licensed and unlicensed personnel and no large maintenance efforts,

availability for the 1993-94 reporting year was even better than in the previous year. There were only 21.38 days forced unavailability, 13.25 days planned unavailability and 3.00 days of administrative shutdown. Significant sources of forced unavailability were to check out and verify proper detector current and operation of the compensated ion chamber and linear (red) pen following failure due to excessive moisture in October 1993, to check, locate and correct erratic response in the Safety-3 control blade position indicating (BPI) circuit in December 1993 and January 1994, to locate and correct an open circuit in the Safety-3 control blade drive circuit in January/February 1994, and to replace the intermittently failing shield tank water level trip magnetic reed switch in February 1994. The replacement of the nixie tube indicators in the control blade position indicating circuits in June 1994 promised to reduce forced outages from failures of the BPI circuits in the future.

With a full-time Reactor Manager again available for the full 1994-95 reporting year, reasonable availability of other licensed and unlicensed personnel and a limited number (3) of medium length forced outages, availability for the 1994-95 reporting year was only slightly reduced to 88.15% from the previous year. There were 26.50 days forced unavailability, 11.75 days planned unavailability and 5.00 days administrative shutdown. The three significant sources of forced unavailability were for the outage to address the anomalous primary coolant resistivity drop in March 1995, for the outage to remove debris and perform checks of the primary coolant system return line flow trip switch following removal of debris in June 1995, and finally for the outage to repair the automatic flux controller in August 1995 and which was still in progress at year's end.

With a full-time Reactor Manager again available for most of the 1995-96 reporting year, limited somewhat by family illness until resigning the position effective August 9, 1996, and with reasonable availability of other licensed and unlicensed personnel, but with several (3) medium length forced outages plus considerable planned outage time for roof repair, availability for the 1995-96 reporting year was somewhat reduced to 75.68% from the previous year. There were 44.875 days forced unavailability, 41.875 days planned unavailability and 2.25 days administrative shutdown. The three significant sources of forced unavailability were for the continued outage at the beginning of the year in September 1995 for the outage to repair the automatic flux controller begun in August 1995, for the outage to repair the linear (red) pen circuit in October 1995, and for the outage to troubleshoot and repair the Safety Channel 2 loss of high voltage monitoring circuit in April 1996 and again in July 1996. There was also significant planned outage time for the year for two surveillances to complete the inspection of mechanical integrity of the control blade drive systems internal to the biological shielding (V-1 Surveillance) in December 1995 and the biennial inspection of incore fuel elements (B-2 Surveillance) in August 1996. Similarly, the contract work to replace and then repair the reactor building roof involved considerable planned unavailability throughout the 1995-96 year and was still in progress at year's end.

With a full-time Reactor Manager only available for about three months beginning in late December 1996 until March 28, 1997, plus the loss of one part-time SRO and the licensing of another in midyear leading to somewhat restricted availability of licensed as well as unlicensed personnel, plus considerable forced outage time for replacement of failed equipment and some

planned outage time for conducting and improving the annual calibration checks of nuclear instrumentation, availability for the 1996-97 reporting year was further reduced to 62.20% from 75.68% the previous year. There were 102.25 days forced unavailability, only 16.625 days planned unavailability and 4.50 days administrative shutdown. The three most significant sources of forced unavailability were for the outage to replace the failed compensated ionization chamber (CIC) with the uncompensated ionization chamber (UIC) run in CIC mode, to obtain a new UIC, to replace the connectors and cables on both detectors and then test and assure proper calibration of the nuclear instruments in September to December 1996 (72.875 days); for replacement of the shield tank demineralizer system pump including flow circuit rearrangement in July/August 1997 (20.875 days); and replacement of a failed reed switch in the primary coolant level trip circuit in July 1997 (2.75 days). There was also significant planned outage time for the year to make adjustments and rework the annual calibration of nuclear instrumentation (A-2 Surveillance) in March 1997 (10 days) plus continuing periodic contract work to replace and then repair/upgrade the reactor building roof until June 1997 (4.75 days).

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. 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 four entries in Table V-2 which involved maintenance in progress at the end of the 1995-96 reporting year; indeed the first

item was opened during the 1992-93 reporting year as MLP #93-10 was used to control planned installation of a new temperature recorder. Two of these four entries (MLP #95-25 to control installation of a new roof on the reactor building and MLP #96-25 to control security system repairs) were closed out during the current 1996-97 reporting year, but MLP #93-10 is still not closed out as work has been delayed and now postponed as implementation of the new temperature recorder is a major modification. The same situation applies for MLP #94-14 to install a new area radiation monitoring system.

Similarly, five maintenance log pages remain open at the end of the current reporting year: MLP #93-10 opened on April 5, 1993 to control installation of the new temperature recorder, MLP #94-14 to control installation of a new area radiation monitoring system, MLP #96-30 to control repair and upgrade of the security system, MLP #97-19 to control installation of new bearings for the stack dilute fan shaft, and MLP #97-26 to control repair of a low level portable radiation survey meter all remain open. It is expected that MLP #93-10 and MLP #94-14 will be open for some time as implementation of the new temperature recorder is a major modification as is implementation of a new area radiation monitoring system. However, MLP #96-30, MLP #97-19 and MLP #97-26 should be closed out relatively early in the new reporting year.

TABLE V-1

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

Date		Surveillance/Check/Test Description
4 Sep 96	Q-5	Quarterly Radiological Survey of Restricted Areas - Extra Due to Unstacked Shielding for B-2 Fuel Inspection
5/6 Sep 96	Q-9	Quarterly Calibration Check of Air Particulate Detectors (AMS[4] Remains)
11 Sep 96	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 3 - Upstairs Laboratories and Offices)
4 Oct 96	S-6	Semiannual Security Plan Key Inventory for UFTR and UFSA
4 Oct 96	Q-8	Quarterly Report of Safeguards Events (Four Events)
4 Oct 96	S-3	Semiannual Inventory of Special Nuclear Material
15 Oct 96	S-8	Semiannual Leak Check of PuBe and SbBe Neutron Sources
15 Oct 96	Q-3	Quarterly Radiological Emergency Evacuation Drill
16 Oct 96	Q-6	Quarterly Check of Posting Requirements - Partial Extra to Post RSRS Reappointment Letter
31 Oct 96	Q-1	Quarterly Check of Scram Functions
12 Nov 96	S-7	Semiannual Check (Replacement) of Security System Batteries
19 Nov 96	Q-2	Quarterly Calibration Check of Area and Stack Radiation Monitors
19 Nov 96	Q-9	Quarterly Calibration Check of AIM-3BL Air Particulate Detector
27 Nov 96	Q-4	Quarterly Radiological Survey of Unrestricted Areas
27 Nov 96	Q-5	Quarterly Radiological Survey of Restricted Areas
30 Nov 96	Q-6	Quarterly Check of Posting Requirements

TABLE V-1

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

Date		Surveillance/Check/Test Description
2 Dec 96	A-3	Annual Measurement of UFTR Temperature Coefficient of Reactivity*
3/17 Dec 96	B-6	Biennial Evaluation of Emergency Plan – Extra
5 Dec 96	Q-6	Quarterly Check of Posting Requirements – Extra to Post 1996-97 Campus Telephone Directories
12 Dec 96	Q-3	Quarterly Radiological Emergency Evacuation Drill (Large Drill Including Outside Agencies)
12 Dec 96	Q-9	Quarterly Calibration Check of AMS[4] Air Particulate Detector
13 Dec 96	S-1	Measurement of Control Blade Drop Times
13 Dec 96	S-5	Measurement of Control Blade Controlled Insertion Times
13 Dec 96	S-11	Semiannual Replacement of Control Blade Clutch Current Light Bulbs
27 Dec 96	Q-1	Quarterly Check of Scram Functions
30 Dec 96	S-9	Semiannual Replacement of Well Pump Fuses
31 Dec 96	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 4 - Reactor Building Annex)
2 Jan 97	B-1	Biennial Check to Assure Negative UFTR Void Coefficient
2, 3, 8 Jan 97	S-10	Check and Update of Emergency Call Lists
6 Jan 97	Q-8	Quarterly Report of Safeguards Events (Zero Events)
14 Jan 97	Q-6	Quarterly Check of Posting Requirements – Extra to Post 1997 Gainesville Telephone Directories
23 Jan 97	S-4	Measurement of Argon-41 Stack Concentration (Includes Measurement of Dilution Air Flow Rate - Previously A-2 Surveillance)

TABLE V-1

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

Date		Surveillance/Check/Test Description
13 Feb 97	Q-6	Quarterly Check of Posting Requirements – Extra to Post Letter Limiting Energy Generation
13-24 Feb 97	A-1	Instrument and Test Equipment Calibration
19 Feb 97	Q-2	Quarterly Calibration Check of Area and Stack Radiation Monitors
19 Feb 97	Q-5	Quarterly Radiological Survey of Restricted Areas
22 Feb 97	Q-6	Quarterly Check of Posting Requirements
27 Feb 97	Q-4	Quarterly Radiological Survey of Unrestricted Areas
28 Feb 97	S-12	Semiannual Review of Requalification Training Program Binders
28 Feb 97	Q-9	Quarterly Calibration Check of AMS^4 Air Particulate Detector
3 Mar 97	Q-6	Quarterly Check of Posting Requirements – Extra to Post SRO John Powers Operator's License
10-18 Mar 97	A-2	UFTR Nuclear Instrumentation Calibration Check and Calorimetric Heat Balance
11 Mar 97	Q-9	Quarterly Calibration Check of AIM-3BL Air Particulate Detector
17 Mar 97	A-4	Annual Check/Replacement of Fire Alarm System Monitoring Station Batteries – Extra
17 Mar 97	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 1 - Reactor Cell and Control Room)
24-25 Mar 97	A-2	UFTR Nuclear Instrumentation Calibration Check and Calorimetric Heat Balance – Extra to Assure No Apparent Operation Above 100 kW Safety Limit

TABLE V-1

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

Date		Surveillance/Check/Test Description
4 Apr 97	S-3	Semiannual Inventory of Special Nuclear Material
4/7 Apr 97	S-6	Semiannual Inventory of Special Key Inventory for UFTR and UFSA
7 Apr 97	S-7	Semiannual Check (Replacement) of Security System Batteries – Extra
7/8 Apr 97	Q-8	Quarterly Report of Safeguards Events (One Event)
10 Apr 97	Q-3	Quarterly Radiological Emergency Evacuation Drill
15 Apr 97	S-8	Semiannual Leak Check of PuBe and SbBe Neutron Sources
18 Apr 97	Q-1	Quarterly Check of Scram Functions
23 Apr 97	S-1	Measurement of Control Blade Drop Times
23 Apr 97	S-5	Measurement of Control Blade Controlled Insertion Times
23 Apr 97	S-11	Semiannual Replacement of Control Blade Clutch Current Light Bulbs
11 May 97	S-10	Semiannual Check and Update of Emergency Call Lists – Extra to Incorporate NRC Region II Changes with Relocation Per March 25, 1997 Letter
14 May 97	S-7	Semiannual Check (Replacement) of Security System Batteries – Partial to Replace 4 Volt Rechargeable Batteries
16 May 97	A-6	Annual Physical Inventory of Security-Related Locks/Cores
19-20 May 97	Q-2	Quarterly Calibration Check of Area and Stack Radiation Monitors
20 May 97	Q-6	Quarterly Check of Posting Requirements
23 May 97	S-1	Measurement of Control Blade Drop Times – Extra for Safety Blade S-3 Due to Drive Motor Replacement and Extra Drops for Total of Three on All Blades
23 May 97	S-5	Measurement of Control Blade Controlled Insertion Times – Extra for Safety Blade S-3 Due to Drive Motor Replacement
28 May 97	Q-5	Quarterly Radiological Survey of Restricted Areas
30 May 97	Q-9	Quarterly Calibration Check of AIM-3BL Air Particulate Detector

TABLE V-1

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

Date		Surveillance/Check/Test Description
4 Jun 97	Q-9	Quarterly Calibration Check of AMS[4] Air Particulate Detector
11/17 Jun 97	Q-4	Quarterly Radiological Survey of Unrestricted Areas
13 Jun 97	Q-7	Quarterly Check of UFTR Building Fire Alarm System (Zone 2 - Downstairs Laboratories and Offices)
18 Jun 97	S-7	Semiannual Check (Replacement) of Security System Batteries – Partial to Replace 4 Volt Rechargeable Batteries
20-23 Jun 97	B-4	Biennial Evaluation of UFTR Standard Operating Procedures – Partial to Include 0-Series, A.1 and A.2 Procedures
24 Jun 97	S-9	Semiannual Replacement of Well Pump Fuses
24/25/29 Jun 97	S-10	Check and Update of Emergency Call Lists
26 Jun 97	Q-1	Quarterly Check of Scram Functions
5 Jul 97	Q-8	Quarterly Report of Safeguards Events (Zero Events)
7 Jul 97	S-7	Semiannual Check (Replacement) of Security System Batteries – Partial Extra to Replace 4 Volt Rechargeable Batteries
19-26 Jul 97	B-4	Biennial Evaluation of UFTR Standard Operating Procedures – Partial to Include A.3 through A.8 Plus B, C, D and E Series Procedures
24 Jul 97	Q-3	Quarterly Radiological Emergency Evacuation Drill
24 Jul 97	S-7	Semiannual Check (Replacement) of Security System Batteries – Partial Extra to Replace 4 Volt Rechargeable Batteries
25 Jul 97	S-4	Measurement of Argon-41 Stack Concentration (Includes Measurement of Dilution Air Flow Rate – Previously A-2 Surveillance)
30 Jul 97	S-7	Semiannual Check (Replacement) of Security System Batteries – Partial Extra to Replace 4 Volt Rechargeable Batteries

TABLE V-1

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

Date		Surveillance/Check/Test Description
4-20 Aug 97	B-4	Biennial Evaluation of UFTR Standard Operating Procedures - Partial to Include F Series Procedures and Completion of Changes for A.3 through A.8 Plus B, C, D and E Series Procedures
13 Aug 97	Q-9	Quarterly Calibration Check of AIM-3BL Air Particulate Detector
13 Aug 97	Q-2	Quarterly Calibration Check of Area Radiation Monitors
20 Aug 97	Q-2	Quarterly Calibration Check of Stack Radiation Monitor
25 Aug 97	Q-6	Quarterly Check of Posting Requirements
28-31 Aug 97	S-2	Annual Reactivity Measurements (Worth of Control Blades, Total Excess Reactivity, Reactivity Insertion Rate and Shutdown Margin)
28 Aug 97	S-12	Semiannual Review of Requalification Training Program Binders
29 Aug 97	S-7	Semiannual Check (Replacement) of Security System Batteries - Partial Extra to Replace 4 Volt Rechargeable Batteries

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; one such event occurred in the current reporting year for the annual measurement of the UFTR temperature coefficient of reactivity which was originally due on 30 September 1996 but was delayed until 2 December 1997 due to the outage for a failed compensated ionization chamber in the nuclear instrumentation.

All required UFTR surveillances, checks and tests are up to date at the end of the reporting year. In some years, surveillances have been carried over to the new year within the allowable interval; such is the case this year for the Q-4, Q-5, Q-9, A-5 and B-4 surveillances, all of which were completed within the required interval.

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
5 Apr 93	Following general checkout of the new temperature recorder obtained under the DOE instrumentation grant, the unit is considered generally acceptable. Under MLP #93-10, maintenance work is being performed to develop a safety evaluation and investigate installation of the new temperature recorder to include various checks and consultation with Professor G.J. Schoessow in April 1993; in May 1993 work continued in design development for installing the new recorder; in June 1993, work continued in design development with considerable computer work completed including work descriptions and evaluations along with proposed changes to the annual nuclear instrumentation calibration check (UFTR SOP-E-4) and consultations with the NES electronics engineer in July 1993 work continued at a slower rate as the change package is nearing the point for final drafting with the complete modification package submitted to the RSRS for review at its 30 September 1993 meeting where the modification was approved to the point of being ready for implementation at which the RSRS wishes to review the materials including SOP changes prior to implementation. During October 1993 the materials necessary for this modification to be completed were ordered and their delivery was being awaited; during November, most but not all of the material arrived; the remainder of the material arrived in January 1994. During March 1994, linearity checks were performed on the new temperature monitoring system. No work has been performed since that time, especially since the recorder has been relatively problem free in the last several years. (MLP #93-10 remains open.)
16 Mar 94	After the new area radiation monitoring system including a 19-inch rack, recorder, computer console, battery backup, probes, attachments, cabling and hardware was received, MLP #94-14 was used to control setup of the new ARM system including connecting the battery power supply and the recording module. During April 1994, the new detectors were also mounted. During May, electrical cables were run from the detectors to the control room monitors. Actual on-line installation of the new system will require a modification package which is now in progress. No work has been accomplished since May 1994, again primarily because of relatively trouble-free operation. (MLP #94-14 remains open.)

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
14 Jul 95	Following awarding of the contract to David Lancaster (Lancaster Roofing) for reroofing the reactor building, 10 CFR 50.59 Evaluation and Determination No. 95-02 was fully approved on 14 July 1995. Subsequently, dumpsters were placed in the west fenced reactor lot and the roof replacement was scheduled for 15-17 July 1995. The south low roof over the NAA Laboratory and the north low roof over the annex were to be worked on over the weekend (15-16 July) with the reactor cell high roof not to be worked on until reactor staff could be present on 17 July 1995. Under MLP #95-25 on 15 July 1995, most of the south low roof was replaced up to the outer level per the 10 CFR 50.59 Evaluation and Determination. It began to rain as this section was nearing completion; subsequently, there were several leaks which were repaired but, except for roof checks on the morning of 16 July 1995, no further work other than pumping water off the new roof section was accomplished due to periodic rains and other contractor commitments. On 11 August 1995, the dumpsters (one full) were removed from the west lot to other jobs with the roof to be worked on in the near future. On 30 August 1995, a PPD technician accessed the roof to replace some nails in preparation for future work. During September, a supervisor with Douglas Roofing Inc., visited on 20 September and again on 21 September to assure dumpsters could be moved to the west lot and to schedule further roof work. On 22 September, the supervisor and foreman visited to check on status and secure the west gate lock and then the foreman assured the proper location of a dumpster in the west lot. On 28-29 September, the roofers continued to work on the south roof over the offices to finish the last section and to replace the entire roof over the annex with the initial layers of roofing material. On 29 September 1995, the supervisor toured the ex-cell areas of the building to assure securing power to all the fume hood blowers; these blowers along with missed ones from previous fume hood removals were removed with new ones to be installed on three fume hood lines. Considerable debris was dropped on the floor of the rabbit system area during removal of the old blowers resulting in scarring and tar on the floor around the front of the hot cave and rabbit system. At month's end it was raining.

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description

This rain resulted in multihundreds of gallons of water intrusion in the NAA Laboratory. Although there was no contamination, over eight (8) manhours were spent cleaning up the laboratory area with the floors still unsightly but no one seemingly willing to clean them properly. On 4 October and again on 6 October, the roofing company supervisor toured the annex to check on leaks there. On 6 October 1995, he visited to schedule roofing work for 9 October. On 9 October, dumpsters were removed from the west lot and there was five (5) hours of work on the roof until it started to rain. The roofing company foreman then removed the tar pots and ladders from the west lot on 10 October. There was no further contact until the supervisor visited on 17 October to check the south section of the roof and plan repairs for the following week. On 26 October, the supervisor and two (2) assistants accessed the roof briefly to move supplies. Then on 27 October, the supervisor and foreman visited to tour the NAA Laboratory and upstairs office areas to plan and schedule replacement of the roof drain in the northeast corner of the NAA Laboratory area. In preparation for the drain replacement, all equipment was removed from this area of the NAA Laboratory with the roofers installing a new roof drain on 30 October 1995 as they worked most of the day on the south roof section. Subsequently, there was a gas smell in the non-cell portion of the building. After being assured by the roofers they were using no solvents, the police department was called with Gainesville Fire Rescue responding as well. A bucket of gasoline soaked rags was then discovered in the west fenced lot; these had apparently been used to clean tar from the NAA Laboratory floor that had resulted from the roof drain replacement (on October 30) and the fume hood blower removal (in September), which is why the gasoline smell was in the building. Subsequently, the rags were properly secured to conclude the month, though at month's end it was again raining.

This rain resulted in roof drain leaks into staff offices and the NAA Laboratory on 1 November 1995. Again there was no contamination; however, a number of hours of staff and housekeeping personnel time were spent cleaning up the mess until 6 November 1995. Corrective work on the south (NAA Laboratory) building roof was implemented by Douglas Roofing Company (DRC) on 6 November but, subsequently, two plumbers and the roofing company supervisor accessed the roof on 7 November to

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR
PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description

unclog the roof drains. On 8 November, there were more leaks with cleanup by housekeeping personnel and a promise by the overseeing engineer that the problem would be fixed. DRC finished sealing the NAA Laboratory roof on 9 November with the roofing company foreman inspecting the job on 9 November. On 10 November, DRC worked on the annex roof while they worked on the NAA Laboratory roof on 13 November. The cell roof was finally addressed on 17 November with supposed finishing touches applied on 18 November as the facility director admitted the roofers to the west lot on Saturday and checked the facility several times over the weekend through 19 November. Considerable time was spent cleaning up small grit and debris in the cell on 20 and 22 November. The roofing company supervisor visited on 27 November seeking more work time but reactor projects prevented making any commitment. The foreman did a little roof work on 28 November and checked the south roof and walked through the facility for a negative check on leaks with facility director on 29 November. Additional cell housekeeping to clean up debris was undertaken on 29 November as considerable areas remain to be cleaned at month's end.

On 1 December 1995, the overseeing engineer from Craig Salley and Associates visited so that they could remove ladders and tarpots from the west lot. On 6 December, the roofing company foreman visited to check the roof and tour the NAA Laboratory areas to check leakage with the reactor manager. The roofing company supervisor and foreman then scheduled roof work for 7 and 8 December until 3:30 p.m. Subsequently, the roofers worked a full day redoing one half of the south roof on 7 December and then worked on both the cell and south sections for one-half day on 8 December with the supervisor indicating that the north roof was finished and the reactor roof only needs flashing. On this day, several hours were spent cleaning the cell from the grit produced by the cell roofing activities. On 12 December, the roofers worked all day on the flashing on the cell roof and on the south roof. On 13 December, the overseeing engineer and the foreman visited to have supplies moved to the roof and then the roofers worked nearly all day on 14 December with reactor staff spending about a half day continuing cleaning of the cell. On 15 December, the roofers failed to show up as committed and then on

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	19 December there was another major leakage of water into the building with cell leakage on the south wall causing a security alarm just prior to beginning the work day. About one-quarter day was spent cleaning up this water as well as major water intrusion in an upstairs laboratory and several places in the NAA Laboratory. This delayed work under MLP #95-40. The roofing company supervisor visited on 20 December to schedule more roof work but then representatives of Craig Salley and Associates toured the entire building to document water intrusion and damage and to announce that Douglas Roofing was removed from the contract and could only work that day to try to limit further leakage of water which the roofers did for about one-quarter day. Supervisory personnel from Lancaster Roofing then visited on 21 December to say they had been removed from the work and to apologize for the leaks. Subsequently, the roofers visited on 22 December to remove a tarpot and their ladders but with the west lot grounds strewn with debris. At this point it was hoped that the leaks were fixed as the new roofing contract was apparently in place; at month's end it was again raining for the first time in a week.
	On 1 January 1996, there was again some water leakage into the NAA laboratory areas as well as upstairs above the NAA Laboratory for which considerable absorbent paper was placed. On 2 January 1996, three representatives of Perry Roofing plus a PPD technician were conducted on a tour and some time was spent cleaning up water leaks. On 3 January 1996, the PPD technician pumped water off the south roof for several hours; on 4 January 1996, he toured the annex and shop areas with the facility director to check on their status. Finally, on 11 January 1996, the overseeing engineer from Craig Salley and Associates visited with Perry Roofing representatives for instructions and to plan access as well as check some of the upstairs water damage. On 12 January 1996, they returned with a crew to access the west lot and spend about six hours clearing debris from the three roof sections. On 17 January 1996, the PPD technician checked the roof again. On 19 January 1996, the full trash dumpster was finally removed from the west lot. Finally, on 29 January 1996, a Perry Roofing representative returned to check the roof status relative to where further work was needed.

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	On 12 February 1996, some water was noted to be dripping from the ceiling area over the cabinets and dripping over in the NAA Laboratory. On 13 February 1996, a PPD supervisor and PPD technician conducted an inspection of the roof and promised to get back on reconnecting the fume hoods in the reactor building. Nothing happened after that date, though a PPD ventilation and air handling equipment technician checked the laboratory leak and evaluated the leak as coming from the roof on 23 February 1996. Nothing else occurred in February though much water was left standing on the south reactor roof section at month's end.
	On 1 March 1996, the PPD technician visited the NAA Laboratory to confirm a small leak in the freeze dryer area was coming from the roof. On 18 March, the PPD project supervisor visited concerning the leak in the cell outside the control room and six (6) relatively small leaks at most penetrations in the NAA Laboratory area around the hot cave. Later, he toured with two Perry Roofing company personnel who then accessed the roof to temporarily stop the leakage from the rainstorm in progress. On 19 March, a representative of Craig Salley and Associates toured the facilities to inspect and take pictures of the roof leakage. Finally, on 26 March, a Perry Roofing supervisor accessed the roof briefly to get information on the flashing. Work was then expected to occur in April.
	On 2 April 1996, officials of Perry Roofing Company visited the facility to check on leaks and schedule roof repair times. On 4 April 1996, the west fenced lot locks were changed out to facilitate roofing company access. On 5 April, the overseeing engineer from Craig Salley and Associates visited Perry Roofing Company personnel and Carlos Hope Electric Company personnel to locate fume hood breakers, examine hoods and check out horsepower rating of removed motors to support bidding on a subcontract to install the new exhaust system. On 5 April, there was also one-half day work on the NAA Laboratory and annex roof to prevent leaks. On 8 April, the Perry Roofing Company foreman visited to set work schedules and to get supplies placed for future work. On 10 April, his supervisor visited with another potential electrical subcontractor to inspect fume hoods for a potential bid to install new motors. On 17 April and 24 April, the Perry Roofing Company foreman visited and the roofers

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR
PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description

spent two half-days making the NAA Lab roof and annex roof leak tight. On 29 April, the roofers moved the new fume hood motors and exhaust vents to the roof and positioned them. On 30 April, Perry Roofing Company personnel visited along with a PPD technician to check on a number of leaks in the NAA Laboratory area. Perry Roofing Company then worked about ¾ day to stop the leaks which occurred during a heavy storm. Additional work was then expected to occur in May as the old work will need to be torn off the south roof section.

On 1 May, Perry Roofing Company pumped water off the roof and patched leaks in the south roof section. On 7 May, the foreman from Perry Roofing Company visited and work was begun on installing a new temporary roof on the south section. He visited again on 8 May with work continuing on the south roof section on 9 and 10 May with work also completed on the diesel generator room roof on 10 May. The foreman visited again on 14 May and reported that the new tapered roof was now laid in to prevent water from building up on the roof. The foreman visited again on 15 May to schedule future work with final stages of south roof section layering completed on 17 May. The foreman and his supervisor visited with a factory materials installation inspector to check the roof work to date on 20 May. Work continued on the south roof section on 21, 22 and 24 May. On 29 May, the Perry Roofing Company foreman visited with a representative of Thompson Sheet Metal and work was begun installing flashing and fume hood vents and exhausts with a number of days of effort remaining before completion.

On 3 June, the Perry Roofing Company foreman and a representative of Thompson Sheet Metal visited to schedule some work relative to a small leak in the NAA Laboratory around the vents. On 5 June, an SRO-trainee cleaned up from the leak and more roof work was accomplished on 7 June. The Perry Roofing Company supervisor visited again on 10 June to check out a continuing leak in the NAA Laboratory with work performed to correct the leak. Roof work, especially on vents and flashing, on the NAA Laboratory roof was accomplished on 18 and 19 June. The supervisor then visited on 24 June to check on the continuing small leak in the NAA Laboratory and to schedule more work. Thompson Sheet Metal personnel

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	then visited on 25, 26 and 27 June to assure roof access was allowed with most sheet metal work completed to include installing permanent ladders for accessing the reactor roof from the south and north roof sections.
	On 10 July, the supervisor from Perry Roofing Company visited and additional roof work and sheet metal work was accomplished on 10 and 12 July 1996. On 15 July, the supervisor visited again to schedule final detailing work which was accomplished on 16 July 1996. The overseeing engineer from Craig Salley and Associates then visited on 18 July to check leakage damage and provide access to the west lot for equipment removal. At month's end there were still two small leaks in the NAA Laboratory area.
	On 15 August, the acting reactor manager met with the overseeing engineer from Craig Salley and Associates and the PPD project supervisor concerning scheduling repairs to correct the NAA Laboratory leak, reconnecting the fume hoods, etc. Perry Roofing Company and Thompson Sheet Metal then conducted roofing work on 15, 16 and 19 August whereupon the acting reactor manager met with the overseeing engineer on 19 August to discuss the project status and the need for still more work. Additional roof work was accomplished on 20 August and then the overseeing engineer visited twice on 21 August to discuss project status with reactor management. The supervisor from Perry Roofing then visited on 23 August to indicate the NAA Laboratory roof was essentially complete and to access the annex roof where water pockets could necessitate redoing the roof. On 30 August, the facility director called and the overseeing engineer visited to examine small leaks still occurring in Room 106 upstairs and in the outer NAA Laboratory area downstairs. Subsequently, two electricians from Dudeck Inc. visited to discuss reconnecting the fume hoods. Subsequently, on 30 August, the PPD project supervisor, the Craig Salley and Associates representative and the owner of Reliable Painting visited to check out water damage and discuss painting needs with plans made for painting in Room 106 upstairs and in the outer NAA Laboratory downstairs.

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	As scheduled, Wayne Handley and six painters painted the outer NAA Laboratory walls as well as the ceiling in Room 106 upstairs to repair damages due primarily to the roof leaks with several checks on progress by the reactor director on 2 September. The roofers then worked to repair the two leaks on 3 September with supervisor Rick Owens placing equipment in the west lot on 6 September with plans to rework the annex roof on 7 September which was prevented by the reactor use schedule. Subsequently, Perry Roofing worked on the annex roof on 8 and 9 September with Dudeck Electric Inc. electricians Ken Shiver and assistant Casey Weaver plus Rob Roberts of Craig Salley and Associates checking on connecting fume hoods on 9 September. The electricians then completed connections inside and outside on 9 and 10 September to restore fume hood operation. Rob Roberts then visited on 11 September to notify of the upcoming substantial completion inspection which was then postponed. The UFTR Facility Director then toured upstairs and downstairs to check the same two leaks with a UPD Officer on 11 September with T.J. of Perry Roofing checking the locations of the leaks and working to fix them on 12 September. Subsequently, James Wallace of the College of Engineering toured the facility on 18 September relative to the upcoming substantial completion inspection to check on status and damages. He visited again on 19 September to clarify damage referrals. Subsequently, Rob Roberts and Supervisor Rick Owens visited on 25 September for roof access for the substantial completion inspection. Dwayne Atkinson of Thompson Sheet Metal then visited and considerable flashing work was conducted on 26 September. Finally, on 30 September, Perry Roofing personnel performed roof work and removed most of their equipment. At month's end there was no apparent leakage with work nearly complete.
	During October 1996, a tour following extensive rains on 8 October showed no signs of water intrusion. Perry Roofing personnel then installed new roof drains on 16 October with no further work during the month.
	During November 1996, Mr. Ken Perlowski of Physical Plant Division called to check on fixing laboratory damage from roof leaks and repair work. Since the floor cleaners restored the laboratory floor to good

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description

condition in October 1996, he was told there was no need for further repairs. However, there were damages to books and other items as well as time and supplies used in clean up over the past fifteen months for which we would like to request reimbursement. He indicated the request should come to him, so a memorandum summarizing damages in Building 557 for which we seek compensation was in progress at month's end. He was also informed that we need official confirmation when work is complete.

During December 1996, Alan Kent of U.S. Test and Balance Inc., representing the Architect Engineer Craig Salley and Associates, visited on 12 December to check a non-operational classroom fume hood. Alan Kent and Gary Marianni then got the hood blower properly installed on 13 December with Mr. Kent verifying proper operation on 16 December. Subsequently, on 16 December, Mr. Tim McKee, a supervisor with Perry Roofing Company visited to check the status of the hoods and roof drains. Later on 16 December, a subcontractor performed moisture tests on the south roof section. Two DrillTec electricians then checked the hoods again on 17 December with two Perry Roofing personnel installing downspouts on the west side of the building on 18 December 1996. Following the conversation with Ken Perlowski of the UF Physical Plant Division on 20 November, a memorandum dated 11 December 1996 was sent to him outlining damages that have occurred during the roofing project and detailing costs for which reimbursement is sought. The memorandum also emphasizes that we are awaiting word that roof work is now finished.

During January 1997, Ken Godwin of Advanced Lightning Protection (Perry Roofing subcontractor) visited on 29 January to arrange roof access and then install holders for roof lightning protectors. Supervisor Tim McKee then visited briefly to arrange roof access later in the day for electricians. McKee then checked the fume hood exhausts on 29 January and reported the one not working in the NAA Laboratory had blown motor fuses twice so some additional calculations were needed on fuse sizing. Ken Godwin returned with a bucket truck on 31 January and completed installation of lightning protection on the reactor roof. In addition, telephone calls from PPD employee Dan Walker on 30 and 31 January indicated that we should receive reimbursement for some of our costs

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR
PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description

outlined in the 11 December memorandum to Ken Perlowski with requisitions needed for the items and costs quoted not to include OPS salaries which had not yet been done as of the end of February 1997.

During February 1997, Tim McKee called on 14 February to arrange for roof work on 16 February which involved supervisor Rick and four employees who replaced a ten-foot square section of the south roof where water had been detected. Supervisor Rick returned on 17 February to remove waste materials from the roof and two workers returned on 26 February to remove several tools and pieces of equipment from the roof. PPD engineer Lynn Hodge visited on 27 February and indicated work was nearing completion. Supervisor Rick then visited later on 27 February to schedule a roof walk-through which was pending at month's end.

During March 1997, Tim McKee checked the roof on 4 March and indicated about two more accesses would be needed. Thompson Sheet Metal personnel then worked on roofing flashing on 5 March. Ken Godwin of AL Inc. then visited on 5 March to schedule access; he returned with an assistant on 6 March and completed installation of advanced lightning protection. Subsequently, Tim McKee and four other Perry Roofing Company employees spent a half-day on 9 March working on roofing flashing and other details on all three roof sections. Finally, Thompson Sheet Metal personnel accessed the roof to complete work and move off some equipment on 17 March, hopefully completing work except final inspection.

According to communication from Denis Mercier on 16 April 1997, the roof only needs a final inspection to be certified complete. On 23 May 1997, the Radiation Control Officer toured the facility with Jerry Hammett, President of Mid State Electric making plans to install surge protection for the building related to the previously installed lightning protection. This work was planned for some time in June 1997.

On 9 June 1997, when it was noted that electric power would be secured for the surge protection installed as a subcontract with Mid State Electric under the reroofing contract work addressed under MLP #95-25, it was

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	decided to open a separate duplicate maintenance record for the installation of surge protection alone since it would be completed in a single day. This work involved securing all electrical equipment in the building including the reactor console. The surge protection was installed by Mr. Jerry Hammett, President of Mid State Electric and his assistant and overseen by PPD technicians Mike Williams and T.C. Hall after similar work was completed in the Nuclear Sciences Center. Subsequently, all equipment was returned to service, the console was returned to power and a daily checkout was performed after a warmup period. Except for the optical tachometer not being operable due to needing to be reset following loss of power, all recovery was without incident with no problems noted as this work is tracked on two maintenance log pages so that MLP #97-16 was closed on 9 June 1997. On 18 August 1997, Supervisor Tim McKee of Perry Roofing Company visited indicating the roof was now complete and the need to access the roof for a biennial check, which he did. Subsequently, on 29 August 1997, completion of the roof was verified with the General Services and Facilities Manager for the College of Engineering and with the Maintenance Superintendent with the University of Florida Physical Plant Division to conclude this project with no problems noted in a number of months. (On 29 Aug 97, MLP #95-25 was closed.)
13 Aug 96	Following a larger than usual number of spurious security alarms in early August, an alarm occurred on 13 August just prior to normal work hours. Under MLP #96-25 troubleshooting was conducted and an electronic component was replaced under 10 CFR 50.59 Evaluation Number 96-08. Subsequently, the system was returned to service with some malfunctions compensated and additional work required. The system was near fully functional until repairs were finalized and MLP #96-25 closed out on 16 September when a further problem occurred which was finally corrected on 17 September when MLP #96-25 was reopened and closed the next day. (16 Aug 96 and 17 Sep 96, MLP #96-25 was closed.)

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
9 Sep 96	During the weekly checkout, the stack monitor alarm on the auxiliary alarm panel was noted not to be responding. Under MLP #96-28 the needle mechanism was cleaned to restore proper alarm function with no further problems noted (9 Sep 96, MLP #96-28 was closed.)
18 Sep 96	In preparing to perform the daily checkout, the linear (red) pen was found to be not responding (failed downscale). Under MLP #96-29 preliminary checks and troubleshooting were performed to assure the two pen recorder was functioning properly and to isolate the problem to a failure of the compensated ion chamber (CIC) or connecting cables feeding the linear channel in the nuclear instrumentation system. Subsequently, RWP 96-2-I was issued on 23 September and the CIC was removed with the connectors and dielectric noted to be brittle confirming the failure. Subsequently, unsuccessful attempts were made to remove the cables from the cable trace with the boroscope used to isolate a connector obstructing the pathway from beneath the S-1 control blade pedestal. In the meantime, two spare CIC chambers were examined but cannot be used without modification of their cable connectors. On 26 September, the uncompensated ion chamber (UIC) was removed since its cables were in the same cable trace and it had to be disconnected anyway. New cables were ordered under 10 CFR 50.59 Evaluation Number #96-10 and the UIC inspected on 27 September to confirm its integrity. At month's end attempts were under way to locate a replacement CIC or an acceptable source to rework the spare on-hand CICs as well as check their operability. During October 1996, the radiation monitor system was checked successfully and the CIC operation of the detector used as an uncompensated ion chamber in Safety Channel 2 was checked to be able to operate in the CIC mode. Subsequently, after all cables were removed, new cables were routed and connected at the pedestal end of the lines. In addition, it was decided to move the existing UIC to the CIC location and utilize it as a CIC and to purchase a new UIC evaluated equivalent to the existing UIC from IST Technology which had one in stock. At month's end, the new UIC was on order and arrived early in November 1996 as all the pedestal side cable connections had been completed.

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	During November 1996, much time was spent checking circuit schematics and measuring system parameters, moving the UIC to the CIC location for operation as a CIC and installing the new UIC for Safety Channel 2, developing 10 CFR 59.59 Evaluation and Determination Number 96-12 to modify SOP-E.4 to perform restart/calibration check following relocation of detectors, installation of connectors and testing of detectors, checkouts and installation of shield plugs, performance of modified precalorimetric and partial modified restart procedure, change of gain of linear channel picoammeter to allow calibration of the CIC, development of 10 CFR 50.59 Evaluation Number 96-14 to allow raising gain of picoammeter, removal of picoammeter to balance amplifier and verify resistance values of calibration circuit, troubleshooting of picoammeter with replacement of resistors and balancing of components with subsequent restart to check gain with following correction of gain and restart for checking and assuring rough calibration check. Completion of the final calibration run occurred on 27 November with closeout of Radiation Work Permit 96-2-I and MLP #96-29 on 27 November 1996. Though ready to resume normal operations after 27 November, the annual measurement of the temperature coefficient of reactivity (A-3 Surveillance) became overdue at the end of November, so this surveillance had to be completed satisfactorily prior to restart for normal operations. The A-3 Surveillance measurements were conducted on 2 December 1996 with data reduction completed on 3 December prior to subsequent restart for normal operations on 3 December 1996 with no further problems noted. (27 Nov 97, MLP #96-29 was closed.)
11 Nov 96	Following one spurious security alarm on 10 November and two alarms on 11 November 1996, the security system batteries were checked and replaced (S-7 Surveillance). Under MLP #96-30 the rechargeable batteries were found to be low and were recharged. Subsequently, 10 CFR 50.59 Evaluation Number 96-13 was developed to allow modification and replacement of the power pack to prevent recurrence of the problem of spurious alarms due to low voltage. Measurements were made and security system circuits checked and verified. In addition, the 6 volt batteries were recharged in mid-month. At the end of November 1996, the design and development of a new power pack per 10 CFR 50.59 Evaluation Number 96-13 was in progress; at the end of December 1996, the 10 CFR 50.59

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	Evaluation is complete as is the design, with installation of the new power supply on 7 January 1997 with all but one siren operational to meet requirements. Subsequently, the west lot siren was repaired on 13 January and both the west lot and journalism side siren horn drivers wiring was reterminated on 14 January 1997. Drawings and maintenance log were subsequently updated and an evaluation made that separate grounds would be needed for the security system batteries to assure proper charging and eliminate spurious alarms as the batteries discharge over time. On 10 March 1997, the power supply was removed for modification. Upon installation, various problems occurred resulting in partial and intermittent compensated outage of the security system over the period 10-21 March with circuit mapping performed for troubleshooting on 19 March and the intermittent ground finally repaired on 21 March 1997, but without installation of the modification to separate grounds, basically returning the system to its state prior to 10 March. Subsequently, the 4 volt rechargeable batteries have been replaced on 14 May 1997, 18 June 1997, 7 July 1997 and 24 July 1997 (for prevention purposes on 30 July 1997) and on 29 August 1997 as partial S-7 Surveillances. (MLP #96-30 remains open.)
13 Dec 96	During one of Physical Plant Division's periodic checks, a PPD technician discovered the hot water valves in the reactor cell air handler needed to be replaced due to leakage. Under MLP #96-31 and MWO #279351, PPD technician Carter Vaughn replaced both hot water valves with no further problems noted. (On 19 Dec 96, MLP #96-31 was closed.)
19 Dec 96	On 16 December 1996, during the weekly checkout, the AIM3BL air particulate detector was noted to be providing no air flow apparently due to pump failure. Subsequently, under MLP #96-32, the technical manual was sought but work was delayed as the AMS[4] air particulate detector meets all requirements for normal operations. On 14 March 1997, the air pump carbon vanes on the AIM3BL were finally repaired to restore proper operation with no further problems noted though air flow is somewhat lower than expected so the possibility of a partial blockage will be checked as time permits. (On 14 Mar 97, MLP #96-32 was closed.)

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
27 Dec 96	Following the addition of sixty gallons of demineralized water to the shield tank during the quarterly scram checks, the output of the city water demineralized make-up water system was noted to indicate the demineralizer resins needed to be replaced. Under MLP #96-33, the make-up water demineralizer resins were replaced to restore the source of high resistivity water with no further problems noted. (On 27 Dec 96, MLP#96-33 was closed.)
13 Jan 97	During reactor operation on 10 January 1997 at full power, it was noted that the adjustable stack monitor was reading approximately 1000 cps higher than the fixed stack monitor. The fixed stack monitor was reading approximately 2800 cps which was consistent with recent previous runs at full power and thus was considered normal. The Reactor Manager and Facility Director concurred that the requirements of Table 3.3 in the Technical Specifications were still being met. However, the decision was made to open a Maintenance Log Page (MLP) on the next working day and perform the stack monitor portion of the Q-2 surveillance to include calibration of the adjustable stack meter. On 13 January 1997, review and comparison of the Stack Monitor Calibration procedure (on the Q-2 Surveillance Data Sheet) and the Radiation Control Technique (RCT) #37 procedure showed inconsistencies between the two and neither included a step to match calibration of the adjustable stack meter with the fixed stack monitor. Additionally, the following discrepancies/items were noted: • No predicted stack count data sheet for the Cs-137 calibration source was included in RCT #37. • Instructions on the Q-2 surveillance data sheet were incorrect. They were apparently not updated when the RCT was changed in April 1990 to change from the tedious and subject-to-error process of moving the Cs-137 calibration source to the proper decay-corrected position within the base of the stack each time the monitor was calibration checked to moving the Cs-137 source to the same position each time and simply decay correcting the Cs-137 source-produced count rate.

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	• Review of the Q-2 surveillance data sheets completed since March 1990 seems to indicate that the "Expected Results" portion of the procedure has continued to be performed as it was done prior to the RCT revision in April 1990. Instead of determining the predicted decay corrected count rate at the fixed "4000 cps position" and the fixed "100 cps position," a more difficult approach of empirically determining the distance, from the stack detector, necessary to get approximately 4000 cps and 100 cps was used, at least on some occasions. After Reactor Manager discussions with the Radiation Control Officer and Facility Director about the calibration procedure to be performed, MLP #97-01 was opened and the Reactor Manager, an SRO-trainee, and a radiation control technician walked through and then calibrated the fixed and adjustable stack monitors making necessary changes to assure a proper Q-2 surveillance data sheet as they proceeded. Only minor adjustments were needed in the calibration performed on 13 January 1997. More details on this unusual event and its evaluation and reportability are contained in Table III-8 in Chapter III of this report and in the 14-day report on this event as submitted to NRC which is in Appendix F to this report. (On 13 Jan 97, MLP #97-01 was closed.)
27 Jan 97	During the weekly checkout, the level in the primary coolant storage tank was noted to be getting low at 20.5 inches. Under MLP #97-02, sixty gallons of demineralized water were added to the PC storage tank to restore the level to 28 inches with no problems noted. (On 27 Jan 97, MLP #97-02 was closed.)
7 Feb 97	During several checkouts, it was noted that the temperature recorder indications were becoming illegible. Under MLP #97-03 the temperature recorder ink pads were replaced to restore legibility to the temperature printouts with no further problems noted. (On 7 Feb 97, MLP #97-03 was closed.)

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
13 Feb 97	In checking the Keithley 197A digital multimeter prior to shipping it for a calibration check, its LCD display was noted to be failed. Under MLP #97-04 the multimeter was transferred to the electronics shop where contacts were cleaned to restore proper LCD display with no further problems noted. (On 13 Feb 97, MLP #97-04 was closed.)
27 Feb 97	In completing the daily checkout, the rpm indication from the DC tach-generator for the stack dilute fan was noted to be indicating zero rpm. Under MLP #97-05, loose wires were noted on the mechanical tachometer which was removed to the shop for repairs. Subsequently, the wires were reconnected on 5 March to restore the mechanical tach rpm indication with bearing or fan motor problems suspected as the root cause of this failure so that physical plant was requested to check the bearings. Subsequently, the mechanical tach was disconnected from fan pulley shaft on 10 March due to apparent fan shaft axial movement caused by worn bearings. The mechanical tach servo will remain disconnected until the fan shaft bearings are replaced to prevent damage to the mechanical tach servo. (On 5 Mar 97, MLP #97-05 was closed.)
6 Mar 97	In response to suspected problems with the stack dilute fan bearings as a result of mechanical tach failures, MWO #299763 was called in so PPD technician D. Walton could check the system. He noted the need to replace belts and a possible need to replace the bearings as there was some indication of axial shaft movement. Some room intake filters were removed following recent Physical Plant installation to minimize axial shaft movement due to differential pressure. Though vibrating somewhat more than desirable, the fan was judged acceptable with Mr. Walton to check on further response. The decision was made to replace bearings as called into physical plant on 11 March. Subsequently, under MLP #97-07 (MWO #301271), the bearings were relocked down and regreased, the fan belts were replaced and new bearings ordered by D. Walton on 14 March. On 25 March, PPD mechanical technician D. Sprague visited to schedule further work. On 26 March, the pigtail was rewired and the coupling repaired by PPD technicians D. Sprague and C. West with no further problems noted, though new bearings are on order and the mechanical tach

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	will remain disconnected to assure no failure due to axial shaft movement/vibration. (On 26 Mar 97, MLP #97-07 was closed.)
10 Mar 97	During performance of the pre-calorimetric portion of the A-2 Surveillance (UFTR Nuclear Instrumentation Calibration Check and Calorimetric Heat Balance), certain voltages and setpoints were noted to require minor adjustments as expected. Under MLP #97-06, various voltages and setpoints were adjusted to assure proper nuclear instrumentation calibration with further changes needed at the conclusion of the post-calorimetric checks so that resistor changes were needed to increase the gain of picoammeter A-2 amplifier to facilitate linear channel calibration under Special Test Procedure E.4 (Modified) per 10 CFR 50.59 Evaluation and Determination No. 97-02. After nuclear instrumentation adjustments and resistor changes, the A-2 Surveillance was successfully completed on 18 March 1997. Subsequently, to avoid apparent (not actual) operation in excess of 100 kW, the complete calorimetric was redone on 24-25 March 1997 to incorporate a safety factor per changes to SOP-E.4 approved at RSRS meeting on 21 March 1997. (On 18 Mar 97, MLP #97-06 was closed.)
31 Mar 97	During a reactor operations exercise, the reactor was at 10 watts. In preparation to raise power, the SRO attempted to set the automatic flux control servo potentiometer assembly but it was found to be freely spinning. Following an unscheduled shutdown, UFTR Form SOP-0.6B, Unscheduled Shutdown Review and Evaluation, was completed to show all systems responding properly with no safety concerns (completed Form SOP-0.6B is available at the UFTR facility. Under MLP #97-08, the servo potentiometer was unbolted to determine if it could be adjusted. Since the servo potentiometer is a self-contained unit, it could not be adjusted, so the decision was made to order a duplicate replacement. After replacement of existing potentiometer with new potentiometer, a daily checkout was performed and the reactor was started up and the servo potentiometer checked briefly at 3 kW and 10 kW. The reactor was then taken to 95 kW in manual control and, after waiting for temperatures to stabilize (~17 minutes), the automatic flux controller percent demand potentiometer was adjusted for 95 kW and placed in automatic control and checked for

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	proper operation. Steps 7.3.4.1 through 7.3.4.4 of SOP-E.4 were performed to ensure that the Linear Range Selector Switch was in the 100 kW position with two licensed operators present for the performance of step 7.3.4.4. Further it was noted that the Linear Channel is already calibrated per a recent calorimetric. Therefore, all that was needed was to assure that a setting on the percent demand potentiometer corresponded to the proper linear channel setting on the red pen, which it did. So, the retest procedure simply assured that the new potentiometer gives linear channel readings consistent with the one removed. The Maintenance Log Page #97-08 was closed out early in the afternoon on 2 April 1997 with the reactor subsequently returned to normal operations with no further problems noted. (On 2 Apr 97, MLP #97-08 was closed.)
16 Apr 97	In attempting to use the E140/1048 GM survey meter, the detector was noted to be loose and disconnected from the cable leading to the meter on 16 April 1997. Under MLP #97-09, the detector was reterminated to the cable and then the meter calibration was verified to restore proper operation with no further problems noted. (On 18 Apr 97, MLP #97-09 was closed.)
24 Apr 97	On 23 April 1997, while performing control blade drop time measurements (S-1 Surveillance) with one time recorded for all blades and a second time recorded for the Safety-3 control blade, the high speed temperature recorder failed with at least part of the problem being a leaking ink reservoir. Since sufficient satisfactory drop times had been recorded, the S-1 Surveillance was considered complete to meet requirements but with plans to obtain additional times for statistical purposes at a convenient later time. Subsequently, under MLP #97-10, the high speed recorder was removed to the electronics shop where repairs were finally completed when the recorder was needed to measure drop times following replacement of the failed Safety-3 control blade drive motor on 23 May 1997. (On 23 May 97, MLP #97-10 was closed.)
16 May 97	The Physical Plant Division and Alarm Systems Supervisor Skip Rockwell had previously requested to be able to convert the four-zone fire alarm monitoring system for the reactor building to a digital dialer arrangement. The necessary 10 CFR 50.59 Evaluation Number 97-04 was reviewed and

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	fully approved at the RSRS meeting on May 8. Subsequently, under MLP #97-11, the digital dialer unit was installed on the wall adjacent to the monitoring station outside the Emergency Support Center (108 NSC) on 16 May 1997 by a PPD fire alarm systems technician. On 20 June, a PPD telephone technician connected the 21428 and 21429 telephone lines under MWO #320510. Subsequently, on 10 July, the digital dialer was actuated by PPD fire alarm system technicians who then returned to close out the Maintenance Log Page on 11 July 1997. (On 11 Jul 97, MLP #97-11 was closed.)
19 May 97	During performance of the quarterly calibration check for the area and stack radiation monitors, several adjustments were necessary. Under MLP #97-12, minor adjustments were made for the 1.0 and 2.5 mR/hr settings on the north area radiation monitor along with a small adjustment for the stack monitor with no further problems noted. (On 19 May 97, MLP #97-12 was closed.)
20 May 97	During a reactor operations laboratory class following closure of the dump valve at 0940 hours on 20 May 1997 the rupture disk broke immediately upon starting the primary coolant pump. There was no operator error involved as the disk in place had apparently developed a crack and broke upon occurrence of the small pressure change caused by starting the PC pump. Under MLP #97-13, it was determined that approximately 35 gallons of primary coolant were dumped to the equipment pit which was cleaned up following characterization for radioactivity content. Since the reactor had not run for the week, the pit water sample and the weekly primary coolant sample were essentially equivalent. Subsequently, a duplicate rupture disk was removed from inventory, installed in the system and leak checked by closing the dump valve and starting the PC pump. A small drip leak was corrected with further tightening of the flange for the rupture disk and subsequent leak checks were negative with no further problems noted. This occurrence is evaluated as having no impact on reactor or personnel safety with the reactor returned to normal operations following successful completion of the daily checkout on the afternoon of 21 May 1997. (On 21 May 97, MLP #97-13 was closed.)

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
21 May 97	During a reactor operations laboratory class, during performance of step 7.2.5.5.1 of the daily checkout involving removal of the Safety-3 control blade about 40 units for a period trip check, the Safety-3 control blade position was noted to move out, then in, then out in a step fashion. Under MLP #97-14, the Safety-3 control blade drive motor was noted to be quite hot so it was removed and an on-hand spare drive motor was removed from inventory, its shaft modified to accept the shear pin per previously implemented changes and then installed in the Safety-3 control blade drive system. A successful daily checkout was then completed involving minimal control blade movements. Subsequently measurements of Safety-3 drop times and controlled insertion as well as controlled removal times were all normal with the motor and control blade noted to be operating smoothly over the full range, with measurements of the control blade drop time delayed until the afternoon of 23 May 1997 awaiting completion of maintenance under MLP #97-10 on the high speed recorder used in measurement of the control blade drop times. This occurrence, discovered during a daily checkout, was evaluated to have little impact on reactor safety and no impact on personnel safety with the reactor returned to normal operations following successful completion of another daily checkout on the afternoon of 23 May 1997 with no further problems noted. (On 23 May 97, MLP #97-14 was closed.)
2 Jun 97	During the weekly checkout, the water level in the primary coolant storage tank was noted to be getting low. Under MLP #97-15, sixty gallons of demineralized water were added to the PC storage tank to raise the level to 28½ inches with no problems noted. (On 2 Jun 97, MLP #97-15 was closed.)
9 Jun 97	When it was noted that electric power would be secured for the surge protection installed as a subcontract with Mid State Electric under the reroofing contract work addressed under MLP #95-25, it was decided to open a separate duplicate maintenance record for the installation of surge protection since it would be completed in a single day. This work involved securing all electrical equipment in the building including the reactor console. The surge protection was installed by Mr. Jerry Hammett, President of Mid State Electric and his assistant and overseen by PPD

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR
PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	technicians Mike Williams and T.C. Hall after similar work was completed in the Nuclear Sciences Center. Subsequently, all equipment was returned to service, the console was returned to power and a daily checkout was performed after a warmup period. Except for the optical tachometer not being operable due to needing to be reset following loss of power, all recovery was without incident with no problems noted as this work is tracked on two maintenance log pages so that MLP #97-16 was closed on 9 June 1997. (On 9 Jun 97, MLP #97-16 was closed.)
9 Jun 97	When the optical tachometer rpm indicator was lost following returning to power after installation of surge protection under MLP #97-16, it was decided to repair and reinstall the mechanical tachometer-generator. Under MLP #97-17, the mechanical tach-generator was repaired, reconnected and checked to be operating to indicate proper stack dilute fan rpm with no immediate problems noted. (On 9 Jun 1997, MLP #97-17 was closed.)
9 Jun 97	The optical tachometer rpm indication was noted to be lost following returning AC power after installation of surge protection per MLP #97-16. Under MLP #97-18, the optical tachometer was removed. Later, when the mechanical tachometer connections failed, it was decided to check the optical tach to return it to service to meet the applicable Tech Spec Limiting Condition for Operation. It was later checked out with no failure noted except the need for reset following loss of power. Subsequently it was reinstalled and verified to be operating properly with no further problems noted. (On 11 Jun 1997, MLP #97-18 was closed.)
11 Jun 97	In preparing to conduct a daily checkout, it was noted that the mechanical tach-generator rpm indication had been lost again. Under MLP #97-19, the mechanical tach connecting wires were noted to be broken apparently due to axial thrust/vibration of the stack dilute fan shaft. The mechanical tach was then removed to await the arrival and installation of new fan shaft bearings previously requested under MWO #301271 per MLP #97-07. Subsequently, PPD technician D. Walton visited to verify the need for and type of bearings to assure they were properly ordered. At the end of the reporting year, the facility continues to await arrival of the bearings. (MLP #97-19 remains open.)

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
19 Jun 97	During performance of the daily security check, one of the response checks failed to operate. Under MLP #97-20, a loose wire in the security system was repaired to correct the problem. (On 19 Jun 1997, MLP #97-20 was closed.)
1 Jul 97	During the daily checkout with an NRC inspector observing, the primary coolant level trip failed to actuate. Under MLP #97-21, after eliminating the field relay as the source of the failure, the float switch terminal boards were accessed where the level switch appeared to be sticking. Under RWP 97-1-I, the level switch was removed and found to be failed with contacts stuck together. On 2 July 1997, a reed switch from stock was bench tested satisfactorily and it was installed in the system under 10 CFR 50.59 Evaluation Number 97-05 since the specifications on the failed reed switch were not designated anywhere. On 3 July 1997, various multiple checks and tests were performed on the level trip switch as installed to assure proper trip actuation. In addition, step 4 of the Quarterly Scram Check (Q-1 Surveillance) was performed satisfactorily along with requisite operational checks per UFTR SOP-A.1 step 7.2.5.6 so the reactor was returned to normal operation with no further problems noted. (On 3 Jul 97, MLP #97-21 and RWP 97-1-I were closed.)
11 Jul 97	After noting increased temperature and humidity levels in the reactor cell and control room, a work request was called in to Physical Plant to have someone examine the air handler temperature control system. Under MWO #330331, a PPD technician visited on 10 July to assess the situation and schedule access time. On 11 July 1997, under MLP #97-22, the technician adjusted the hot deck control valve on the reactor cell air handler to restore proper operational control of the system with no further temperature or humidity control problems noted. (On 11 Jul 97, MLP #97-22/MWO #330331 was closed.)
17 Jul 97	Although replacement paper was ordered for the temperature recorder in April 1997, it had not arrived by mid-July due to supply problems. As a result, 10 CFR 50.59 Evaluation Number 97-06 was developed to allow use of the reverse side of a roll of used temperature recorder paper until the replacement paper (ordered on priority) should arrive. On 17 July 1997,

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR
PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	under MLP #97-23 used for tracking purposes, the last roll of unused temperature recorder paper was used up and replaced with a reversed roll with operators cautioned to read temperatures carefully with no problems noted. The new paper arrived and it was installed on 6 August 1997. (On 17 Jul 97, MLP #97-23 was closed.)
28 Jul 97	In preparing to perform the weekly checkout, the operator noted that the shield tank water demineralizer system pump was not running. Under MLP #97-24, the tank level was checked to be above suction, the level trip was checked to be operable and fifty (50) gallons of demineralized water were added to the shield tank. On 30 July 1997, blown fuses on the K4 field relay were replaced whereupon the pump was energized but noted to be very noisy indicating bad bearings or excessive impeller/pump housing friction, so the pump was secured to prevent blowing more fuses. At month's end plans were to approve running without the pump subject to confirmed proper resistivity of the shield tank water. On 1 August 1997, 10 CFR 50.59 Evaluation Number 97-07 was developed to approve reactor operation without the pump provided shield tank resistivity was acceptable. Little operation was planned due to the end of summer classes and staff absences. Subsequently, two brief operations were conducted on 6 and 8 August 1997. During the weekly checkout on 11 August 1997, the shield tank resistivity level was near the operating limit so no further operations were allowed until the system was functional again. On 11 August 1997, the suction and discharge valves were closed and the pump and motor were removed from the demineralizer system. Problems noted included broken impeller vanes; in addition, in a test the motor was found to be noisy and providing no suction. Following checkout, the pump was transferred to Gainesville Pump and Supply Company to identify an equivalent replacement. Subsequently, an equivalent pump with motor was identified and ordered with 10 CFR 50.59 Evaluation (and Determination) Number 97-09 developed for its implementation. Upon delivery on 25 August 1997, it was noted that new conduit was needed for the wiring and a 1.25 inch to 1.00 inch transition pipe was needed for the suction side. The conduit and wiring were installed on 26 August 1997 as were a bushing and nipple for the 1.00 inch

TABLE V-2

CHRONOLOGICAL TABULATION OF UFTR PREVENTIVE/CORRECTIVE MAINTENANCE

Date	Maintenance Description
	to 1.25 inch transition. In addition, the piping was examined for sizing to the pump. Finally, on 27 August 1997, the piping was sized to the pump using a bushing on the discharge to mate to the flange, the stanchion blocking the pump was removed and the pump was installed and all joints tightened. Subsequently, the pump and suction piping was filled and primed, the pump was tested for proper rotation and then run. Resistivity checks showed 0.85 MΩ-cm. Checks one hour later indicated the pump and motor were cool to the touch with no leaks. Resistivity checks after another 1.5 hours showed 1.21 MΩ-cm. Subsequently, the reactor was returned to normal operations with no further problems noted. (On 27 Aug 97, MLP #97-24 was closed.)
12 Aug 97	Following spurious security alarms on three successive days, under MLP #97-25 an effort was made to diagnose possible sources of the problem. As a result, several anti-tamper switches in the outdoor security siren horns and on the door switches were found to be degraded. Since duplicate switches were not available, equivalent switches were approved under 10 CFR 50.59 Evaluation Number 97-08. Following delivery of replacement switches in two stages, the anti-tamper switches on the outdoor security siren horns were replaced on 14-15 August while the switches on the rear door to the west lot and the control room door were replaced on 19 August with no further spurious alarm actuations for the remainder of the month. (On 19 Aug 97, MLP #97-25 was closed.)
21 Aug 97	During preparations to segregate radioactive trash, the Bicro Microanalyst (microrem) survey meter was found to be inoperable with the high voltage out. Under MLP #97-26, this survey meter was transferred to the electronics shop for diagnosis and repair. At year's end, this survey meter has not yet been returned to service as it awaits repair. (MLP #97-26 remains open.)

MLP #93-10 remains open from 5 April 1993.
MLP #94-14 remains open from 16 March 1994.
MLP #96-30 remains open from 11 November 1996.
MLP #97-19 remains open from 11 June 1997.
MLP #97-26 remains open from 21 August 1997.

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 1996-97 reporting year. As such, this chapter provides a ready reference for the status of various license-related documents to include Technical Specifications, Safety Analysis Report, Standard Operating Procedures, Emergency Plan, Security Response Plan, Reactor Operator Requalification and Recertification Training Program, HEU-to-LEU Conversion Documents as well as Quality Assurance Program Approval for Radioactive Material Shipments and other key documents as they are generated or changed.

A. Changes to Technical Specifications

The new Technical Specifications for the UFTR were issued on August 30, 1982 and officially established on September 30, 1982. Two sets of requested corrections/changes to the Technical Specifications were submitted to the NRC during the 1982-83 reporting period. As noted in the 1983-84 annual report, the UFTR facility received approval for Amendments 14 and 15 to the UFTR Technical Specifications during that reporting year. As noted in the 1985-86 annual report, the UFTR facility requested and received approval for Amendment 16 in that year 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 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.

For the 1992-93 reporting year, Tech Spec Amendment 18 was submitted to NRC with a letter dated September 28, 1992. Approved license (Tech Spec) Amendment 18 was received on March 29, 1993 per a letter from NRC dated March 25, 1993. The approved amendment consisted of a revision to the Tech Specs to permit submittal of the annual report of activities up to December 31, rather than November 30 of each year. Also, the current mailing address for the annual report was changed to correspond to the current NRC mailing requirement.

For the 1993-94 reporting year, two Tech Spec Amendments were submitted. Tech Spec Amendment 19 was submitted to NRC with a letter dated December 2, 1993. Approved license

(Tech Spec) Amendment 19 was received on March 10, 1994 per a letter from NRC dated March 25, 1993. The approved amendment consisted of a revision to address the revised 10 CFR Part 20; areas addressed include updating the limitation on Argon-41 discharge concentrations, updating the references to Part 20 for liquid and gaseous effluent discharges and changing the reference to "Maximum Permissible Concentration" to "maximum concentration," correcting the 500 mrem/yr federal limit to 100 mrem/yr for members of the public, and deleting any reference to active plans to upgrade the UFTR to 500 kW operation. Documentation for Amendment 19 is contained in Appendix A of the 1993-94 annual report.

Tech Spec Amendment 20 was submitted to NRC with a letter dated June 2, 1994. This initial request was to permit sanitary sewage system disposal of aqueous radioactive material in accordance with 10 CFR Part 20.2002. In late August 1994, NRC staff members indicated the amendment as proposed did not address the proper sections of the new Part 20 for releases from the facility holdup tanks. As of a conference call with NRC staff on September 1, 1994, it was decided to amend the submission to address the releases from the holdup tank as normal effluents versus waste; that is, to address effluents and refer to 10 CFR Part 20.1301 and 10 CFR Part 20.1302 in Paragraphs (1) and (2), respectively, of Section 3.4.5 of the UFTR Technical Specifications on Page 12 entitled "Liquid Effluents Discharge." The key here is the facility releases via the holdup tanks are to meet normal effluent requirements; they are not to be considered waste. During review of the draft submission deleting references to all attachments to the earlier amendment submission, it was also decided to change the UFTR technical specifications in Section 4.2.4, Paragraph (3) on Page 20 to refer to release of liquid effluents versus radioactive waste in agreement with the change to Section 3.4.5 and with the existing title of Section 4.2.4 which is "Radiation Monitoring Systems and Radioactive Effluents Surveillance."

For the 1994-95 year, these changes in the revised Amendment 20 letter and attachments were mailed to NRC as a letter dated September 9, 1994. After a number of inquiries and discussions, this License Amendment 20 (Tech Specs) was finally approved by NRC per a letter dated February 6 and received on February 10, 1995. All the documentation for Tech Spec Amendment 20 including the revised Amendment 20 letter and attached Tech Spec change pages 12 and 20 as well as the letter notifying issuance of the amendment, the amendment indicating it is effective on the date of issuance as February 6, 1995, along with the amendment pages and the NRC Safety Evaluation supporting the amendment are contained in Appendix A of the 1994-95 annual report.

For the 1995-96 reporting year, one Tech Spec Amendment was submitted. Tech Spec Amendment 21 was submitted to NRC with a letter dated August 2, 1996, all of which is in Appendix A of the 1995-96 annual report. The only change is at the beginning of Section 6.6.1 and simply allows two additional months for submittal of the "routine annual report covering the activities of the reactor facility during the previous calendar year." Because December is normally a relatively high activity month at the UFTR facility with the end of fall semester classes and because a number of other commitments also come due in December, plus facility staff typically take leave time after the end of classes, this change to allow two further months for submittal is expected to provide assurance that this report can be filed on time to avoid the problem of failure to submit reports cited in NRC Inspection Report 50-83/96-01. This change as requested is not

considered to have any safety significance and involves an administrative change only. Approved Tech Spec Amendment 21 was received on October 15, 1996 per a letter from NRC dated October 10, 1996 as the effective date of the amendment allowing submittal of the UFTR annual report of activities six months following the end of the reporting year which occurs on August 31 each year. The full NRC transmittal including the cover letter, the amendment indicating it is effective on the date of issuance as October 10, 1996 along with the amendment pages and the NRC Safety Evaluation Report supporting the amendment are contained in Appendix A of this report.

For the 1996-97 reporting year, one more Tech Spec amendment was submitted. Tech Spec Amendment 22 was submitted to NRC with a letter dated August 21, 1997. The first change is on Figure 6.1 (UFTR Organization Chart) on page 30 in the Level 1 organization box which is updated to reflect the name change from the "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering" for the department that continues to be responsible for operation of the University of Florida Training Reactor. The submittal notes that this change was initiated by the faculty of the department to reflect better the educational and research activities and goals of the department and was approved by the University of Florida administration; the change is in name only as the same administrative structure continues in existence. On page 32, this same department name change is made once in paragraph 6.2.5(1), Composition and Qualifications, and three times in paragraph 6.2.5(2), Charter and Rules, subparagraph (a) of Membership. Finally, on page 37, at the end of Section 6.6.1 (Operating Reports), the Attention Line is moved to the second line of the NRC's Washington, DC address. In addition, the address for submission of annual reports to NRC Region II is deleted to reflect the transfer of the Non-Power Reactor Inspection Program from the NRC Region II office to the Office of Nuclear Reactor Regulation, Non-Power Reactor Directorate per a letter from Luis A. Reyes, Region II Regional Administrator dated August 1, 1997 and received on August 7, 1997. These changes requested are not considered to have any safety significance and involve nomenclature/administrative changes only. This entire Amendment 22 submittal package is contained in Appendix B of this report. Approval for this change request has not yet been received at the end of the reporting year.

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.

B. Revisions to UFTR Safety Analysis Report

FSAR Revision 5 was submitted to NRC and inserted in the UFTR Safety Analysis Report (SAR) 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. During

the 1991-92 reporting year, Revision 7 of the UFTR SAR was submitted with a letter dated April 3, 1992 and consisted of changes to two pages. The first change was on Page 5-8 to allow use of an equivalent deep well pump per the slightly changed but equivalent description in Section 5.2 describing the UFTR Secondary Cooling System. The second change was to Page 9-6 in Sections 9.2.3 and 9.2.4 to allow use of an equivalent resin in the Demineralized Water Makeup System and the Primary Coolant Purification System because the Amberlite IRN-150 nuclear grade resins previously specified for use in the purification systems are no longer available.

Revision 8 of the UFTR Safety Analysis Report dated 5/95 was submitted to NRC with a letter dated May 11, 1995. Revision 8 consists of changes to two pages. The revision resulted from the need to make certain minor changes in the schematics describing the UFTR Secondary Water Cooling System to reflect modifications that have been implemented. There were no textual changes required in the Safety Analysis Report.

Revision 9 of the UFTR Safety Analysis Report dated 8/95 was submitted to NRC with a letter dated September 14, 1995 and consists of changes to two chapters. Although the changes were initiated for only several pages as a result of the CY 1993 audit by the Reactor Safety Review Subcommittee, continuing review resulted in changes on Pages 1 through 5 and Pages 19 and 20 of Chapter 12 (Radiation Protection) and a complete update of all pages for Chapter 13 (Conduct of Operations). The changes are not considered to involve any unreviewed safety question or to impact the UFTR Safety Analysis and include a number of simple wording clarifications, updates of organization names, corrected document references, deletion of references to UFTR power upgrades, updates of surveillance references and examples, update of UFTR administrative structure diagram to delete specific named individuals as well as a number of corrections to match Tech Spec requirements, and many typographical error corrections made in the interest of readability. There are also a number of changes made to match the designations in Chapter 13 with the current approved UFTR Requalification and Recertification Training Program. For details on the changes in Revision 9, the reader is referred to complete documentation for SAR Revision 9 contained in Appendix B of the 1995-96 annual report.

For the 1996-97 reporting year, Revision 10 of the UFTR Safety Analysis Report was submitted to NRC with a letter dated March 17, 1997. This change was approved as 10 CFR 50.59 Evaluation and Determination Number 97-03; it was made to correct inconsistent labeling of scales for percent power and power level in Figure 7.2 (Operating Range of UFTR Neutron/Power Level Detectors) on page 7-5. The complete submittal for SAR Revision 10 including letter of transmittal and revised page 7-5 labeled "REV10, 3/97" is contained in Appendix C of this report. As expected, there has been no response on this submittal to date.

There have been no other subsequent revisions of the UFTR SAR. However, with completion of most neutronics and thermal-hydraulics analyses to support the HEU-to-LEU conversion, other SAR updates are planned as necessary to keep the SAR current and to support the planned HEU-to-LEU fuel conversion and subsequent preparations for relicensing the UFTR.

C. Generation of New Standard Operating Procedures

No new Standard Operating Procedures (SOPs) were generated during the 1995-96 reporting year. This condition marks the maturity of the UFTR Standard Operating Procedures as great efforts have been undertaken to implement good practice requirements in generating new procedures. At the end of the reporting year, also in contrast to many earlier previous years, no further new procedures are in progress.

D. Revisions to Standard Operating Procedures

All existing UFTR Standard Operating Procedures were reviewed and rewritten into a standard format during the 1982-83 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 (1995-96) 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 (1996-97) 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 in parentheses for each SOP; 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 revisions to SOPs generated during this reporting year versus none last year which was in contrast to the significant administrative effort by UFTR facility staff when eight revisions were generated two years ago in the 1994-95 reporting year. The basic reasons for the three SOP revisions in 1996-97 are explained in the following paragraphs with a copy of each revision contained in Appendix D of this report.

The three revisions to UFTR Standard Operating Procedures generated during the 1996-97 reporting year include UFTR SOP-A.1, SOP-B.4 and SOP-C.3. The revisions this year were relatively minor in nature. All three could have probably been Temporary Change Notices except that the number of page changes made a revision more appropriate. The revisions for SOP-B.4 and SOP-C.3 were generated as a direct result of the Biennial Evaluation of the UFTR Standard Operating Procedures (B-4 Surveillance) completed during the last part of the reporting year.

UFTR SOP-A.1 (Preoperational Checks) underwent a complete revision (16) primarily to collect several previous temporary changes and to incorporate a check of the source alarm operation and setpoint into the weekly checkout. As a result, the step references in sections 3.2.1.2, 3.2.2 and 3.2.2.1 were changed and the source alarm check was added via steps 7.1.13 and 7.1.13.1 with renumbering of all subsequent steps which is why a revision was generated and not a Temporary Change Notice.

UFTR SOP-B.4 (Flood) underwent a complete revision to correct several misnumbered paragraphs, to update the weather bureau contact telephone number and to note conditions for its 24-hour availability and the fact the number is listed on Call List #2 posted around the facility. Some statements were also clarified to include noting that removal of hurricane rods is only allowed when authorized by the Reactor Manager or a duly authorized representative and the Reactor Manager is to be informed when such removal is complete. In addition, typographical errors were corrected and gender references removed throughout the procedure which was not stored on the current computer system. Since all pages were affected by these minor changes, a revision was generated instead of aTemporary Change Notice.

UFTR SOP-C.3 (Fuel Inventory Procedure) also underwent a revision to update references to the Nuclear Engineering Sciences (NES) Department which became the Nuclear and Radiological Engineering (NRE) Department in late 1996. In addition, the fuel inventory forms were reformatted. As a result of affecting most pages in the procedure, a revision was generated and not aTemporary Change Notice.

In addition to the three revisions generated during the 1996-97 reporting year, a number of minor changes were incorporated into the UFTR Standard Operating Procedures as needs and/or errors were identified especially in response to the Reactor Safety Review Subcommittee (RSRS) annual audit and facility evaluations and as a result of training on the Standard Operating Procedures and their periodic review as well as NRC Inspection recommendations and completion of the Biennial Evaluation of UFTR Standard Operating Procedures (B-4 Surveillance). In contrast to the previous reporting year when only eleven (11) TCNs were issued, twenty-nine (29) TCNs were issued this year to correct minor discrepancies or better express the unchanged intent of twenty-one (21) different procedures, with only SOP-0.1 (Operating Document Controls), SOP-0.5 (QA Program), SOP-A.2 (Reactor Startup), SOP-A.1 (Radiological Emergency) and SOP-E.4 (UFTR Nuclear Instrumentation Calibration Check) changed more than once, including SOP-0.1, SOP-0.5, SOP-0.7, SOP-A.2, SOP-A.3, SOP-A.5, SOP-B.1, SOP-B.2, SOP-C.1, SOP-C.2, SOP-D.1, SOP-D.2, SOP-D.4, SOP-D.5, SOP-E.4, SOP-F.1, SOP-F.2, SOP-F.3, SOP-F.4, SOP-F.5 and SOP-F.6. It should be noted that more than half of the TCNs were generated as a result of the Biennial Evaluation of the UFTR Standard Operating Procedures (B-4 Surveillance) completed during the last part of the reporting year. It should also be noted that one of the two TCNs for SOP-E.4 incorporated additional conservatism into the procedure to assure no apparent operation at power levels above 100 kW.

The remaining TCNs all involve similar minor changes affecting one or a few sections of the respective SOP, sometimes as little as a single sentence. All were fully reviewed by UFTR facility management and approved by the RSRS. Because of the quantity of paper involved and the relatively minor nature of TCNs, 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; the changes are briefly summarized in Table VI-3.

E. Revisions to UFTR Emergency Plan

With a letter dated December 10, 1992, Revision 8 was submitted to the NRC, providing updates and minor revisions to fifteen (15) pages. In a letter dated July 20, 1993, the NRC notified the facility of their evaluation that these changes do not decrease the effectiveness of the Plan which maintains compliance with 10 CFR 50 Appendix E. Therefore, the approved changes were incorporated into the current Emergency Plan. Revision 8 was then distributed to all holders of the Plan with a letter dated August 2, 1993 just prior to the beginning of the 1994-95 year.

During the 1994-95 reporting year, with a letter dated January 20,1995, Revision 9 was completed and submitted to the NRC. Revision 9 consists of a set of updates and revisions to thirteen (13) pages: ii, iv, 1-12, 5-1, 5-2, 7-5, 7-6, 7-7, 8-2, 8-3, 10-2, 10-6 and 11-1, as well as Appendix I - Shands Teaching Hospital and Clinics, Inc. Plan for Emergency Handling of Radiation Accident Cases. In addition, Appendix II - Agreement Letters and Appendix III - Emergency Implementing Procedures were to be removed from the Plan.

Revision 9 was reviewed by UFTR management and the Reactor Safety Review Subcommittee (RSRS) to assure Revision 9 did not decrease the effectiveness of the UFTR Emergency Plan. All the changes were considered relatively minor in nature; they were the result of reviews of the Plan and our response to simulated emergencies following emergency drills. The two revised emergency procedures (SOP-B.1 and SOP-B.2) were implemented in early February 1995. Further minor revisions to SOP-B.1 were implemented in July 1995. Minor revisions to SOP-B.2 were implemented in August 1995. The remainder of the changes were not implemented during the 1994-95 reporting year awaiting NRC approval of the submittal before distributing changes to holders of the Emergency Plan. Except for discussing the implementation of the revised emergency procedures and the general content and scope of Emergency Plan Revision 9 with Craig Bassett during a call on January 26, 1995, and documenting his favorable evaluation, there had been no response from NRC up to August 1995. Documentation for Emergency Plan Revision 9 omitting the emergency procedures and including only the title page and signature page for the "Shands Hospital Emergency Department Plan for Emergency Handling of Radiological Accident Cases" was contained in Appendix D of the 1994-95 report.

In a letter dated October 10, 1995, the NRC indicated that their staff had reviewed this Revision 9 and found that the changes in the body of the plan as well as the new Shands Hospital Emergency Plan in Appendix I are acceptable and can be implemented without prior NRC approval in accordance with 10 CFR 50.54(q). However, in addition to these minor modifications, the NRC letter indicated that certain other changes, i.e., removal of Appendix II - Letters of Agreement, and Appendix III - Emergency Implementing Procedures were found to be of a substantive nature. These changes were reviewed by the NRC staff for their impact on the effectiveness of the Plan and/or their potential safety significance which concluded that the Letters of Agreement should be an integral part of the Plan and must be maintained in the Emergency Plan on the basis that their removal would decrease the effectiveness of the Plan. Further, the NRC found that the Emergency Implementing Procedures may be removed from the Plan; however, a list of these procedures, by title, must be referenced in the Plan. A copy of this NRC letter approving Emergency Plan Revision 9 subject to the above noted limitations is contained

in Appendix F of the 1995-96 annual report. Subsequently, all of the Revision 9 changes were incorporated into the Plan with the exception that the Letters of Agreement were left in Appendix II and a list of the Emergency Implementing Procedures by title is referenced in the Plan as had been incorporated into Revision 9. This Revision 9 was completely implemented and supplied to all Emergency Plan holders in December 1995.

During the 1996-97 reporting year, with a letter dated April 10, 1997, Revision 10 of the UFTR Emergency Plan was completed and submitted to the NRC. Revision 10 of the Emergency Plan consists of a set of updates and revisions to thirteen (13) pages: ii, iv, 1-11, 3-1, 3-2, 3-3, 3-4, 3-5, 3-8, 7-1, 8-1, 8-4 and 8-5, as well as Appendix I - Shands Teaching Hospital and Clinics, Inc. Plan for Emergency Handling of Radiological Accident Cases and Appendix II - Agreement Letters. First, Figure 1.8 on page 1-11 is updated to show a large addition made to the J.W. Reitz Union building and show its location a little better. This addition has no effect on UFTR building access routes.

Second, there are a number of changes on six pages in Chapter 3, all updating the Plan to account for various department name changes. On page 3-1, section 3.1, paragraph 1 is updated in two places to reflect the name change from the "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering" and also to correct a misspelling where "eduction" should be "education." On page 3-2, the UFTR Organization Chart in Figure 3.1 is updated to reflect the name change from the "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering" in the Level 1 organization box. On page 3-3, section 3.2.3, line 4 is updated to reflect the name change from the "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering" and section 3.3 is updated in two places to reflect the name change from the "State of Florida Department of Health and Rehabilitative Services Office of Radiation Control" to the "State of Florida Department of Health, Bureau of Radiation Control." On page 3-4, section 3.4.3 is changed to correct a typographical error in the reference to the Shands Hospital "Plan for Emergency Handling of Radiation Accident Cases" which is changed to the "Plan for Emergency Handling of *Radiological* Accident Cases." In addition, on page 3-4, section 3.4.4 is updated to correct an incorrect word in line 2 so that "of" the environs now reads "to" the environs. Also on page 3-4, section 3.4.5 is updated as the section title changes from "State of Florida Office of Radiation Control" to the "State of Florida Bureau of Radiation Control" and the first line of the section 3.4.5 text is updated to reflect the name change from the "State of Florida Department of Health and Rehabilitative Services Office of Radiation Control" to the "State of Florida Department of Health, Bureau of Radiation Control." On page 3-5, section 3.5 is updated near the end of the first paragraph to reflect the name change from the "State of Florida Department of Health and Rehabilitative Services Office of Radiation Control" to the "State of Florida Department of Health, Bureau of Radiation Control." On page 3-8, section 3.9 is updated to reflect the name change from the "State of Florida Department of Health and Rehabilitative Services Office of Radiation Control" to the "State of Florida Department of Health, Bureau of Radiation Control."

Third, on page 7-1, section 7.1.1, paragraph 4 is updated to reflect the name change from the "Department of Health and Rehabilitative Services" to the "Department of Health."

Fourth, there are changes to three pages in Chapter 8, one to account for a name change and two to correct typographical errors. On page 8-1, section 8.2, paragraph 2 is updated to reflect the name change from "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering." On page 8-4, section 8.3, paragraph 1 is changed to correct a typographical error in two references to the "Plan for Emergency Handling of Radiation Accident Cases" which are changed to the "Plan for Emergency Handling of *Radiological* Accident Cases." Similarly, on page 8-5, section 8.3.4 is also changed to correct the typographical error in the reference to the "Plan for Emergency Handling of Radiation Accident Cases" which is changed to the "Plan for Emergency Handling of *Radiological* Accident Cases." Also on page 8-5, section 8.4, paragraph 1, the area code for the telephone in the Emergency Support Center is noted to be changed to reflect the new Gainesville area code so the number becomes "*352*-392-1428" versus "904-392-1428."

Fifth, Appendix I of the UFTR Emergency Plan is updated by removing the version dated 12/94 and adding the latest updated version of the Shands Hospital "Plan for Emergency Handling of Radiological Accident Cases" dated 12/95. The Appendix I cover sheet is also updated to reflect the typeface used for other changes.

Sixth, Appendix II of the UFTR Emergency Plan is updated by removing older versions of agreement letters for the Alachua County Office of Emergency Management and Shands Teaching Hospital and Clinics Inc. and replacing them with current letters dated December 10, 1996 for the Office of Emergency Management and March 20, 1997 for Shands.

Finally, the Table of Contents is updated on page ii to reflect the name change in section 3.4.5 from the "State of Florida Office of Radiation Control" to the "State of Florida Bureau of Radiation Control" and on page iv to add back Appendix II - Agreement Letters, removed inadvertently with Revision 9.

Several changes were also made in SOP-B.1 (Radiological Emergency) primarily as a result of the recent name changes. However, the Emergency Procedures are no longer contained in the Emergency Plan document but are maintained separately, so these changes were not submitted for approval since they are not part of Revision 10 of the Emergency Plan.

As indicated, all these Revision 10 changes were reviewed by UFTR management and by the Reactor Safety Review Subcommittee to assure they do not decrease the effectiveness of the UFTR Emergency Plan. In general, these changes make the Plan better suited to assuring a proper response to emergencies at the University of Florida Training Reactor.

In a letter dated August 22, 1997 and received on August 28, 1997, NRC Senior Project Manager of the Non-Power Reactors and Decommissioning Project Directorate, Division of Reactor Program Management, Office of Nuclear Reactor Regulation, acknowledged receipt of Revision 10 to the University of Florida Training Reactor Emergency Plan. Based on our determination that the changes do not decrease the effectiveness of our Emergency Plan, and that it continues to meet the requirements of Appendix E to Part 50, the letter indicated NRC approval is not required. The letter also notes their initial review of these changes indicates them to be in

accordance with 10 CFR 50.54(q). However, implementation of these changes will be subject to inspection to confirm that they did not decrease the effectiveness of our Emergency Plan. The submission to the NRC including the cover letter summarizing Revision 10 plus the changes themselves are included in Appendix E except that only the first page of the Shands "Plan for Emergency Handling of Radiological Accident Cases" is included in the interest of space. In addition, the attachments are deleted from the agreement letter from Alachua County Emergency Management. Both are available at the UFTR facility for those interested. A copy of the Project Manager's acknowledgment letter is also included in Appendix E. At year's end, efforts were under way to incorporate Revision 10 into copies of the Emergency Plan and to supply the revision to all holders of the Plan.

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 reporting year's end, no further revisions are planned.

F. Revisions to UFTR Physical Security Plan

In the 1994-95 reporting year, as a result of a Safeguards and Material Control and Accountability Inspection conducted by NRC inspectors on May 18-19, 1995, several recommendations were made including submitting a Security Plan change concerning material allowed on site. They also reviewed a security plan procedure change identified by UFTR review and outlined the proper submission procedure. No violations were identified. With a letter dated July 18, 1995, Physical Security Plan Revision 12 was submitted to NRC as promised to the NRC inspectors. As indicated to the inspection team, this revision involved one change to the plan concerning allowable quantities and locations for special nuclear material on site as well as one correction of a section number in SOP-F.2. In addition, one further minor change was submitted to update SOP-F.2. Since these changes involved no reduction in the effectiveness of the Security Plan, they were submitted per 10 CFR 50.54(p) to keep the Plan updated. The NRC requested and additional information was submitted by letter dated October 27, 1995 and the revision was finally approved by letter dated November 2, 1995. This revision is withheld from public disclosure.

As a result of the annual RSRS audit and a review for training, Physical Security Plan Revision 13 was submitted to NRC per 10 CFR 50.54(p) with a letter dated June 6, 1996 to update various sections of the Security Plan to correct typographical errors, name changes, errors in the text and a number of inconsistencies in the Security Plan, all of which were considered minor in nature. Subsequently, this revision was approved by letter from NRC dated June 19, 1996. This revision is also withheld from public disclosure.

As a result of conducting the Biennial Evaluation of the UFTR Standard Operating Procedures (B-4 Surveillance) completed near the end of the reporting year,Temporary Change Notices were generated and approved for six security response procedures per Table VI-3. The procedures are withheld from public disclosure and are part of the UFTR Physical Security Plan. Changes involved primarily updating the procedures for the name change to the Nuclear and Radiological Engineering Department and movement of all UFTR inspection and reporting requirements from NRC Region II to NRC Headquarters. As a result, Revision 14 of the UFTR

Physical Security Plan was under development at the end of the reporting year for submission in the next reporting year.

G. Biennial Reactor Operator Requalification and Recertification Program

The existing operator requalification and recertification program training cycle for the UFTR was scheduled to end in June 1997. Therefore, renewal of the program for the July 1, 1997 through June 30, 1999 period with minor changes and new dates was undertaken by submission to the NRC of the new two-year program cycle with a letter dated May 29, 1997. Since the entire program had been rewritten and approved by NRC in the 1991-92 reporting year, as contained in Appendix H of the 1991-92 annual report, this renewed training program was not expected to require significant review and approvals. In effect, the revised plan was essentially the same as that currently being used for the two-year training cycle with only the name of the Department of Nuclear Engineering Sciences changed to Department of Nuclear and Radiological Engineering in paragraph 3 on page 1 to reflect a change made in late 1996, and the two training sessions on annual reports being moved from November to the following February in each year in the Schedules in Appendix A of the Plan to account for a change in UFTR Tech Specs delaying required submittal of UFTR annual reports. Subsequently, in a letter from the NRC Project Manager dated July 9, 1997 and received on July 14, 1997, the NRC indicated that the revisions do not alter the intent of the approved Plan and therefore are acceptable. A copy of the renewal letter, the revised plan and the NRC letter approving the revised Plan are contained in Appendix F of this report.

H. UFTR ALARA Program

As the part of the process of implementing the requirements of the new 10 CFR Part 20, a UFTR ALARA Program was generated. This ALARA Program was developed to be consistent with the University of Florida ALARA Program as well and was implemented along with the new 10 CFR Part 20 in January 1994 of this reporting year. A copy of the original UFTR ALARA Program was in Appendix D of the 1993-94 annual report and was not changed during this reporting year.

I. UFTR Respiratory Protection Program

NRC Inspection Report No. 50-83/94-01 dated April 6, 1994 contained a Severity Level IV Notice of Violation for the failure to have issued a written policy statement on respirator usage and for not having advised users that they could leave an area at any time for relief. Also, the potential respirator users had not been fit tested for the types of respiratory protection equipment at the facility. During May 1994 much work was performed on developing the required respiratory protection program. The facility reply to the Notice of Violation was submitted to NRC as a letter dated May 6, 1994. It indicated that a written statement to all potential respirator users informing them that they may leave the area at any time for relief was issued on May 2, 1994 and that the written policy statement concerning respirator usage was under development with full compliance including documented review and approval of the policy committed to be achieved by August 31, 1994. In a letter dated May 25, 1994 and received on May 31, 1994, the

NRC indicated that they had evaluated the UFTR response and found it met the requirements of 10 CFR 20.201 (should be 20.2001).

A draft Respiratory Protection Program was completed and submitted to the RSRS on August 25, 1994. The NRC (Craig Bassett) was informed that the Program would not be approved by the August 31, 1994 commitment date and indicated that such should be officially transmitted to NRC. Subsequently, via letter dated August 31, 1994, the delay in the UFTR commitment was transmitted to the NRC with a new commitment to have the UFTR Respiratory Protection Program approved at the next RSRS meeting scheduled for September 29, 1994 and full compliance including documented review and approval of the policy achieved by September 30, 1994. The initial revised version of the Respiratory Protection Program with a Policy Statement was finally reviewed and approved by the RSRS at its meeting on September 29, 1994 and implemented on September 30, 1994. A revised UFTR Respiratory Protection Program (Revision 1) amending the required frequency of medical examinations was implemented on March 16, 1995. The original (Revision 0) Program Document as well as the Revision 1 version of the UFTR Respiratory Protection Program are contained in Appendix E of the 1994-95 annual report. The Severity Level IV Notice of Violation for failure to comply with all portions of the Respiratory Protection Program was finally closed out during the NRC Inspection conducted on May 22, 1996 per page 7 of NRC Inspection Report No. 50-83/96-01.

J. HEU to LEU Fuel Conversion Documents

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. During subsequent reporting years, new proposals updating the UFTR conversion schedule and work status per 10 CFR 50.64(b)(2) requirements were submitted to NRC each March to meet the annual March 27 deadline.

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

The required visual inspection and identification of SPERT fuel pins was completed on September 19, 1988. As committed, a sufficient number of SPERT fuel pins was radiographed to provide an LEU core and replacement pins for the UFTR by March 31, 1989, when the SPERT usage license was to expire. As for the SNM-1050 license, a significant effort was involved as the renewal license application for renewal under "storage only" conditions was submitted with

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

A proposal for support to provide 1200 SPERT fuel pins for transfer for shipment to Oak Ridge National Laboratory was submitted to Martin Marietta Energy Systems, Inc. in January 1990 in response to Request for Proposal CO378-19 dated December 12, 1989. This proposal was submitted to Martin Marietta Energy Systems in January and accepted. Loading of the drums was completed per approved UFSA SOP-U.4 on May 16, 1990 and 1200 pins in 19 DOT type 6M drums plus one (1) empty drum were transferred to Mr. Leon Fair of Martin-Marietta Systems Inc. for shipment by truck to a secure DOE facility at Oak Ridge National Laboratory on May 17, 1990. Revision 3 of the Physical Security Plan (PSP) for the SNM-1050 License was then transmitted to the NRC with a letter dated June 7, 1990 to update the Special Nuclear Material on site following the May 17 transfer of 1200 pins to Martin-Marietta's control. Approval of Revision 3 to the University of Florida SPERT Assembly Physical Security Plan occurred with a letter dated June 20, 1990 and received on June 26, 1990.

An application to amend the storage-only SNM-1050 license to allow storage of the fuel in the North Quonset Hut (Room 6) versus Room 5 of the Nuclear Research Field Building was submitted to NRC with a letter dated June 6, 1990. This SNM-1050 license amendment making the smaller Room 6 an allowed storage location was approved per a letter and license amendment dated June 14, 1990. All of the remaining 4200 SPERT fuel pins not previously shipped were then moved to Room 6 on July 30. Revision 4 of the SNM-1050 Physical Security Plan was submitted to NRC with a letter dated September 13, 1990 while the response to several security allegations was submitted as a letter also dated September 13, 1990. The next security inspection was conducted on October 25, 1990 by NRC Security Inspector Orysia Masnyk, to investigate security violation allegations associated with the SNM-1050 license as well as to consider final approval of Revision 4 to the Physical Security Plan for the SNM-1050 license. In NRC Inspection Report No. 50-83/90-02 dated November 23, 1990, NRC Region II did close out the allegation and accept implementation of Revision 4 of the UFSA Security Plan.

Throughout the 1988-89 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 1989-90 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, 1989 and 1990 deadlines per 10 CFR 50.64(b)(2) showed a further lengthening of the schedule.

An updated proposal was submitted to NRC with a letter dated March 26, 1991 explaining that a student thesis project had resulted in good progress in assuring neutronics methodology is adequate and the modeling 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 alch via a letter dated April 25, 1991 with a copy supplied to Keith Brown. The extension agreed to be until April 30, 1992 with notification of the extension not received until fall 19 making some plans and efforts difficult to implement. The updated proposed schedule submitted as required by March 27, 1991 per 10 CFR 50.64(b)(2) therefore showed a further schedule slippage.

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 and continued his work until May 23, 1991. After the number of fuel plates per bundle was set at 14 from the neutronics analysis, thermal hydraulics analyses were begun late in the 1990-91 reporting year. During the 1991-92 reporting year, a graduate assistant continued working on the thermal hydraulics area on the 14 plate fuel bundle arrangement selected for the conversion with good progress made to nearly complete this work during that reporting year. Work on the NRC submission package was also begun with limited progress made. During the 1992-93 reporting year and again in the 1993-94, 1994-95 and 1995-96 reporting years, the delay of official grant extension and unavailability of personnel made financial support of this effort more difficult. The same was true in this latest reporting year, so the latest updated proposal schedule submitted as required on March 27, 1997 per 10 CFR 50.64(b)(2) as Revision 11 therefore shows a further schedule slippage as depicted in Table VI-5. This further delay is because the basic thermal-hydraulics analysis proceeded more slowly than expected and because of DOE questions about fuel and core design arrangements that are requiring staff time to answer in preparation for approving the final fuel bundle design.

K. Quality Assurance Program Approval for Radioactive Material Package

During the 1987-88 reporting year, plans were made to ship ~1200 SPERT fuel pins held under the SNM-1050 license to Oak Ridge National Laboratory (ORNL). Since ORNL wanted the University of Florida to be the shipper of record, an approved Quality Assurance Program was needed with the University to be responsible to see that the shipment would meet all 10 CFR 71 requirements. ORNL was planning to have these pins shipped in 6M Type drums on which they would have performed the necessary criticality calculations. The initial request for QA Program approval to ship SPERT F-1 LEU fuel pins was submitted to NRC with a letter dated September 2, 1987. 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.

These 1200 fuel pins were finally transferred to the Oak Ridge National Laboratory on May 17, 1990 under the existing QA Program approval. Efforts are underway to transfer the remainder of the pins but no specific acceptance has ever been received from DOE. Indeed, several inquiries were made by ORNL seeking to ship the 1200 fuel pins back to the University of Florida. Since there was no longer any room to store them in the smaller storage room, this return was categorically disallowed and documented in a letter to Don Ingersoll at ORNL dated October 13, 1992. Even if some or all of the remaining pins are not wanted by ORNL, the QA Program approval will also allow transfer shipment of the SPERT fuel to other secure facilities such as the low power training reactor at RPI. Therefore, it had been hoped that all of these pins could be transferred during this most recent year since they are no longer being considered for the HEU-to-LEU fuel conversion of the UFTR and since the QA Program Approval was to expire on October 31, 1992. However, because DOE has been unable to locate space at a storage facility and because RPI will not accept the fuel unless DOE funds a larger storage facility for them and pays for the fuel shipment, UFTR management is no longer hopeful of near-term shipment of these pins. Therefore, an amended program dated September 30, 1992 was submitted to NRC on September 30, 1992. Quality Assurance Program approval for Radioactive Material Packages No. 0578, Revision 2, dated October 20, 1992 was received on October 26, 1992 and has an expiration date of October 31, 1997. It is contained in Appendix D of the 1994-95 annual report for ease of reference. Nevertheless, the presence of the remaining 4200 SPERT fuel pins in the more confining North Quonset Hut (Room 6) of the Nuclear Research Field Building promises to make the transfer more difficult, time consuming and costly whenever it occurs.

The SNM-1050 license was due to expire on June 30, 1994. However, with a letter dated May 31, 1994, the SNM-1050 License Renewal Application for storage only was submitted on June 4, 1994 under Docket No. 70-1068 to assure extension of the license until the NRC NMSS office could decide on the storage only renewal package in the upcoming year. In various discussions with NRC, NMSS representatives, one of whom visited the facility to clarify geometry and subcriticality considerations, it was decided to cite two unlikely events based on geometry and moderator exclusion in modifying the relicensing submittal. The revised paragraph on Page 4-1 referencing both geometry control and moderator exclusion to prevent inadvertent criticality was finally submitted by fax and letter dated May 12, 1995. NRC NMSS called several more times to say they would extend the exemption on the criticality alarm except when moving fuel and to clarify license renewal to say both Room 6 and Room 5 would be allowed by the license renewal for storage. They verified there is no sprinkler in Room 6. They also verified concern of no sprinkler in Room 5 for fire suppression; that is, they do not want a sprinkler available. Double contingency requires geometry control and moderator (H_2O!) exclusion. They indicated that we could submit a change deleting Room 5 as allowable or they could disallow Room 5 as a license condition. It was agreed that such a license condition is acceptable, so the license renewal was finally received on June 12, 1995 with a letter dated June 8, 1995. The renewal was effective on June 8, 1995 through June 30, 2000. The cover letter and license renewal are contained in Appendix F of the 1994-95 annual report.

TABLE VI-1

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(as of August 31, 1996)

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 15, 8/95)
A.2 Reactor Startup (REV 12, 5/87)
A.3 Reactor Operation at Power (REV 12, 11/94)
A.4 Reactor Shutdown (REV 11, 10/89)
A.5 Experiments (REV 4, 12/88)
A.6 Operation of Secondary Cooling Water (REV 3, 5/95)
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 5, 1/95)
B.2 Fire (REV 9, 1/95)
B.3 Threat to the Reactor Facility (Superseded by F-Series Procedures)
B.4 Flood (REV 1, 4/83)

C. FUEL HANDLING PROCEDURES

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

TABLE VI-1 (CONTINUED)

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(as of August 31, 199)

D. RADIATION CONTROL PROCEDURES

D.1 UFTR Radiation Protection and Control (REV 5, 12/93)
D.2 Radiation Work Permit (REV 10, 3/87)
D.3 Primary Equipment Pit Entry (REV 3, 5/95)
D.4 Removing Irradiated Samples From UFTR Experimental Ports (REV 6, 5/95)
D.5 UFTR Reactor Waste Shipments: Preparations and Transfer (REV 1, 4/92)
D.6 Control of UFTR Radioactive Material Transfers (REV 0, 12/88)

E. MAINTENANCE PROCEDURES

E.1 Changing Primary Purification Demineralizer Resins (REV 4, 8/95)
E.2 Alterations to Reactor Shielding and Graphite Configuration (REV 3, 5/87)
E.3 Shield Tank and Shield Tank Recirculation System Maintenance (REV 2, 4/83)
E.4 UFTR Nuclear Instrumentation Calibration Check (REV 1, 4/90)
E.5 Superseded
E.6 Argon-41 Concentration Measurement (REV 1, 9/93)
E.7 Measurement of Temperature Coefficient of Reactivity (REV 0, 5/85)
E.8 Verification of UFTR Negative Void Coefficient of Reactivity (REV 0, 12/85)

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

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

TABLE VI-2

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(as of August 31, 1997)

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 16, 2/97)
- A.2 Reactor Startup (REV 12, 5/87)
- A.3 Reactor Operation at Power (REV 12, 11/94)
- A.4 Reactor Shutdown (REV 11, 10/89)
- A.5 Experiments (REV 4, 12/88)
- A.6 Operation of Secondary Cooling Water (REV 3, 5/95)
- 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 5, 1/95)
- B.2 Fire (REV 9, 1/95)
- B.3 Threat to the Reactor Facility (Superseded by F-Series Procedures)
- B.4 Flood (REV 2, 8/97)

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 4, 8/97)
- C.4 Assembly and Disassembly of Irradiated Fuel Elements (REV 0, 9/84)

TABLE VI-2 (CONTINUED)

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(as of August 31, 1997)

D. RADIATION CONTROL PROCEDURES

D.1 UFTR Radiation Protection and Control (REV 5, 12/93)
D.2 Radiation Work Permit (REV 10, 3/87)
D.3 Primary Equipment Pit Entry (REV 3, 5/95)
D.4 Removing Irradiated Samples From UFTR Experimental Ports (REV 6, 5/95)
D.5 UFTR Reactor Waste Shipments: Preparations and Transfer (REV 1, 4/92)
D.6 Control of UFTR Radioactive Material Transfers (REV 0, 12/88)

E. MAINTENANCE PROCEDURES

E.1 Changing Primary Purification Demineralizer Resins (REV 4, 8/95)
E.2 Alterations to Reactor Shielding and Graphite Configuration (REV 3, 5/87)
E.3 Shield Tank and Shield Tank Recirculation System Maintenance (REV 2, 4/83)
E.4 UFTR Nuclear Instrumentation Calibration Check (REV 1, 4/90)
E.5 Superseded
E.6 Argon-41 Concentration Measurement (REV 1, 9/93)
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 (TCNs) ISSUED FOR 1996-97 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
0.1	3/97	4, 5, 11	Expands Form SOP-0.1A "Coversheet/ Change Request Form" and its directions for completion to add a step in Part A to provide for documentation of walk-throughs of proposed procedure changes if needed to ensure accuracy of any procedure changes as has been understood in the past and formalized by this change; also corrects mistyped reference to Form SOP-0.1B, "Distribution Request Form."
	6/97	7, 5, 16	Updates procedure to retitle Section 7.4 for the Periodic Evaluation of Procedures (B-4 Surveillance) and incorporates evaluation of procedures into requirements of this procedure; also deletes gender references and updates Form SOP-0.1C "Review Standard" to include Tech Spec Amendment 21 and Form SOP-0.1D to reflect changes in titles or individuals designated to hold procedure manuals.
0.5	12/96	Q-6 (pp 1-5)	Updates the surveillance data sheets for the Quarterly Check of Posting Requirements (Q-6 Surveillance).
	1/97	Q-2	Updates procedural instructions on the surveillance data sheet for the Area and Stack Monitor Calibration Check (Q-2 Surveillance) to reference Radiation Control Technique #37 to eliminate conflicting and potentially confusing directions to assure proper calibration checks of the stack radiation monitoring system.

TABLE VI-3 (CONTINUED)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES (TCNs) ISSUED
FOR 1996-97 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
	1/97	B-6 (pp 1-2)	Updates and corrects the two pages of the surveillance data sheets for the Biennial Evaluation of the Emergency Plan (B-6 Surveillance) to facilitate the surveillance and references to sections of the Emergency Plan.
	6/97	29, A-1	Updates the procedure for the Biennial Evaluation of UFTR Standard Operating Procedures (B-4 Surveillance) to assure the list of surveillance data sheets not controlled by a separate procedure on Page 29 is current; updates the Instrument and Test Equipment (A-1 Surveillance) data sheet to include two possible contacts for sending meters out to be calibrated as well as noting that a thermometer should also be sent.
0.7	5/97	2, 5	Updates the procedure to correct the NRC Region II contact address and telephone numbers per a letter from NRC dated March 25, 1997 documenting the move of the Region II office in Atlanta.
A.2	1/97	12	Updates the procedure in Section 7.1.7 to clarify operation of the adjustable stack monitor alarm so the proper setting is somewhat above the expected steady-state count rate to serve as a warning; also corrects reference to UFTR Form SOP-B.1A, "Emergency Procedure Qualification" and several other typographical errors.

TABLE VI-3 (CONTINUED)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES (TCNs) ISSUED
FOR 1996-97 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
	2/97	8, 10	Updates the procedure in the note before Section 7.8 to reference the source alarm occurring at 100 watts versus previously noted 10 watts and in Section 7.15 to say the source should be removed below 10 watts with the source alarm at 100 watts; also corrects typographical errors.
	8/97	7	Updates procedure in Section 7.6 to formally incorporate a check that is already being performed to assure the temperature recorder is operating; also rewords the checks to assure the scram lights are out and magnet power is on into complete sentences.
A.3	2/97	2	Updates procedure to reference source removal in Section 4.1 before raising power to 100 watts. In Section 4.6.1, the reference to equilibrium stack count rates for 10 kW and 100 kW are updated to typical ranges based on the latest calibrations versus the previously quoted value of approximately 2000 cps.
A.5	8/97	12	Updates Paragraph 7.4.4.2 to clarify existing acceptable personnel requirements for sample removal to indicate that a radiation control qualified individual must be present for sample removal from all ports except the rabbit system where a certified rabbit system operator is acceptable.

TABLE VI-3 (CONTINUED)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES (TCNs) ISSUED
FOR 1996-97 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
B.1	1/97	3, 7, 8, 12	Updates procedure to add the Florida Bureau of Radiation Control to notifications of emergency drills and occurrences and also the Call List in Appendix I; also updates references to the Department of Health and Rehabilitative Services to be the Department of Health.
	8/97	2, 3, 5, 6	Updates procedure to expand the purpose in Section 3.1 to note the procedure addresses evacuation from the entire reactor building, not just the reactor cell; to note in Section 4.9 that four not three notifications may be made prior to drills; to expand the designation in Section 7.1.1.1.5 of those qualified to evacuate to the ESC as they see fit to include not only licensed operators but also rad con qualified personnel and to allow other personnel to accompany such evacuees to facilitate emergency response; to reformat the main paragraph in Section 7.1.1.6 to match the remainder of the procedure.
B.2	8/97	3, 6, 8	Updates the procedure in Section 3.4.3 to correct an error in location of self-contained breathing apparatus which are in the auxiliary support center, to clarify in Section 7.2.1.2.2 that an attempt should be made to restore reactor cell ventilation after extinguishing a control room fire only if there is no radiological involvement, to replace "firemen" in Section 7.2.4.6.2 with "responding hazardous materials/fire fighting personnel."

TABLE VI-3 (CONTINUED)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES (TCNs) ISSUED
FOR 1996-97 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
C.1	8/97	7, 8	Updates procedure to delineate better when a reactor operator is needed at the console for various activities leading up to fuel removal from the reactor core such as bringing up the reactor water.
C.2	8/97	7	Updates procedure in Paragraph 7.4.2 to correct the word "fuel" in the phrase "partially fuel UFTR core" to read "partially fueled UFTR core."
D.1	8/97	2, 10, 11	Updates procedure to correct references to the Florida Department of Health and Rehabilitative Services to be the Florida Department of Health, Bureau of Radiation Control; also updates references to the University of Florida Radiation Control Guide per state reorganizations and per a newly issued Guide.
D.2	8/97	4	Updates procedure to delete reference in Section 4.4.3 to Radiation Control Form RC-2 (Application for Radioisotope Procurement) which is no longer used for materials irradiated in the reactor since Form SOP-A.5A (Request for UFTR Operation) must be used.
D.4	8/97	5	Updates procedure in Section 7.5 to correct the reference to UFTR Form SOP-D.4B which was missing the word "Form."

TABLE VI-3 (CONTINUED)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES (TCNs) ISSUED
FOR 1996-97 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
D.5	8/97	6, 10, 11, 13, 14	Updates the procedure to correct several references to the State of Florida Department of Health and Rehabilitati. Services to be the Department of Hea ı, Bureau of Radiation Control per state agency reorganization; also corrects telephone number area codes in Sections 7.1.3 and 7.6.1.
E.4	3/97	8, 9, 11, 12. 8, 24, 15	Updates the procedure to incorporate an additional safety factor to provide an administrative margin to ensure there is no apparent operation at steady-state power levels above the safety limit at 100 kW per concerns raised about readings on the safety channels potentially indicating above the safety limit; also corrects several typographical errors.
	6/97	13	Updates the procedure per RSRS auditor recommendation to correct the caution box saying two operators should be present to perform Step 7.3.4.3 to saying only licensed operators or properly trained personnel may perform the adjustments in Step 7.3.4.3. The caution is corrected to say the individual may not be the operator of record which has always been understood to be the case, so two operators are not necessary to perform the step.

TABLE VI-3 (CONTINUED)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES (TCNs) ISSUED
FOR 1996-97 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
F.1	8/97	13	Updates procedure per Nuclear and Radiological Engineering Department name change and movement of all UFTR inspections and reporting requirements from Region II to headquarters (withheld from public disclosure).
F.2	8/97	2, 5	Updates procedure per Nuclear and Radiological Engineering Department name change and movement of all UFTR inspections and reporting requirements from Region II to headquarters (withheld from public disclosure).
F.3	8/97	2, 4, 5	Updates procedure per Nuclear and Radiological Engineering Department name change and movement of all UFTR inspections and reporting requirements from Region II to headquarters (withheld from public disclosure).
F.4	8/97	3	Updates procedure per Nuclear and Radiological Engineering Department name change and movement of all UFTR inspections and reporting requirements from Region II to headquarters (withheld from public disclosure).
F.5	8/97	4	Updates procedure per Nuclear and Radiological Engineering Department name change and movement of all UFTR inspections and reporting requirements from Region II to headquarters (withheld from public disclosure).

TABLE VI-3 (CONTINUED)

TABULATION OF UFTR STANDARD OPERATING PROCEDURES
TEMPORARY CHANGE NOTICES (TCNs) ISSUED
FOR 1996-97 REPORTING YEAR

SOP	TCN Date	Affected Pages	Summary Description of Change
F.6	8/97	3	Updates procedure per Nuclear and Radiological Engineering Department name change and movement of all UFTR inspections and reporting requirements from Region II to headquarters (withheld from public disclosure).

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 11)

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)	. . . . .	October 1997
III.	Date of NRC Order to Convert	. . . . .	January 1998
A.	Date of Completion of All Plans to Convert	. . . . .	September 1998
B.	Date of Receipt of LEU Fuel	. . . . .	November 1998
C.	Date of Completion of Any Final Tests with HEU Fuel	. . . . .	February 1999
D.	Date of Removal of HEU Fuel	. . . . .	April 1999
E.	Date of Shipment of HEU Fuel	. . . . .	July 1999
F.	Date of Loading of LEU Fuel	. . . . .	September 1999
G.	Date of Completion of Determination of Initial Operational Parameters with LEU (Startup and Power Operations Testing)	. . . . .	December 1999
H.	Date of Submittal of Report to NRC/DOE Summarizing New Operational Characteristics and Comparing with Predictions of Safety Analysis	. . . . .	February 2000

3/97

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. 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 is 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 Measurements."

TABLE VII-1

UFTR GASEOUS RELEASE SUMMARY

Month	Release	Monthly Average Concentration
September 1996	2.6648×10^{6} μCi/Month	0.7224×10^{-9} μCi/ml
October 1996	0.0000×10^{6} μCi/Month	0.0000×10^{-9} μCi/ml
November 1996	3.0129×10^{6} μCi/Month	0.8138×10^{-9} μCi/ml
December 1996	9.9312×10^{6} μCi/Month	2.6923×10^{-9} μCi/ml
January 1997	7.8372×10^{6} μCi/Month	2.2772×10^{-9} μCi/ml
February 1997	6.0975×10^{6} μCi/Month	1.7717×10^{-9} μCi/ml
March 1997	15.5764×10^{6} μCi/Month	4.5259×10^{-9} μCi/ml
April 1997	7.4642×10^{6} μCi/Month	2.1688×10^{-9} μCi/ml
May 1997	3.9996×10^{6} μCi/Month	1.1621×10^{-9} μCi/ml
June 1997	3.3209×10^{6} μCi/Month	0.9649×10^{-9} μCi/ml
July 1997	6.4674×10^{6} μCi/Month	1.9593×10^{-9} μCi/ml
August 1997	0.0477×10^{6} μCi/Month	0.0144×10^{-9} μCi/ml

TOTAL ARGON-41 Releases for the Reporting Year: 66.4198 Ci

YEARLY AVERAGE ARGON-41 Release Concentration: 1.5897×10^{-9} μCi/ml

UFTR Technical Specifications require average Argon-41 release concentration averaged over a month to be less than 1.0×10^{-8} μCi/ml. All such monthly values are well below this limiting release concentration with an average monthly release concentration of 1.590×10^{-9} μCi/ml. Even with the newest 10 CFR Part 20 values reducing the Argon-41 release concentration limit to 1.0×10^{-8} μCi/ml in January, 1994, there has been no problem expected as the highest monthly value listed in Table VII-1 is less than 46% of the allowable limit and the second highest is less than 27% of the allowable limit.

Total releases and average monthly concentrations are based upon periodic Argon-41 release concentration measurements made at equilibrium full power (100 kW) conditions. The results for these experimental measurements used in calculating the gaseous Argon-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 TABLE

Month(s)	Releases per Unit Energy Generation	Instantaneous Argon-41 Concentration at Full Power[1]
Sep. 1996 - Dec. 1996	3930.03 μCi/kW-hr	7.761×10^{-8} μCi/ml
Jan. 1997 - June 1997	4064.93 μCi/kW-hr	8.504×10^{-8} μCi/ml
July 1997 - Aug. 1997	3200.95 μCi/kW-hr	6.982×10^{-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

The effluent discharged into the holding tanks comes from 20 laboratories within the Nuclear Sciences Center as well as the UFTR complex. The UFTR normally releases about one (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 1.12×10^{-7} μCi/ml (β-γ) and 1.85×10^{-8} μCi/ml (α) for this 1996-1997 reporting period. In addition to these weekly samples, on May 20, 1997 the rupture disk was broken and 35 gallons of primary coolant was drained to the equipment pit. The 35 gallons were subsequently discharged to the holdup tanks during cleanup. The activity for this discharge was 2.27×10^{-7} μCi/ml (β-γ) and 1.96×10^{-8} μCi/ml (α.)

There were no discharges from the holdup tanks during this reporting period. One release of 83,650 liters was made on July 13, 1995, over two years ago.

C. Solid Waste Shipped Off-site

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 of 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 seven reporting years and again this reporting year to remove all of 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 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 two years. The new Standard Operating Procedure UFTR SOP-D.5, "UFTR Reactor Waste Shipments: Preparations and Transfer" originally generated in the 1986-1987 reporting year and revised in April, 1992 will be used to assure proper control of the waste shipment as will guidance provided in several NRC Information Notices published in the last several years.

D. Environmental Monitoring

The UFTR maintains continuous thermoluminescent dosimeter monitoring in areas adjacent to and in the vicinity of the UFTR complex. The TLD cumulative totals for this reporting year from September, 1996 to August, 1997 are summarized in Table VII-3A. As can be noted, the values for the 12 months of the reporting period are either minimal or low in all cases. Overall, the values in Tables VII-3A and VII-3B show minimal environmental radiation dose from UFTR operations. The recorded TLD exposures are essentially background to within the accuracy of the monitoring instruments.

The accumulation of exposure recorded by month of exposure on the TLDs is presented in Table VII-3B. The values recorded in Tables VII-3A and VII-3B are considered to support the conclusion of minimal environmental exposures from UFTR operations, especially since the three months (November, 1996, January and April, 1997) with non-minimal exposures represent the ninth, fourth and fifth highest monthly total UFTR energy generation, respectively. Based on these and previous non-correlations, the occasional exposures registered above minimal are clearly not correlated to UFTR energy generation.

TABLE VII-3A

CUMULATIVE RESULTS OF ENVIRONMENTAL MONITORING SEPTEMBER 1, 1996 TO AUGUST 31, 1997

TLD Designation	Total Exposure (mrem)[1]	Month(s) of Exposure
1	30	11/96, 1/97
2	50	11/96, 1/97, 4/97
3	20	11/96, 4/97
4	10	1/97
5	20	11/96, 1/97
6	10	1/97
7	10	1/97
8	10	1/97
9	M	--
10	20	1/97, 4/97
11	M	--
12	40	11/96, 1/97

[1]M denotes minimal (< 10 mrem) exposure.

TABLE VII-3B

THERMOLUMINESCENT DOSIMETER EXPOSURE RECORD BY MONTH OF EXPOSURE[1]

TLD Number	Sep 96 (mrem)	Oct 96 (mrem)	Nov 96 (mrem)	Dec 96 (mrem)	Jan 97 (mrem)	Feb 97 (mrem)	Mar 97 (mrem)	Apr 97 (mrem)	May 97 (mrem)	Jun 97 (mrem)	Jul 97 (mrem)	Aug 97 (mrem)
1	M	M	20	M	10	M	M	M	M	M	M	M
2	M	M	20	M	20	M	M	10	M	M	M	M
3	M	M	10	M	M	M	M	10	M	M	M	M
4	M	M	M	M	10	M	M	M	M	M	M	M
5	M	M	10	M	10	M	M	M	M	M	M	M
6	M	M	M	M	10	M	M	M	M	M	M	M
7	M	M	M	M	10	M	M	M	M	M	M	M
8	M	M	M	M	10	M	M	M	M	M	M	M
9	M	M	M	M	M	M	M	M	M	M	M	M
10	M	M	M	M	10	M	M	10	M	M	M	M
11	M	M	M	M	M	M	M	M	M	M	M	M
12	M	M	30	M	10	M	M	M	M	M	M	M

[1]M denotes minimal (< 10 mrem) exposure.

E. Personal Radiation Exposure

Maintenance and experimental work requiring significant exposure commitment was minimized as much as possible during the 1996-1997 reporting year as in the 1987-1996 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 this section. In this reporting year, there was no in-core control blade inspection as was performed in December, 1996, nor was there a biennial fuel inspection as there was in August, 1996. As a result UFTR-associated personnel exposures for this 1996-1997 reporting year are among the lowest ever.

Table VII-4 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 personnel on an annual basis with no further breakdown because all exposures are well below 100 mrem for the year.

TABLE VII-4

ANNUAL UFTR PERSONNEL EXPOSURE

Name	Position	Permanent Film Badge Exposure (mrem)[1]
D. Cronin	Senior Reactor Operator	10
J. Wolf	Senior Reactor Operator	< 10
J. Powers	Senior Reactor Operator	< 10
W. Vernetson	Senior Reactor Operator	< 10

[1]The exposure recorded here is for deep/whole-body dose.

Table VII-5 lists the permanent whole-body badge exposures recorded above background for the reporting year for non-permanent personnel employed at the UFTR. These exposures are summarized for all badged non-permanent UFTR personnel on an annual basis with no further breakdown because all exposures are well below 100 mrem for the year.

TABLE VII-5

ANNUAL NON-PERMANENT UFTR PERSONNEL EXPOSURE[1]

Name	Position	Permanent Film Badge Exposure (mrem)[2]
T. Uhlmer	NAA Lab/Radiation Control Technician	M
R. Pitzer	NAA Lab/Reactor Facility Technician	M
A. Harrison	NAA Lab/Reactor Facility Technician	M
R. Widargo	NAA Lab/Reactor Facility Technician	M
A. Knight	NAA Lab/Reactor Facility Technician	M

[1]M denotes minimal (< 10 mrem) exposure.
[2]The exposure recorded here is for deep/whole-body dose.

Whole-body badge exposures for the University of Florida personnel employed by the Radiation Control Office where the exposure is attributed to radiation control work associated with the UFTR activities was minimal. During this reporting period, there were no major work items that required a Radiation Work Permit. Thus, no radiation exposure was attributed to major maintenance procedures.

For visitors, students, or other non-permanent UFTR personnel, only one individual had a non-zero prompt reading dosimeter exposure measurement over the entire reporting period as indicated in Table VII-6. The five (5) mrem exposure recorded for this prompt-reading pocket dosimeter was attributed to uncertainty in reading the device, since others involved in the same education session received no recorded dose.

TABLE VII-6

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

Personnel[1]	Date	Exposure (mrem)[1]	Comments
J. Knott	06/27/97	5	Evaluated dose received while observing operations in the NAA Laboratory and probably due to uncertainty in reading the self-reading pocket dosimeter.

[1] All exposures readings are for whole-body exposures.

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

VIII. EDUCATION, RESEARCH AND TRAINING UTILIZATION

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

Radiation Protection Training - Reactor Operations Based Radiation Protection Health Physics Cooperative Work Training Program - Dr. W.G. Vernetson, R. Rawls (CFCC), S. MacKenzie (CFCC), D.L. Munroe, D. Cronin, C. Guincho, R. Pitzer*, J. Harrison*, 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 with great success. Students who take these courses are well suited to work as radiation control technicians and health physics assistants at nuclear power plants. The exercises are also extremely adaptable and some of them have been upgraded and used in the undergraduate and graduate health physics laboratory and other courses at the University of Florida. The development of this course and its subsequent presentation to CFCC students has been partially supported under the UFTR DOE Reactor Sharing Program and has been a valuable resource in the continuing effort to sustain and even increase reactor utilization. During this reporting year considerable staff effort was again devoted to improving the materials used for several of the exercises and to development of variations on several exercises.

UFTR Reactor Operations With NAA, Neutron Radiography, Shielding, Half-Life, Robotics and Other Laboratory/Demonstration Experiments and Exercises - Dr. W.G. Vernetson, Dr. B. Abbott, Dr. M.J. Koroly, D. Cronin, J. Powers, R. Allen (UCHS), R. Rawls/S. MacKenzie (CFCC), Dr. M. Lombardi (HCC), S. Marchionno/R. Sturm/Dr. A. Ferrari/B. Shultzaberger (SFCC), A. Butler (CRHS), R. Davie/J. Vaughn (SPCC), D. Henderson*, R. Pitzer*, J. Harrison*, N. Mascarella*, A. Knight*, Reactor Staff

Mini-courses (including lectures, tours, demonstrations, reactor operations, NAA of unknown and standard samples, half-life measurements, radiation field measurements, demonstrations of neutron radiography, robotics, etc.) have been developed and presented as part of the UFTR DOE Reactor Sharing Program to provide practical reactor operations, radiation protection and health physics training as well as NAA laboratory experience and neutron radiography practice for groups of students from Central Florida Community College Radiation Protection Technology Program, Santa Fe Community College Nuclear Medicine Technology/Radiologic Programs, Santa Fe Community College Natural Sciences Department, Pensacola Community College Physics Department, Valencia Community College Science Department, the Hillsborough Community College Nuclear Medicine/Allied Health Technology programs, St. Petersburg Community College, and a group of visiting Turkish secondary school teachers and a group of boy scouts.

Other participants in all or part of such mini-courses this year include physics, chemistry, biology, science and/or government students from St. Johns County Community College, Hillsborough High School, Rickards High School, Lakeside Christian School, Crystal River High School, Union County High School, Howard Bishop Middle School, Keystone Heights Elementary School, and McRae Elementary School, as well as individual and groups of students from Lecanto High School, a student from Buchholz High School for career shadowing and mixed groups of high school students from the Florida High School Scholars Program, various minority outreach programs and gifted programs from High School districts throughout Florida as well as several groups of high school teachers and guidance counselors.

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

Students in the reactor operations course spend about two and a half hours weekly at the controls of the UFTR performing reactor operations exercises under supervision of licensed reactor operators. The lab encompasses training in reactivity manipulations, reactor checkouts, operating procedures, standard and abnormal operations and applicable regulations. Specific exercises directed toward development of understanding of light water power reactor behavior are included as this laboratory course serves as basic preparation for students entering the utility industry in the test and startup area as well as plant operations. When this course is not interrupted by outages, students usually perform a series of exercises designed to assure them of conducting 10 meaningful startups and 10 shutdowns along with a broad usage of reactivity manipulations. A special effort is made to correlate UFTR exercises with various aspects of LWR operations. This stand alone lab course was offered one time during the current reporting year.

Service to Florida Foundation of Future Scientists (Renamed Center for Precollegiate Education and Training) - Lectures, Tours and Demonstrations of Reactor Operations - Dr. M.J. Koroly, Dr. W.G. Vernetson, D. Cronin, D. Paulin, J. Harrison*, R. Pitzer*, N. Mascarella*, 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 CPET Summer Research Program and was extended to include a large group of UF Talent Identification Program high school student and parent participants. This year it also included service to the Teacher Research Update Experience (TRUE) for two dozen high school teachers.

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

The following courses are identified where one or in many cases as many as four or five classes or labs in a course would be conducted using the UFTR facility. All would begin with the lecture,

tour and reactor operations and facility capabilities demonstration with later classes, where needed, devoted to more detailed lab instruction in one or more areas of UFTR facility operations such as instrumentation demonstrations, radiation surveys and effluent characterization, irradiations for half-life measurements, neutron activation analysis using the rabbit system for short irradiations or the vertical ports for longer irradiations as well as neutron radiography applications and methodology evaluation. The freshman engineering program via EGN-1002 is a regular user for experimental measurements. Courses include:

Course	Instructor(s)
CHS-5110/5110L	Dr. K. Williams/Dr. L. Muga/Dr. W.G. Vernetson
EGN-1002	Dr. W.G. Vernetson, Dr. M. Hoit, Dr. D.E. Hintenlang
EES-3000	Ms. L. Tyson, Dr. S. Dougherty
EML-4450	Dr. Y. Goshwami
ENU-4505L	Dr. E.R. Dalton/Dr. E.T. Dugan/Dr. W.G. Vernetson
ENU-4612/5615	Dr. W.E. Bolch
ENU-4612L/5615L	Dr. W.E. Bolch/Dr. W.G. Vernetson
ENU-4905	Dr. W.G. Vernetson
ENU-4930	Dr. W.G. Vernetson
ENU-5516L	Dr. G.R. Dalton, Dr. E.T. Dugan, Dr. W.G. Vernetson
EML-6451	Dr. Y. Goshwami
ENU-6935	Prof. J.S. Tulenko/Dr. W.G. Vernetson
ENU-6936	Dr. W.G. Vernetson
ENU-6937	Dr. W.G. Vernetson
ENV-6215L	Dr. W.E. Bolch
GLY-6268	Dr. Paul Mueller, Dr. Ann Heatherington
IDH-2931	Dr. E. Dunnam
PHY-1033	Dr. S. Detweiler
PHM-3032	Dr. W.G. Vernetson

Radiation Protection and Control Health Physics Practice (ENV-6215L) - Dr. W.E. Bolch, Dr. W.S. Properzio, Dr. W.G. Vernetson, D.L. Munroe, C. Guincho, R. Pitzer*, Reactor Staff

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

Nuclear Radiation Detection and Instrumentation (ENU-4612/ENU-5615) - Dr. W.E. Bolch, Dr. W.G. Vernetson, T. Wagner**, J. Harrison*, R. Pitzer*, Reactor Staff

These two courses are the senior and graduate lecture courses in the areas of radiation detection and instrumentation. Incorporating a design component into these courses was emphasized this year with a number of students working on projects utilizing the reactor and/or NAA Laboratory facilities for various projects in the 1995-96 reporting year to determine trace element content in oranges (T. Wagner/B. Winne), to analyze contaminants in well water (L. Kyler, B. Anderson and W. Dougherty), to apply inverse kinetics methods to measure UFTR control blade worth (B. Quintero), to identify metals in waste water effluents (J. Scaglione/R. Blanchard), and to measure dead time by the decaying source method (M. Johns/W. Tomé). All groups made oral presentations and produced reports of their work with the efforts deemed a great success. During this year the reactor outage prevented all but simple uses in this area.

Nuclear Instrumentation Laboratory I/II (ENU-4612L/5615L) - Dr. W.E. Bolch, Dr. W.G. Vernetson, R. Pitzer, T. Wagner**, L. Thomsen**, Reactor Staff

These courses provide nuclear engineering science students with basic experience in making nuclear measurements and setting up nuclear instrumentation equipment. The reactor is utilized for general radiation protection experiments and for gamma ray spectroscopy and half-life measurements. This year two students have begun reorganizing these laboratory courses with one doing much NAA-oriented work for the spectroscopy component at the reactor (Wagner) and the other emphasizing course overall organization and integration of reactor facilities (Thomsen).

Radiation Worker Training - 10 CFR 19 Radiation Worker Instructions - Dr. W.G. Vernetson, D.L. Munroe, D. Cronin, J. Harrison*, R. Pitzer*, Reactor Staff

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

Nuclear Engineering Laboratory I/II (ENU-4505L/ENU-5516L) - Dr. G.R. Dalton, Dr. E.T. Dugan, Dr. W.G. Vernetson, D. Cronin, J. Harrison*, R. Pitzer*, Reactor Staff

ENU-5516L is the nuclear engineering laboratory course for graduate students in Nuclear Engineering Sciences; ENU-4505L is for undergraduates. The UFTR is used for a variety of exercises and experiments including radiation dose measurements, measurement of induced radioactivity, foil irradiations for coincidence counting, flux mapping, diffusion length in graphite, 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, neutron activation analysis for trace element

identification, reactor calorimetry and evaluation of temperature coefficient of reactivity and hot channel factors as well as a variety of other reactor physics parameter determination and operational measurements.

NAA Service Research - Trace Element Evaluation of Silicon Nitride Samples - Dr. W. Winefordner, Dr. K. Williams, R. Pitzer*, J. Harrison*, Scott Baker**, Reactor Staff

Neutron Activation Analysis of silicon nitride samples to identify a selected number of trace elements to support doctoral dissertation work was continued during this year. Results to date have identified some of the elements of interest in several samples.

Investigation of Properties of Fuel Storage Pit Liners - Dr. S. Turner (Holtec, International), Dr. W.G. Vernetson, J. Wallis (Holtec, International), D.L. Munroe, D. Cronin, C. Guincho, D. Cronin, 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.

Optical Physics Research - Analysis of Radiation Induced Lattice Disturbances in Dielectric Materials - Dr. H. Plendl (FSU), Dr. P. Gielisse (FSU/FAMU), D. Cronin, 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 1988-89 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 was continued during the 1991-92 year with irradiation of other types of dielectrics including beryl for which extensive

irradiations have been performed on a second set of samples with work continuing at a reduced level during the 1992-93 year and limited work during the last several years.

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

As part of the DOE LEU Conversion Program, thermal-hydraulic analysis related to redesign of the UFTR core using SPERT fuel rods has been performed. Computer analysis has been undertaken to evaluate the UFTR/SPERT design for steady-state conditions as well as transients arising in response to a step insertion of reactivity, a loss of coolant flow, and a loss-of-coolant accident. Results to date indicate required safety margins and transient response conditions can be maintained with the UFTR/SPERT core design. Subsequently, using support provided by DOE to analyze conversion alternatives, the decision was made not to go with SPERT fuel because of load considerations with thermal-hydraulic related conversion analysis expected to be much simpler. Analysis in this area of thermal hydraulics on the basic 14-plate core fuel bundle configuration had begun at the end of the 1990-91 reporting year and was continued through most of this reporting year to provide input to support the license amendment for the HEU-to-LEU conversion since neutronics analysis has now been completed to set the core configuration. The thermal-hydraulics analysis was nearly completed during the 1991-92 reporting year with only a few calculations remaining. The initial review of fuel drawings was also made during 1992-93 with Eileen Yokuda of EG&G Idaho visiting the facility and spending two days reviewing the unique UFTR core design which may necessitate manufacturing a complete dummy core to assure proper fit of the fuel in the fuel boxes in 1993-94. The final fuel drawings have arrived for review. No work was accomplished during this 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 as they have had a study completed by Science Applications International Corporation which appears to place UFTR risk level with some of the higher power reactor facilities. This interest may lead to reactivation of this project, particularly for modifications to the reactor safety and control systems.

NAA Research - Determination of Chlorine, Titanium and Fluorine Concentrations in Quartz - Dr. G.P. LaTorre (GelTech), Dr. C. Balaban (Advanced Materials Research Company), Dr. W.G. Vernetson, 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 - Biogeochemical Assessment of the Pollard, Alabama Oil Field - Dr. G. Cwick (SEMSU), Dr. M. Bishop (UWEC), T. Downing*, D. Henderson*, Reactor Staff

The biogeochemical analysis of soil and vegetation samples is the first phase of a three-phase study to determine if hypothesized biogeochemical anomalies occur in the Pollard, Alabama oil field and can be correlated to tonal anomalies in satellite imaging that corresponds to hydrocarbon deposits. Potentially abnormal concentrations of selected elements characteristic of hydrocarbon seepage from underground deposits could produce identifiable stress-type conditions or growth reactions in the vegetation. These environmental characteristics may be correlated to satellite mapping of hydrocarbon production potential. Environmental vegetative anomalies detected by neutron activation analysis will be correlated to image anomalies. This work was initially supported under the DOE Reactor Sharing Program as data is being generated to support a proposal for external funding. Irradiation and analysis of Phase 1 samples was completed in November 1989 with Phase 2 samples prepared for irradiation and considerable analysis performed in the 1989-90 year. During the 1990-91 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 with this work completed four years ago as this work is in abeyance.

NAA Research - Evaluation of Elemental Volatility in Standards - Dr. W.G. Vernetson, Dr. W.H. Ellis, T. Downing*, D. Henderson**, R. Pitzer*, Reactor Staff

This project was undertaken to support NAA Laboratory activities. Various standards have been analyzed via NAA to determine whether handling or preparation of standards would affect results for volatile elements such as mercury. The results have been useful in evaluating laboratory procedures and identifying the proper means for preparing and handling samples, especially those containing mercury, depending upon whether in elemental or compound-specific state. This work is ongoing as a freeze dryer and moisture analyzer were obtained with DOE funding in the 1994-95 reporting year to limit the loss of volatile sample constituents.

NAA Research - Evaluation of Silicon Carbide Fibers - Dr. W. Toreki (MSE Dept), Dr. W.G. Vernetson, R. Ratner*, T. Downing*, D. Henderson*, 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 initially as silicon (and graphite) do not activate sufficiently to allow relative content of either to be used to identify samples. This work was continued in the 1994-95 year as the fibers were shielded with cadmium to absorb the thermal neutrons and enhance sensitivity though efforts continue to improve sensitivity sufficiently to implement this technique. No work has been performed for two years though this project is continuing.

UFTR Core Redesign (LEU Program) - Neutronics Analysis for UFTR Core Redesign - Dr. W.G. Vernetson, Dr. E.T. Dugan, D. Simpkins

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 under-moderation) 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, in the 1987-88 reporting year the decision was 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 master's project this year. This project examined several possible core fuel bundle designs and by the beginning of the 1992-93 reporting year the decision had been made to select the 14 fuel plates per fuel bundle design with thermal hydraulics analysis begun and nearly completed during the reporting year. At year's end, little additional work has been completed with the thermal hydraulics analysis nearly completed. A visiting professor will be present in the next reporting year to work on this project.

UFTR Operator Training and Requalification - Dr. W.G. Vernetson, D.L. Munroe, D. Cronin, C. Guincho, Reactor Staff

Lectures and hands-on operations on the reactor are necessary to license operators for the UFTR. The requalification and recertification training program establishes a required number of startups, weekly checks, daily checks, drills, practical exercises, lectures and examinations for each operator. Operator participation is mandatory in order to maintain assurance of proficiency levels and to be able to demonstrate the requisite operator skills. Operational proficiency is assured by written and oral examinations as well as by observations in practical exercises. The same program in an accelerated mode is used to train UFTR reactor operator license candidates. Current 10 CFR Part 55 (Operator Licenses) requirements have been considered in continuing the UFTR Operator Requalification and Recertification Training Program. Two senior operators were licensed in October 1991 and another began license training in August 1992 and was licensed in February 1994 in this reporting year. In addition, the individual who was serving as the Acting Reactor Manager on a consultant basis ceased this association in August 1992 as a fully certified SRO assumed this position for the entire reporting year. Finally, after submission of the UFTR Requalification and Recertification Training Program for its usual two-year renewal in May 1991, the facility received a letter in November 1991 with eleven questions concerning the Program and how it meets the requirements of 10 CFR 55. As a result, the Training Program was completely rewritten documenting the Program as implemented and submitted to the NRC in December 1991, with approval received in February 1992. During the 1992-93 reporting year, the program was submitted unchanged for renewal through June 1995. During the 1994-95 reporting year, the program was submitted unchanged and approved by the Nuclear Regulatory Commission through June 1997. During the 1995-1997 years, one new SRO-trainee was participating in qualification training for his license and was licensed in February 1997. An updated requalification training program for the July 1997 to June 1999 period was submitted to NRC in May 1997.

Gaseous Release Determinations - Argon-41 Stack Measurements - Dr. V. G. Vernetson, Dr. W.E. Bolch, D. Cronin, D.L. Munroe, R. Pitzer*, J. Harrison*, 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 a 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 variables affecting stack release concentrations may be moved to a higher priority in the next reporting year if a student can be found to work on it. During the last reporting year the existing limits as well as the new 10 CFR Part 20 limits on Argon-41 release concentrations have both been incorporated into the semiannual measurements (S-4 Surveillance). During the 1993-94 year the new Part 20 limits were fully incorporated with good results. One doctoral student also attempted to model Argon-41 production but no significant new results were obtained. Periodic sampling results have been quite consistent during the 1994-1997 reporting years.

NAA Research - Neutron Activation Analysis for Characterization of Various NBS and USGS Standards with In-house Certification of Trace Elements - Dr. W.G. Vernetson, D. Henderson*, R. Pitzer*, Reactor Staff

Various NBS (now NIST) standard reference source samples in various dilutions are being irradiated for neutron activation analysis to determine the NAA lower limit of detection for the various standards and to identify and benchmark secondary standards based on NBS noncertified concentration values and USGS (US Geological Survey) standards obtained from USGS. This work formed the basis for training a high school student in research methods under the 1986 and again under the 1988 Florida Foundation of Future Scientists Summer High School Student Research Program under the DOE Reactor Sharing Program as well as for a student senior project during the previous year. Limited results were obtained. Although good reports in limited areas have been prepared by the students in each case, the work has continued to progress slowly as various reliable secondary standards are to be developed to facilitate NAA on samples where multiple trace element concentrations are to be determined. This ongoing project provides data on which to base generating irradiation and decay schemes targeted to measure concentrations of specific elements in NIST (NBS) Standards to assure certified comparisons with unknown samples are available. Work to date is progressing well, but considerable additional effort is required to benchmark uncertified contents of standards. During the previous two years (1989-91), as part of a students' senior design project, the contents of various NIST/NBS and USGS standards are being cross correlated and spread sheets being developed. This project is intended to allow for potential NAA Laboratory user to consult a matrix to determine which standards should be used for trace element determinations, depending on the makeup of the sample matrix. Considerable work has been devoted to this project as the students project has been concluded; however, more work is planned as the NAA Laboratory matures and attempts to develop its own standards for special or even routine applications. During the 1990-91 reporting year another useful student project was completed involving the compilation and verification of standard reference materials (SRMs) table files to promote and facilitate rapid computer access to information on various standards that are available so that individual project libraries can be rapidly and optimally developed to support neutron activation analysis projects. Limited progress was made on this project in the past four reporting years as we await an interested student.

NAA Research - Evaluation of Lake Sediments - Dr. W.G. Vernetson, R. Pitzer*, N. Mascarella*, K. McKenna**, C. Gregory**, R. Bowles**, D. Simpkins, D. Cronin, Reactor Staff

Special problems in nuclear engineering involving design and evaluation of results of a project to identify and determine metallic element content of sediments from the Lake Alice area on the University of Florida campus. Part 19 radiation worker training as well as training in performing trace element analysis was performed whereupon the students obtained a series of samples with some irradiations and sample analyses to determine elemental constituents completed by the end of the year. This project was begun in the last year and concluded with a report near the end of the 1996-97 reporting year with good results and much more work possible.

NAA Research - Implementation of Upgraded NAA Laboratory Facilities - Dr. W.G. Vernetson, R. Ratner, T. Downing**, D. Henderson**, R. Pitzer*, J. Harrison*, B. Uhlmer*, D. Cronin, Reactor Staff

The implementation of the two PC-based ORTEC analyzers with spectrum analysis software in the 1986-87 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 1988-89 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 1989-90 year was completion of work on the design of an automatic sample changer for one detector system in the NAA Laboratory. As part of a student's senior design project, the automatic sample changer was installed in the NAA Laboratory in mid-1990. The system was mechanically complete and operable for one sample at a time but needed electronics work to sequence its switching circuits properly and interface it with the computer-based analyzer. During the 1991-92 year, considerable progress was made in redesigning the switching circuit and in developing a software package for the necessary interfacing with the computer systems. During the present year, the system is nearing full operability. When fully implemented, this device will allow NAA Laboratory workers to count samples and store the spectra for a dozen or more samples without returning to the laboratory which will greatly increase the potential throughout for the laboratory. Other laboratory improvements in 1991-92 included installing a new monitor for one computer, implementation of additional computer storage capacity and implementation of an upgraded gamma spectroscopy system including a multichannel buffer for multiple detector operation. In

addition, an integral shield was obtained for one HPGe detector system and an upgraded desiccator system with additional storage capacity was obtained for storage of standards and samples prior to irradiation. Laboratory improvements in the 1992-93 year include a complete new detector system including an HPGe detector, integral shield, PC-based analyzer and complete software package to provide a third detector system. Laboratory improvements in 1993-94 included a freeze dryer, a reworked detector and new floor tile. One project was completed to evaluate and quantify Compton suppression effects in gamma spectra obtained on an HPGe detector with an integral shield in a copper-cadmium liner. Much work has also been undertaken to evaluate and implement an extended and streamlined Quality Assurance Program for the NAA Laboratory which has been progressing well in the 1994-95 reporting year along with installation of a poster board on the cannabis sativa project in the laboratory hallway and refurbishment of one more HPGe detector. In addition to training new personnel and upgrading one of the computers in the laboratory, the implementation of a Quality Assurance Program continued during the 1995-96 year and in the 1996-97 year. In addition, a new Pentium-II-based computer system and much new NAA, radionuclide library, report writing and other software was implemented in the 1996-97 reporting year.

NAA Research - NAA Laboratory Quality Assessment Project - Dr. W.G. Vernetson, R. Ratner (PNL), D. Henderson**, R. Pitzer*, Reactor Staff

Neutron activation analysis project to implement a Laboratory Quality Assurance Program. Work here includes cross correlation of standards, documentation of methods of analysis and general quality assessment activities to assure capability of obtaining defensible trace element measurements when projects require such support. Results to date are good as most work for the comparative method of NAA has been completed and several publications produced with the student expected to complete the project early in the next reporting year.

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, D. Simpkins, D. Cronin, L. Morales, UFTR Staff

Thermal column and east-west throughport facilities were evaluated for radiation beam characteristics with the thermal column being determined optimal as a neutron radiography facility. A precollimator/collimator and drift tube assembly have been completed, a film cassette and developing facility have been implemented. The beam configuration modifications have neared completion with certifiable Class I (ANSI Standard E545) neutron radiographs nearly possible. Following final beam configuration development, a shield and shutter assembly will be developed. Checks to determine possibility of producing real time radiographs in several configurations were unsuccessful in the 1986-87 reporting year. One funded and several other repeated applications were performed in the 1987-87 reporting year. During the 1987-88 year extensive work to optimize and characterize the facility parameters was also accomplished along with completion of darkroom facilities for radiograph development including the loan of an autoprocessor which has not been much used. However, this developmental project is ongoing and a major enterprise for utilizing staff time and design efforts in the past reporting year as we attempt to obtain a reliable and easily implemented system. During the present year, an improved

semi-permanent shielding cavity, as well as a movable table to position objects to be radiographed along with movable shield block, have been implemented to facilitate use of the neutron radiography facility with reduced installation time and reliable results for service usages as well as laboratory projects. One service usage clearly demonstrated and documented the sensitivity of the system using graded thicknesses of boraflex material. Several papers have also been presented on this facility and a thesis was also completed at the end of 1989-90 reporting year. During the 1989-90 year another project was undertaken to improve and characterize beam characteristics and design permanent shielding to allow reduction of time to take radiographs with work still in progress as the effort is hoped to eventually allow reaching characteristics necessary for real time radiography. During the 1990-91 year, in addition to staff efforts to improve radiography facility capabilities, one student under the Florida Foundation of Future Scientists Summer High School Student Research Program performed some special studies on the facility and generated a report of his work which was the subject of a science fair exhibit during the 1991-92 year. Activity during the last two reporting years was simply to train new personnel to assure continued capability to set up the experimental facility and produce quality radiographs which continued in this year as use of a new radiography cassette produced good quality radiographs in each of the previous two years with no usage this year.

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

Extensive efforts were conducted to consider qualifying the SPERT fuel for use in the UFTR. Prior work on the SPERT fuel licensed under SNM-1050 has included extensive decontamination work, radiation and contamination surveys, property surveys, SNM-1050 facility modifications, fire alarm system maintenance/upgrade, LEU SPERT fuel movement to a newly decontaminated room, security system modification and NRC Radiation Safety Inspection. Subsequently complete pin by pin identification number verification for fuel inventory and visual inspection was completed along with x-ray radiography of sufficient pins to fuel the UFTR for LEU conversion and allow refueling. Efforts in this area prior to this year have also included relicensing the SNM-1050 facility for "storage only" and concluded with a determination not to use the SPERT fuel for conversion. After the decision in the previous reporting year not to utilize the SPERT fuel for UFTR HEU-to-LEU conversion, the decision was made to ship the SPERT fuel from the University of Florida campus. During the 1989-90 year, 1200 fuel pins were finally loaded into 6M containers and transferred to Martin-Marietta for shipment to Oak Ridge National Laboratory on May 18, 1990 to support blanket experiments associated with a restarted reach. This transfer was accomplished under QA Program Approval 0578 (see Appendix H of the 1990-91 Annual Report). Later in the year a change in the license was generated, submitted and approved by NRC allowing the remaining 4200 SPERT fuel pins to be stored in Room 6 at the Nuclear Research Building. Following Room 6 upgrades, the remaining SPERT fuel was moved from Room 5 to Room 6 in July 1990. One student report on the radiography effort to analyze the LEU pins was completed during the 1990-91 reporting year. At the end of the 1989-90 year and throughout the last seven years, efforts have continued periodically 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 during the past three reporting years though the return shipment of 1200 fuel pins from ORNL was not authorized after conclusion of the ORNL experiments since

Room 6 has insufficient room to store the remaining 1200 pins. Otherwise, this situation remains unchanged except that the application to renew the SNM-1050 storage only license was submitted in June 1994 and following several changes and a visit by an NRC NMSS representative was finally approved on June 8, 1995. The renewed storage-only license is valid to June 2000 with the QA Program for shipping the pins approved until October 1997.

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

The neutron spectra at the thermal column, South beam port and South-West beam port are being determined to provide information for irradiation services. When the irradiation and analysis protocol is established, variation in beam parameters will be attempted to determine the viability of beam variations. This project was initiated by a participant in the 1987 Summer Student Research Program and was continued in the next reporting year to provide the basis for a science fair entry. The work to date is progressing well as several laboratory exercises have contributed to the data base for this project as has the preliminary work on designing a prompt gamma analysis facility performed on the 1988-89 reporting year. For the 1990-91 reporting year, as part of a student's senior design project, various threshold detector foils were activated in the south and southwest beam ports to characterize the energy-dependence of the neutron field with special emphasis on the neutron field above 1 MeV. Though one student project was completed three years ago and then in the 1995-96 year as a class project with some useful spectral measurements produced, little progress was made on this work during the past three reporting years.

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

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

CHS-5510/5510L - Dr. K. Williams, Dr. M.L. Muga, Dr. W.G. Vernetson, D. Cronin, T. Downing*, D. Henderson*, S. Price**, N. Lau**, U. Bansel**, A. Adair**, Reactor Staff

Radiochemistry laboratory project exercises of half-life determination for silver and iodine, 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 via a project in the CHS-5510L Laboratory to identify the trace element concentrations in powdered milk has provided the basis for a yearly repeatable laboratory experiment; as a result, trace element analysis of milk samples and measurement of half-lives using the UFTR and NAA Laboratory constitutes a regular part of the radiochemistry course curriculum. In addition, four course projects were undertaken in the 1995-96 reporting year to determine trace elements in rock samples (Price), to develop I-128 production and processing methodology (Lau), to measure flux variations in UFTR ports (Bansel), and to determine trace vanadium and titanium concentration in hair (Adair). In addition, efforts to perform trace element analysis of zeolite begun in the 1993-94 year were continued throughout the year and resulted in a significant publication in the 1995-96 reporting year. The zeolite work continued periodically this year.

NAA Research - Rare Earth and Trace Element Geochemistry of Sedimentary Mineral Deposits - Dr. A. Dabous (FSU), Dr. R.A. Odom (FSU), Dr. W.G. Vernetson, T. Downing*, D. Henderson*, 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 four reporting years with one student special project completed during the 1992-93 year also supporting the research work which is now on hold.

NAA Research - Oyster Shell Characterization at the Atomic Level - Dr. D.E. Hintenlang, W. Coughlin**, Reactor Staff

In this master's degree project various oyster shells are being irradiated to determine and evaluate the trace element composition. The oyster shells have been selected from various locations on both the east and west coasts of Florida. The objective is to determine how and if the trace element content of the shells varies in an orderly fashion according to the location of the oyster bed from which the sample was taken. This project began two years ago and has continued periodically since then as this student thesis project was completed during the 1995-96 reporting year. It is hoped this project will continue during the coming year.

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

A small toroidal-shaped piece of high temperature polycrystalline superconductor material (YBaCuO - 1:2:3:7) is being irradiated to moderately high fluences of high energy neutrons. These irradiations are intended to demonstrate increased critical current density for the material

after being subjected to high fast neutron fluence. Increased critical current density will then allow for reduction in shielding requirements on superconducting magnets such as for use on fusion reactors. This irradiation was discontinued in the last year but will be continued periodically throughout the next reporting.

NAA Research - Trace Element Analysis of Geological Quartz Samples - Dr. Roy Odom (FSU), D. Henderson*, UFTR Staff

NAA research to evaluate and quantify certain rare earth element content of geological quartz samples for EPR dating purposes. Various samples of geological quartz are analyzed for their elemental content for relating to age of the strata from which it was taken. This project is supported by the DOE Reactor Sharing Program with no work performed during the last two reporting years.

NAA Research - Reliability Research for NAA Sample Packaging Materials - Dr. W.G. Vernetson, T. Downing**, D. Henderson*, Reactor Staff

NAA trace analysis is conducted on packaging materials used to hold samples for irradiation in the reactor. This work is part of the overall NAA laboratory reliability program research to assure accounting for effects of trace element activation in bagging materials on the trace element results quoted for laboratory samples. One abstract was published and one paper was presented on this work during the 1994-95 reporting year with more work planned during the coming year.

NAA Research - Elemental Analysis for Rare Earth Elements - Mr. M. Moore, Lt. C. Pitcher (AFRRI), Dr. W.G. Vernetson, R. Pitzer*, J. Harrison*, Reactor Staff

Elemental analysis has been performed at a number of facilities to obtain isotopic sample concentrations for rare earth samples such as Dy_2O_3, Dy and In_2O_3 for potential use of the rare earth elements as tracers. Work here has consisted of demonstrating capabilities for performing rare earth isotope identification for two representatives from the Armed Forces Radiobiology Research Institute which is heading up this effort. Some trace analysis of old lead and wood also during this past year. This work was performed with some financial support in the 1996-97 reporting year.

NAA Research - Elemental Analysis of Environmental Samples - Mr. Mark Magolis (WMMS), Dr. W.G. Vernetson, D. Simpkins, N. Rhonda, M. Alvarez**, K. Lopez**, M. Rodriguez** P. Carvajal** (WMMS), D. Henderson*, R. Pitzer*, J. Harrison*, Reactor Staff

NAA research to perform trace element analysis on various environmental samples such as sediments, surface water, plants and aquatic life from canals in the West Miami section of Dade County. This work was supported by the DOE Reactor Sharing Program and was the subject of four science fair projects in the 1994-95 reporting year and several more in 1995-96. Again this year a science fair project looking at heavy metals in fish taken from canals in West Miami was conducted and reached the regional level of competition.

NAA Research - Trace Element Analysis of Meat Samples - Dr. W.G. Vernetson, Ms. R. Allen (UCHS), J. Cerdan** (UCHS), C. Polhill** (UCHS), D. Henderson, R. Pitzer*, J. Harrison*, Reactor Staff

Various meat samples were selected and analyzed for trace element content to support a science fair project. Results to date are oriented to key trace elements thought to be important in the diet to maintain health. This project was a local winner and went on to regional competition in the 1995-96 reporting year with work continuing during this year for another science fair entry adding fish as another component to be analyzed. The project again reached regional competition.

NAA Research - Evaluation of Trace Element Differences in Vegetables - J. Conner and E.C. Turvey (HHS), Dr. W.G. Vernetson, Dr. M.J. Koroly, J. Gilliam** (HHS), T. Downing*, D. Henderson*, Reactor Staff

Various samples of vegetables that have well defined but edible skins were obtained. Trace element analysis using neutron activation was then conducted on the meat versus the skins of these various vegetables from cucumbers to radishes. One high school student project in this area was completed as part of the CPET Summer Science Student Research Training Program at the end of the reporting year showing significant differences in the trace element content between the skins and meat of some vegetable samples. This work continued during the 1995-96 reporting year with a science fair project presented on the work that reached the regional level. Plans are to continue this work when student interest warrants.

NAA Research - Evaluation of Elemental Sensitivity Using NAA - R.C. Webster and T.C. Lewis (MCS), Dr. W.G. Vernetson, M. McCullough (MHS)**, T. Downing*, D. Henderson*, R. Pitzer*, Reactor Staff

Various pure materials were mixed into matrices and analyzed using neutron activation. The objective in this project is to determine the sensitivity of NAA methodology dependent upon the matrix being analyzed and the material element to be quantified. One high school student project in this area was completed as part of the CPET Summer Science Student Research Training Program at the end of the 1994-95 reporting year showing significant differences in some samples. A science fair project was presented on this work during the last reporting year with no work during the 1996-97 reporting year.

NAA Research - Evaluation of Trace Element Changes in Various Rices Following Cooking - W. Zale and S. Snow (HHS), Dr. W.G. Vernetson, Dr. M.J. Koroly, S. Hoelle** (HHS), R. Pitzer*, J. Harrison*, N. Mascarella*, D. Cronin, Reactor Staff

Various samples of rice were obtained and then the trace element content identified using NAA techniques. Subsequently, rice samples were cooked and trace element analysis utilized to identify, quantify and evaluate trace element changes caused by cooking. One high school student project in this area was completed as part of the CPET Summer Science Student Research Training Program at the end of the reporting year showing significant differences in the trace element content between the cooked and uncooked samples of some rice types. Work continued on this

project during the 1996-97 reporting year with a science fair project produced on this work during the year.

NAA Research - Trace Element Analysis of Treated Wood - S. Rowe and S. Coccia (PRHS), R. Allen (UCHS), A. Ferrari (SFCC), Dr. W.G. Vernetson, Dr. M.J. Koroly, C. Ramsey** (PRHS), T. Parrish**, Paul McMillan** (UCHS), B. Uhlmer** (SFCC), R. Pitzer*, N. Mascarella*, D. Cronin, Reactor Staff

Most wood intended for outdoor use is pressurized and treated with chemicals to limit decay due to organisms in the soil. Much of the treatment chemical used is an arsenate containing barium, arsenic and copper. Various treated wood samples were obtained and the technique of NAA used to identify the elemental content due to treatment chemical. One high school student project in this area was completed as part of the CFET Summer Science Student Research Training Program at the end of the last reporting year showing significant differences in some samples. A science fair project was presented on this work during the 1996-97reporting year. Another science fair project was completed this past year by two Union County High School students; this work was also used as the basis for a SUCCEED-based project on mentoring research for a Santa Fe Community College student with a report generated. Ultimately, plans are to examine the environmental impact of using such treated wood and to offer analysis of such treated wood as a reactor facility service on a routine basis.

NAA Research - Trace Element Evaluation of Roadside Runoff Sediments - Dr. W.G. Vernetson, K. Van Reken**, B. Uhlmer*, J. Powers, Reactor Staff

Special problems in nuclear engineering involving design and evaluation of trace element analysis to identify and determine elemental content of roadway runoff sediments from around the Gainesville area including the University of Florida campus. Part 19 radiation worker training was conducted as well as training in and performing trace element analysis whereupon the student obtained a series of samples with irradiations and sample analyses concluded and a good senior project produced; significant levels of vanadium were identified in some samples attributed to combustion of oils. It is hoped that further work will be possible in this area in the upcoming year.

NAA Research - Evaluation of Magnesium Levels in Various Foodstuffs - Dr. K. Williams, Dr. W.G. Vernetson, B. Killian**, J. Harrison*, Reactor Staff

Work was completed to prepare samples of various food products for trace element analysis to determine magnesium levels as part of a senior project in the Chemistry Department. After commencement of this project in the 1996-97 reporting year, this work was postponed prior to commencing irradiations.

NAA Research - Evaluation of Prehistoric Manganese Secretions - Dr. M. Jordan (Fairfax County Chief Archivist), M. Moore, Dr. W.G. Vernetson, J. Harrison*, Reactor Staff

Various prehistoric manganese secretions have been irradiated to facilitate assessment of the Cactus Hill site in Suffolk County, Virginia. Results to date have been acceptable with more work planned for the coming year.

BNCT Research - Neutron Beam Irradiations - Dr. W.E. Bolch, Dr. C. Batich, Dr. W.G. Vernetson

Boron neutron capture therapy (BNCT)-related research has been discussed as it is hoped to start a project in the next semester to begin utilizing reactor neutron beams to investigate various neutron absorbing compounds of possible use in boron neutron capture therapy.

NAA Research - Investigation of Radiation Hormesis Effects in Plants - Dr. W.G. Vernetson, P. Allison (HHS), S. Snow (HHS), J. Knott** (HHS), B. Uhlmer*, J. Powers, Reactor Staff

Arabadopsis Thaliana seeds were obtained and subjected to various relatively low levels of Co-60 gamma radiation. The seeds were then planted and grown to identify possible hormetic effects of low levels of radiation dose. This project was supported under the DOE Reactor Sharing Program as part of the CPET Summer Science Student Research Training Program for which a research report and several oral presentations were made. Work continues to investigate elemental variations in the Arabadopsis Thaliana plants which might result from the effects of low radiation doses for presentation as a science fair project in the 1997-98 reporting year.

NAA Research - Trace Element Evaluation of Bottled Water - Dr. W.G. Vernetson, S. Teitel, R. Rothenberg, J. Biegleson (SHS), D. Beek** (SHS), B. Uhlmer*, J. Powers, Reactor Staff

Various brands of natural and prepared bottled water were evaporated to obtain the solid residue to evaluate and quantify the trace elements in the the bottled water products. Considerable NAA trace element determinations have been made following reactor irradiations. This project was supported under the DOE Reactor Sharing Program as part of the CPET Summer Science Student Research Training Program for which a research report and several oral presentations were made. Work continues to prepare the results of this project for a science fair presentation in the 1997-98 reporting year.

NAA Research - Trace Metal Determinations in Fresh Shrimp - Mr. Ron Worthington, D. Nichter** (LHS), Dr. W.G. Vernetson, J. Harrison*, B. Uhlmer*, D. Cronin, Reactor Staff

Work has been conducted for a class and possible science fair project for a Lecanto High School science class to perform trace element analysis for mercury, zinc and iron levels in fresh shrimp samples. This work is progressing well with some determinations for iron and zinc levels and more samples to be supplied as this project is being extended to a science fair project to be presented in the 1997-98 reporting year.

NAA Research - Implementation of k_o-Standardization Methodology - R. Ratner (Battelle Pacific Northwest Laboratory), Dr. W.G. Vernetson, T. Downing**, D. Henderson**, J. Harrison*, Reactor Staff

Multielement instrumental neutron activation analysis (INAA) using the k_o-factor technique is being investigated. The first phase of the experiment was to characterize the neutron flux spectrum in several normally used ports such as the rabbit and vertical ports. The second phase was to determine if a standardized k_o-factor procedure as applied to INAA could be accomplished more efficiently and more accurately than routine elemental analysis. Both phases of this investigation were essentially completed during the previous reporting year with the completion of a Master's project (R. Ratner). Subsequently, a high honors project was undertaken and completed by G. Dalporto to develop a standardized procedure for applying the k_o-method at the UFTR in a detailed step-by-step process. Further work on this methodology has continued occasionally during this reporting year to expand its applicability and improve its sensitivity and elemental applicability with several papers published and presented as efforts are underway to benchmark this method and work continuing to write software to automate the analysis of samples using the k_o-standardization methodology. With the leaving of the primary students (Downing and then Henderson) on this project, only limited work was accomplished over the past two years.

NAA Service Research - Trace Metals in Gulf of Mexico Sediments - Dr. John Trefry (FIT), Dr. W.G. Vernetson, D. Henderson*, Reactor Staff

Neutron activation analysis is being used on a continuing basis to analyze Gulf of Mexico sediments collected near offshore drilling platforms for ten trace elements including barium, iron, chromium and zinc. This project is designed to allow identification of inputs of contaminants from offshore drilling with the work partially supported by external funding from Chevron plus the remainder from the DOE Reactor Sharing Program for determination of additional elements for separate evaluation. No samples have been analyzed for two years though the project is continuing.

SUCCEED Program - Development of Instructional Materials - Dr. M. Hoit, Dr. W.G. Vernetson, Dr. E.T. Dugan, Dr. D.E. Hintenlang, D. Cronin, J. Harrison**, R. Pitzer*, N. Mascarella*, Reactor Staff

As part of the Freshman Introduction to Engineering (EGN-1002) course, various instructional experimental modules on neutron activation analysis, half-life measurements, hot channel factors measurements and radiation protection measurements have been developed and delivered to small groups of freshman students expressing interest in majoring in engineering. A similar set of lectures and experiments was presented to a group of community college students brought to campus as part of a symposium for the SUCCEED program in the 1993-94 reporting year. All of these presentations have been well received and have been further refined this year for three offerings of this course.

NAA Research - Evaluation of Orange Juice for Source Identification - Dr. W.G. Vernetson, J. Harrison*, D. Henderson*, T. Wagner**, Reactor Staff

The juice from fresh oranges from various sources such as Florida, California and Texas were analyzed for trace element content using neutron activation analysis and the k_o-standardization methodology. The objective here is to identify sufficient trace elements and levels to serve as signatures for the orange juice produced from a region or country. The results of this work could be used for source certification to support or discredit truth in advertising claims about so-called "pure" Florida orange juice. One high school student project in this area was completed as part of the 1993 FFFS (now CPET) Summer Science Student Research Training Program at the end of the 1993-94 reporting year showing some significant elemental variations in trace elements between sources. Work continued to develop more data and present a science fair project on this work in the 1993-94 reporting year with no progress until a student in 1995-96 extended this work as part of his Master's project incorporating such trace element work into the ENU-4612/5615 course as well as his own project in the ENU-6935 seminar. This work was applied in the courses again in the 1996-97 year with a publication produced and an oral presentation made. A major paper is also in progress to show how such practical work can augment the design component of an instrumentation course.

Isotope Production - Activation of Pure Copper - Dr. John Kuperus, Dr. W. Drane, Mike Nicole, 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 and doing research on a research scanner utilized for positron emission tomography (PET). A number of samples were supplied especially after acquisition of a second scanner early in the year. Samples supplied have been well used in the calibration procedure as well as research with future usage expected to continue in the upcoming year.

TRTR Newsletter - Publication of Newsletter for Non-power Reactor Community - Dr. W.G. Vernetson, D. Cronin*, N. Mascarella*, R. Smith*

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 1997, four (4) newsletters totaling more than 150 pages were published during the reporting year with the system working well and expected to continue to produce quarterly issues during the upcoming year.

Facility Special Services - Special Individual and Group Lectures, Tours and Demonstrations - Dr. W.G. Vernetson, D. Cronin, J. Harrison*, D. Henderson**, B. Uhlmer*, A. Knight*, R. Pitzer*, Reactor Staff

Various lectures, tours and demonstrations of reactor, NAA Laboratory and other facilities were conducted for hundreds of visitors to include campus and off-campus educational groups, university service personnel, potential and interested facility users, personnel requiring Radiation Workers Instructions or Second Person Qualification, foreign visitors and reporters. Other special visitors this year included Hispanic Outreach visitors, several groups of high school guidance counselors, ANS President Stan Hatcher, several members of the NRE Advisory Committee, several visiting geology professors, Channel 5 news reporter Jessica Clark and a cameraperson, Florida Public TV Reporter Martina Schmid and two videographers for interviews later aired on TV around the State of Florida, U.S. Navy recruiter Scott Lawson, a number of alumni —especially during the NRE Department 40th anniversary celebration, several ex-Navy operators for potential employment, the Reactor Safety Review Subcommittee for its annual audit, various University Police and Gainesville Fire Department personnel, several groups of 1997 Engineering Fair visitors, one NRC inspector, several groups visiting the College of Engineering as part of the College's Hispanic Outreach Program, several groups of outstanding high school students sponsored by Tau Beta Pi Honor Society and other groups, various NRC, DOE and ANI visitors and inspectors, plus many other groups and individuals too numerous to list including NRE personnel for Emergency Response as well as Right-to-Know Training.

Facilities Support - Facility Upgrade/Improvement Activities - Dr. W.G. Vernetson, D. Cronin, D. Henderson*, B. Uhlmer*, 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 have been the continuation of the project to install terminal strips and quick disconnect fittings for all the core thermocouple connections. Various cell preservation activities were also continued. A great deal of effort was also devoted to upgrading various information notices, radiation-related signs and other right-to-know signs required to be posted throughout the facility to meet various federal, state and university requirements. A new area radiation monitoring system as well as a new multipoint temperature recorder were obtained under a DOE Reactor Instrumentation Grant several years ago. Both are in the process of being prepared for installation. In addition, a new telescoping high dose rate survey instrument as well as a low level MicroR survey instrument were obtained under the same DOE grant prior to 1993. Other facility improvements in the 1992-93 reporting year included asbestos removal and installation of a new main air handler in the reactor building, installation of a touchtone telephone in the Emergency Support Center, acquisition of a staff computer for use by the Reactor Manager to simplify report generation plus the delivery and implementation of a complete new detector system in the NAA Laboratory including an HPGe detector, integral shield, PC-based analyzer and complete software package. Of course, various NAA Laboratory activities, in addition to the new HPGe detector system, to prepare better libraries and to obtain and implement improved analysis programs were also instrumental in improving facilities operations as every effort continues to be made to assure smooth and effective facility operations in all areas. In 1993-94, improvements included implementation of a spill kit, lead blankets, a

reworked HPGe detector, a nimbin and NaI detector spectroscopy system, new floor tile in the NAA Laboratory, a freeze dryer plus a boroscope and ultrasonic flow meter. Finally, there was work by one student on a master's project for overhaul and implementation of a whole body counter to perform and document baseline whole body counts as well as liquid scintillation counts of urine samples to provide baseline data and implement the UFTR staff bioassay program which was completed in the 1994-95 reporting year. In addition to refurbishing one HPGe detector and setting up several GM detector systems for half-life measurement exercises, an upgrading modification and overhaul of the rabbit system was implemented during the 1994-95 reporting year in addition to the continuing work to implement a quality assurance program in the NAA Laboratory. During the 1995-96 reporting year, one of the NAA Laboratory computers was upgraded to speed up sample analysis and more progress was made in implementation of the Quality Assurance Program. During the 1996-97 reporting year, work on the project to implement a QA Program was continued. In addition, the NAA facility acquired and implemented one new Pentium-II-based computer system and new ORTEC software packages including new NAA software and radionuclide libraries. The facility also acquired and implemented a new set of 14 self-reading pocket dosimeters and a self-powered charger.

Surveillance Activities - Checks, Tests and Surveillances to Meet License Conditions - Dr. W.G. Vernetson, D.L. Munroe, D. Cronin, 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, while completion and improvements in performance of the annual nuclear instrumentation calibration checks (A-2 Surveillance) accounted for considerable planned unavailability in March 1997.

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

Routine corrective maintenance on UFTR systems and facilities again occupied a considerable, though outage time was reduced during the reporting period. There were several large outages to include addressing the failure of the compensated ionization chamber, failure of the pump in the shield tank demineralizer system and failure of the primary coolant level trip reed switch. There were no entries into the core area to complete the checks on the control blade drive systems (V-1 Surveillance) or to perform a fuel inspection as there was in the previous year. In addition, the continuation and then completion of reroofing work throughout the year caused limited planned unavailability.

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

1. "Concentrations (ppm) of Elements Determined on Short Irradiations of Dade County Canal Water Filtrates," Report to Dr. Helena Solo-Gabriele, Civil Engineering Department, University of Miami, W.G. Vernetson and D.P. Henderson, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, September 17, 1996.

2 "Trace Element Analysis of Silicon Nitride Samples for Materials Evaluation of Bearings," W.G. Vernetson and J. Harrison, Research Report to Dr. J. Winefordner, Chemistry Department, University of Florida, Gainesville, FL, September, 1996.

3. "Quarterly Log of Security Events for the University of Florida Training Reactor R-56 License at the University of Florida," W.G. Vernetson, Submitted to NRC Region II and Withheld from Public Disclosure, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, October 4, 1996.

4. "Presentation on Radiation Worker Training with Current Research Areas and Project Topics," W.G. Vernetson, Seminar Presented for ENU-6935 Graduate Nuclear Seminar Class, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, October 6, 1996.

5. "Amendment No. 21 to Facility Operating License No. R-56 - Technical Specifications Revision," NRC Letter and Safety Evaluation Report, T. Michaels, Washington, D.C., October 10, 1996.

6. "Optimum Utilization of Part 19 Training Requirements in Academia," W.G. Vernetson, Abstract in Proceedings of Annual Meeting of National Organization of Test, Research, and Training Reactors held October 22-25, 1996 in Austin, Texas, October 1996.

7. "Optimum Utilization of Part 19 Training Requirements in Academia," W.G. Vernetson, Presentation on October 25, 1996 at Annual Meeting of National Organization of Test, Research, and Training Reactors held October 22-25, 1996 in Austin Texas, October 1996.

8. "Reactor Facility Innovations in Incorporating Design Content into the Nuclear Engineering Curriculum," W.G. Vernetson, Abstract in Proceedings of Annual Meeting of National Organization of Test, Research and Training Reactors held October 22-25, 1996 in Austin, Texas, October 1996.

9. "Reactor Facility Innovations in Incorporating Design Content into the Nuclear Engineering Curriculum," W.G. Vernetson, Presentation on October 25, 1996 at Annual Meeting of National Organization of Test, Research and Training Reactors held October 22-25, 1996 in Austin, Texas, October 1996.

10. "TRTR - National Organization of Test, Research, and Training Reactors Newsletter," Vol. 8, No. 4, W.G. Vernetson and N. Mascarella, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, November, 1996.

11. "Limiting the Impact of Recent Outage Experience in a Midsize University Reactor Environment," W.G. Vernetson, Trans. Amer. Nucl. Soc., 75, p. 114, November, 1996.

12. "Limiting the Impact of Recent Outage Experience in a Midsize University Reactor Environment," W.G. Vernetson, Presentation on November 14, 1996 at 1996 ANS Winter Meeting in Washington, D.C., November 1996.

13. "Response to Request for Information Concerning Nuclear Material at the University of Florida," W.G. Vernetson, Submitted to Bryce L. Denning, Lockheed Martin Idaho Technologies Co., Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, December 9, 1996.

14. "Continued Services to Support a TRTR Community Newsletter," W.G. Vernetson, Submitted to Tony Vinnola, INEL - Lockheed Martin Idaho Technologies Co., Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, December 17, 1996.

15. "Results of Analysis of Zeolite Samples for Silicon Content," W.G. Vernetson, Submitted to Dr. Kathryn Williams, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, December 18, 1996.

16. "Trace Element Analysis for Mercury in Fish Taken From Dade County Canals," P. Carvahal, Science Fair Project Report, West Miami Middle School, December 1996.

17. "Trace Element Analysis for Mercury in Fish Taken From Dade County Canals," P. Carvahal, Science Fair Project Oral Presentation, West Miami Middle School, December, 1996.

18. "Final Report on the Reactor Operations-Based Health Physics Cooperative Work Training Program Conducted for Radiation Protection Technology Program Students from Central Florida Community College at the University of Florida Training Reactor Fall Semester, 1996," W.G. Vernetson, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, January 8, 1997.

19. "Potential Tech Spec. Violation - Improper Stack Monitor Calibration," W. G. Vernetson, 14 Day Report Submitted to NRC Region II, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, January 27, 1997.

20. "Trace Element Analysis for Mercury in Fish Taken From Dade County Canals," P. Carvahal, Regional Science Fair Project Report, January, 1997.

21. "Trace Element Analysis for Mercury in Fish Taken From Dade County Canals," P. Carvahal, Regional Science Fair Project Oral Presentation, January, 1997.

22. "Analysis of Detection Limits for Cu, Ni, Cr in Pressure-Treated Wood Samples," Paul McMillan and Terry Parish, Union County High School Science Fair Project Report, Lake Butler, FL, January, 1997.

23. "Analysis of Detection Limits for Cu, Ni, Cr in Pressure-Treated Wood Samples," Paul McMillan and Terry Parish, Union County High School Science Fair Project Oral Presentation, Lake Butler, FL, January, 1997.

24. "Trace Element Analysis of Various Meat and Fish Samples Relative to Dietary Requirements," Chris Polhill and Joel Cerdan, Union County High School Science Fair Project Report, Lake Butler, FL, January, 1997.

25. "Trace Element Analysis of Various Meat and Fish Samples Relative to Dietary Requirements," Chris Polhill and Joel Cerdan, Union County High School Science Fair Project Oral Presentation, Lake Butler, FL, January, 1997.

26. "Identification of Trace Element Changes in Various Kinds of Rice Due to Cooking," D.S. Hoelle, Science Fair Project Report, Hillsborough Hill School, Tampa, FL, January, 1997.

27. "Identification of Trace Element Changes in Various Kinds of Rice Due to Cooking," D.S. Hoelle, Science Fair Project Oral Presentation, Hillsborough High School, Tampa, FL, January, 1997.

28. "Trace Element Analysis of Pressure-Treated Wood," C. Ramsey, Science Fair Project Report, Pine Ridge High School, Pine Ridge, FL, January, 1997.

29. "Trace Element Analysis of Pressure-Treated Wood," C. Ramsey, Science Fair Project Oral Presentation, Pine Ridge High School, Pine Ridge, FL, January, 1997.

30. "Reactor Operation and Nuclear Energy: Comparison of Power Reactors with the University of Florida Training Reactor Operations," W.G. Vernetson, Invited Lecture Over FEEDS Network for EML-4450/6451 Energy Conversion Classes, Department of Mechanical Engineering, University of Florida, Gainesville, FL, February 12/14, 1997.

31. "Report on the University of Florida Training Reactor For the Department of Nuclear and Radiological Engineering Visiting Committee," W.G. Vernetson, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, February 20, 1997.

32. "A First for Gainesville: Most Jobs Are in Retailing," D. Greenburg, Article in Gainesville Sun Almanac with interview and picture of W.G. Vernetson and UFTR, Gainesville, FL, February 23, 1997.

33. "Trace Element Analysis of Various Meat and Fish Samples Relative to Dietary Requirements," Chris Polhill and Joel Cerdan, Regional Science Fair Project Report, February, 1997.

34. "Trace Element Analysis of Various Meat and Fish Sample Relative to Dietary Requirements," Chris Polhill and Joel Cerdan, Regional Science Fair Project Oral Presentations, February, 1997.

35. "Annual Progress Report for the University of Florida Training Reactor for September 1, 1995 - August 31, 1996," W.G. Vernetson, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, February 1997.

36. "TRTR - National Organization of Test, Research, and Training Reactors Newsletter," Vol. 9, No. 1, W.G. Vernetson and N. Mascarella, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, February, 1997.

37. "UFTR Fuel Characteristics for Use in the Design of a Spent MTR Fuel Transport Cask," W.G. Vernetson, Submitted to TRANSNUCLEAR, INC., Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, March 7, 1997.

38. "Final Report on the University of Florida U.S. Department of Energy 1995-96 Reactor Sharing Program," W.G. Vernetson, Submitted to U.S. Department of Energy, Department Of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, March 11, 1997.

39. "Proposal for Funding for the University of Florida Training Reactor Through the U.S. Department of Energy University Reactor Sharing Program," W.G. Vernetson, proposal Submitted to Department of Energy, March 12, 1997.

40. "Changes to the University of Florida Training Reactor Information in FEDIX," W.G. Vernetson, Submitted to Federal Information Exchange, Inc., Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, March 14, 1997.

41. "UFTR Argon-41 Releases for CY 1996," W.G. Vernetson, Memorandum to D.L. Munroe, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, March 14, 1997.

42. "Updated Proposal to Meet Requirements of 10 CFR 50.64(c)(2)," W.G. Vernetson, Submitted to NRC Office of Nuclear Reactor Regulation, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, March 27, 1997.

43. "UFTR Safety Analysis Report Revision 10 Documentation," W.G. Vernetson, Package Submitted to U.S. Nuclear Regulatory Commission, University of Florida, Gainesville, FL, March 17, 1997.

44. "1995-96 Annual Progress Report Replacement Pages IV-6, IV-11, IV-12," W.G. Vernetson, Package Submitted to the U.S. Nuclear Regulatory Commission, University of Florida, Gainesville, FL, March 17, 1997.

45. "Design and Implementation of An Improved Radiation Detection and Instrumentation Laboratory Course Curriculum," T. Wagner, Master's Thesis Project, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, March 21, 1997.

46. "Triumph to Tragedy: Nuclear Energy and Chernobyl," Lindsay Johnson, Senior Division Paper, Pensacola High School, Pensacola, FL, March, 1997.

47. "Identification of Trace Element Changes in Various Kinds of Rice Due to Cooking," D.S. Hoelle, Regional Science Fair Project Report, Tampa, FL, March, 1997.

48. "Identification of Trace Element Changes in Various Kinds of Rice Due to Cooking," D.S. Hoelle, Regional Science Fair Project Oral Presentation, Tampa, FL, March, 1997.

49. "UFTR Annual Calendar Year (1996) Audit," M.J. Ohanian, D.L. Munroe, J.S. Tulenko, and W.E. Bolch, University of Florida, Gainesville, FL, March/April, 1997.

50. "Using Virtual Instruments to Replace or Supplement Nuclear Instrument Modules in Radiation Measurement Education," Loren Thomsen, Master's Thesis Project, Department Of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, April 1, 1997.

51. "Quarterly Log of Security Events for the University of Florida Training Reactor R-56 License at the University of Florida," W.G. Vernetson, Submitted to NRC Region II and Withheld from Public Disclosure, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, April 8, 1997.

52. "UFTR Emergency Plan Revision 10 Documentation," W.G. Vernetson, Submitted to U.S. Nuclear Regulatory Commission, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, April 10, 1997.

53. "Design and Implementation of An Improved Radiation Detection and Instrumentation Laboratory Course Curriculum," T. Wagner, Oral Thesis Presentation, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, April 11, 1997.

54. "Results of Trace Element Analysis of Rice Samples," A.J. Harrison, Report Submitted To Stuart Hoelle, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, April 16, 1997.

55. "Elemental Analysis of Lake Alice Sediments Using Neutron Activation, Analysis," Richard Bowles, Cristy Gregory, Nancy Mascarella, and Kevin Mckenna, ENU 4905 Presentation, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, April 18, 1997.

56. "PBS Frontline Broadcast on Nuclear Power," W.G. Vernetson, Interview with Channel Five, Gainesville, FL, April 21, 1997.

57. "Using Virtual Instruments to Replace or Supplement Nuclear Instrument Modules in Radiation Measurement Education," Loren Thomsen, Student Presentation to the Joint Meeting of the Florida Chapters of the Health Physics and American Nuclear Society, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, April 24, 1997.

58. "Design and Implementation of An Improved Radiation Detection and Instrumentation Laboratory Course Curriculum," T. Wagner, Student Presentation to the Joint Meeting of the Florida Chapters of the Health Physics and American Nuclear Society, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, April 24, 1997.

59. "Overview of the Usage and Capabilities For Education, Research, and Service at the University of Florida Training Reactor," W.G. Vernetson, Presentation to the Spring 1997 Joint Meeting of the Florida Chapters of the Health Physics Society/American Nuclear Society, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, April 25, 1997.

60. "Radiation Hardening of Electronics for Robotic Applications," J.S. Tulenko, University Of Florida Rad-Hard Center Brochure, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, Florida, April, 1997.

61. "Nuclear Power Plant Engineers and Technicians," Chronicle Guidance Publications, Acknowledgment of Assistance of W.G. Vernetson, Moravia, NY, April, 1997.

62. "Faculty Meeting Minutes, Tuesday, April 6, 1997," W.G. Vernetson, Faculty Memorandum, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, May 7, 1997.

63. "Response to Annual Calendar Year (1996) Audit of UFTR," W.G. Vernetson, Department of Nuclear And Radiological Engineering, University of Florida, Gainesville, FL, May 15, 1997.

64. "A Follow-up Report on 'Trace Element Analysis of Pressure Treated Wood' by Chris Ramsey," B. Uhlmer, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, May 18, 1997.

65. "University of Florida Operator Requalification and Recertification Training Program Plan," W.G. Vernetson, Revised Plan Submitted to NRC Region II Atlanta, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, May 29, 1997.

66. "How Nuclear Power Plants Work - A Comparison With Non-Power Reactors," W.G. Vernetson, Lecture for participants in 'An Adventure with the Atom,' An Educator Workshop Held at the Orlando Marriott World Center, University of Florida, Gainesville, Florida, May 31, 1997.

67. "Summer Semester Reactor Operations Laboratory Manual for ENU-5176L," W.G. Vernetson, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, May, 1997.

68. "Radiation Worker Instructions Training Manual - Revised," W.G. Vernetson, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, May 1997.

69. "TRTR - National Organization of Test, Research, and Training Reactors Newsletter," Vol. 9, No. 2, W.G. Vernetson and R. Smith, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, May, 1997.

70. "Trace Element Characterization of SRM 1547 Peach Leaves Using the k_o Standardization Method," D.P. Henderson and W.G. Vernetson, Trans. Amer. Nucl. Soc., 76, p. 115, June, 1997.

71. "Germinating and Cultivating a Diverse Clientele for the UFTR Neutron Activation Analysis Laboratory," W.G. Vernetson, Trans. Amer. Nucl. Soc., 76, p. 7, June 1997.

72. "Critical Planning Consideration for Relicensing the UFTR," W.G. Vernetson, Trans. Amer. Nucl. Soc., 76, p. 35, June, 1997.

73. "Design of a Gamma Spectroscopy System Using Low-Speed Analog Interface Cards and Labview (tm) Software," L.M. Thomsen and W.E. Bolch, Abstract in Health Physics The Radiation Protection Journal, Supplement 1, Vol. 72, No. 6, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, June 1997.

74. "Development and Revision of a Senior/First-Year Graduate Student Laboratory Course In Radiation Detection and Instrumentation," T. Wagner and W.E. Bolch, Abstract in Health Physics The Radiation Protection Journal, Supplement 1, Vol. 72, No. 6, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, June 1997.

75. "Trace Element Characterization of SRM 1547 Peach Leaves Using the k_o Standardization Method," D.P. Henderson, Presentation on June 2, 1997 at the ANS Annual Meeting in Orlando, FL, June 1997.

76. "Germinating and Cultivating a Diverse Clientele for the UFTR Neutron Activation Analysis Laboratory," W.G. Vernetson, Presentation on June 3, 1997 at the ANS Annual Meeting in Orlando, FL, June 1997.

77. "Critical Planning Considerations for Relicensing the UFTR," W.G. Vernetson, Presentation On June 3, 1997, at the ANS Annual Meeting in Orlando, FL, June 1997.

78. "Generating Electricity With Nuclear Power Plants: An Evaluative Comparison With Non-Power Reactors," W.G. Vernetson, Presentation on June 18-19 For Participants in a Workshop on Teaching Radiation, Energy, and Technology for Pre-College Educators Held At Savannah State University, Savannah, GA, June 16-20, 1997.

79. "Design of a Gamma Spectroscopy System Using Low-Speed Analog Interface Cards and Labview (tm) Software," L.M. Thomsen and W.E. Bolch, University of Florida, Oral Presentation at the Health Physics Society 42nd Annual Meeting, San Antonio, TX, July 1, 1997.

80. "Development and Revision of a Senior/First-Year Graduate Student Laboratory Course In Radiation Detection and Instrumentation," T. Wagner and W.E. Bolch, University of Florida, Oral Presentation at the Health Physics Society 42nd Annual Meeting, San Antonio, TX, July 1, 1997.

81. "An Examination of Drinking Water Using Elemental Neutron Activation Analysis," D.C. Beek, Interim Report for SSTP Summer 1997, University of Florida, Gainesville, FL, July 11, 1997.

82. "Radiation Hormesis in *Arabidopsis Thaliana*: The Positive Effects of Low-Level Radiation," J. Knott, Interim Report for SSTP Summer 1997, University of Florida, Gainesville, FL, July 11, 1997.

83. "An Examination of Drinking Water using Elemental Neutron Activation Analysis," D.C. Beek, Interim Oral Report for SSTP Summer 1997, University of Florida, Gainesville, FL, July 11, 1997.

84. "Radiation Hormesis in *Arabidopsis Thaliana*: The Positive Effects of Low-Level Radiation," J. Knott, Interim Oral Report for SSTP Summer 1997, University of Florida, Gainesville, FL, July 11, 1997.

85. "Nuclear Power Plants Versus Non-Power Reactors: An Evaluative Comparison," W.G. Vernetson, Presentation for the 39th Annual Student Science Training Program and Teacher Research Update Experience Participants, University of Florida, Gainesville, FL, July 18, 1997.

86. "An Examination of Drinking Water using Elemental Neutron Activation Analysis," D. C. Beek, Final Oral Report for SSTP Summer 1997, University of Florida, Gainesville, FL, July 31, 1997.

87. "Radiation Hormesis in *Arabidopsis Thaliana*: The Positive Effects of Low-Level Radiation," J. Knott, Final Oral Report for SSTP Summer 1997, University of Florida, Gainesville, FL, July 31, 1997.

88. "An Examination of Drinking Water using Elemental Neutron Activation Analysis," D.C. Beek, Final Report for SSTP Summer 1997, University of Florida, Gainesville, FL, July 1997.

89. "Radiation Hormesis in *Arabidopsis Thaliana*: The Positive Effects of Low-Level Radiation," J. Knott, Final Report for SSTP Summer 1997, University of Florida, Gainesville, FL, July 1997.

90. "Neutron Activation Analysis — Sampling Car Exhaust in Road Dirt," K. VanReken, Senior Design Project Report for ENU-4905, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, August 7, 1997.

91. "UFTR Technical Specifications Amendment 22 Documentation," W.G. Vernetson, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, August 21, 1997.

92. "TRTR - National Organization of Test, Research, and Training Reactors Newsletter," Vol. 9., No. 3, W.G. Vernetson and R. Smith, Department of Nuclear and Radiological Engineering, University of Florida, Gainesville, FL, August, 1997.

93. "NRC Inspection Report No. 50-83/97-201," S.H. Weiss, U.S. Nuclear Regulatory Commission, Washington, D.C. (In Progress).

94. "The Synergistic Educational Role of the UFTR Neutron Activation Analysis Laboratory," W.G. Vernetson, Paper Formally Accepted for Presentation at the AND Winter Meeting to Be Held November 16-20, 1997 in Albuquerque, NM.

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

NRC LETTER WITH ATTACHMENTS
APPROVING UFTR TECHNICAL SPECIFICATIONS
AMENDMENT NUMBER 21

RECEIVED OCT 15 1996

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 10, 1996

Dr. William G. Vernetson
Director of Nuclear Facilities
102 Nuclear Reactor Building
Department of Nuclear Engineering
Sciences
University of Florida
Gainesville, Florida 32611

SUBJECT: ISSUANCE OF AMENDMENT NO. 21 TO FACILITY OPERATING LICENSE NO. R-56
TECHNICAL SPECIFICATION REVISIONS (TAC NO. M96341)

Dear Dr. Vernetson:

The Commission has issued the enclosed Amendment No. 21 to Facility Operating License No. R-56 for the University of Florida Training Reactor (UFTR). The amendment consists of changes to the Technical Specifications (TS) in response to your application dated August 2, 1996.

The amendment consists of revisions to the TS to permit you to submit your annual report of activities six months following the end of the UFTR prescribed end of year which occurs on August 31.

A copy of the related Safety Evaluation supporting Amendment No. 21 is enclosed.

Sincerely,

Theodore S. Michaels

Theodore S. Michaels, Project Manager
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 50-83

Enclosures:
1. Amendment No. 21
2. Safety Evaluation

cc: w/enclosures
See next page

cc:

Mr. James S. Tulenko, Chairman
Nuclear Engineering Sciences
Department
University of Florida
202 Nuclear Sciences Center
Gainesville, Florida 32611

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

Mr. Pedro B. Perez, Associate Director
Nuclear Reactor Program
North Carolina State University
P. O. Box 7909
Raleigh, North Carolina 27695-7909

Dr. R. U. Mulder, Director
UVA Reactor Facility
Dept. of Nuclear Engineering
Charlottesville, Virginia 22903-2442

Administrator
Department of Environmental Regulation
Power Plant Siting Section
State of Florida
2600 Blair Stone Road
Tallahassee, Florida 32301

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

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

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

UNIVERSITY OF FLORIDA

DOCKET NO. 50-83

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 21
License No. R-56

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to Facility Operating License No. R-56, filed by the University of Florida (the licensee), dated August 2, 1996, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's regulations as set forth in 10 CFR Chapter I:

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public;

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied; and

   F. Prior notice of this amendment was not required by 10 CFR 2.105 and publication of notice for this amendment is not required by 10 CFR 2.106.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the enclosure to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. R-56 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 21, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Seymour H. Weiss

Seymour H. Weiss, Director
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Enclosure:
Appendix A Technical
Specifications Changes

Date of Issuance: October 10, 1996

ENCLOSURE TO LICENSE AMENDMENT NO. 21

FACILITY OPERATING LICENSE NO. R-56

DOCKET NO. 50-83

Replace the following page of the Appendix A Technical Specifications with the enclosed page. The revised page is identified by Amendment number and contains a vertical line indicating the area of change.

Remove Page	Insert Page
36	36

(a) applicable circumstances leading to the violation including, when known, the cause and contributing factors

(b) effect of the violation upon reactor facility components, systems, or structures and on the health and safety of personnel and the public

(c) corrective action to be taken to prevent recurrence.

The report shall be reviewed by the RSRS and any followup report shall be submitted to the Commission when authorization is sought to resume operation of the reactor.

6.5.2 Action To Be Taken in the Event of an Occurrence of the Type Identified in Section 6.6.2.

(1) Reactor conditions shall be returned to normal or the reactor shall be shut down. If it is necessary to shut down the reactor to correct the occurrence, operations shall not be resumed unless authorized by Level 2 or designated alternates.

(2) Occurrence shall be reported to Level 2 or designated alternates and to the Commission as required.

(3) Occurrence shall be reviewed by the review group at their next scheduled meeting.

6.6 Reports

In addition to the requirements of the applicable regulations, reports shall be made to the Commission as follows:

6.6.1 Operating Reports

Routine annual reports covering the activities of the reactor facility during the previous calendar year shall be submitted to the Commission within six (6) months following the end of each prescribed year. The prescribed year ends August 31 for the UFTR. Each annual operating report shall include the following information:

(1) a narrative summary of reactor operating experience including the energy produced by the reactor and the hours the reactor was critical

(2) the unscheduled shutdowns including, where applicable, corrective action taken to preclude recurrence

(3) tabulation of major preventive and corrective maintenance operations having safety significance

(4) tabulation of major changes in the reactor facility and procedures, and tabulation of new tests of experiments, that are significantly different from those performed previously and are not described in the Safety Analysis Report, including conclusions that no unreviewed safety questions were involved

UNITED STATES
NUCLE[illegible]REGULATORY COMMISSION
[illegible]GTON, D.C. 20555-0001

SAFETY EVALUA[illegible]ICE OF NUCLEAR REACTOR REGULATION

[illegible]ENDMENT NO. 21 TO

FACILITY OPERATING LICENSE NO. R-56

UNIVERSITY OF FLORIDA

DOCKET NO. 50-83

1.0 INTRODUCTION

By letter dated August 2, 1996, the University of Florida (licensee) requested an amendment to its Technical Specifications (TS) for the University of Florida Training Reactor. The licensee requests that two additional months be allowed to submit the routine annual report covering activities of the reactor facility during the previous calendar year.

2.0 EVALUATION

Technical Specification 6.6.1 requires that the licensee submit an annual report covering the activities of the reactor facility during the previous calendar year within four months following the end of each prescribed year. The prescribed year ends August 31 for the licensee. The licensee is requesting that the end of the four months period, i.e., December 31, be changed to a six month period, i.e., end of February. The delay has been requested because December is a relatively high activity month with the end of fall semester classes and because facility staff typically take leave time after the end of classes. The additional two months is expected to provide assurance that the annual report can be filed on time and thus avoid the problem of failure to submit reports cited in NRC Inspection Report 50-83/96-01. The staff finds that a two month extension for submittal of the annual report will not affect the timely review of the annual report and therefore is acceptable.

3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves changes in the category of recordkeeping, reporting, and administrative procedures and requirements. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(10). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

4.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or the health and safety of the public.

Principal Contributor: Theodore S. Michaels

Date: October 10, 1996

APPENDIX B

SUBMITTAL DOCUMENTATION FOR UFTR TECHNICAL SPECIFICATIONS AMENDMENT NUMBER 22

UNIVERSITY OF FLORIDA

Nuclear Reactor Facility
Department of Nuclear and Radiological Engineering

202 Nuclear Sciences Center
P.O. Box 118300
Gainesville, Florida 32611-8300
Tel: (352) 392-1429
Fax: (352) 392-3380
E-mail: vernet@server.nuceng.ufl.edu

August 21, 1997

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

Amendment 22
UFTR Technical Specifications

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83
Request for Change in Technical Specifications

A proposed Amendment 22 to the UFTR Technical Specifications (R-56 License) affecting pages 30, 32 and 37 of the approved Tech Specs is attached. These changes are considered to be minor and will constitute Amendment 22 to the UFTR R-56 License as noted on the text pages. The changes are marked with the usual vertical line in the right-hand margin for Section 6.2.5 (Review and Audit) on page 32 and Section 6.6.1 (Operating Reports) on page 37.

First, Figure 6.1 (UFTR Organizational Chart) on page 30 in the Level 1 organization box is updated to reflect the name change from the "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering" for the department that continues to be responsible for operation of the University of Florida Training Reactor. It should be noted that this change was initiated by the faculty of the department to reflect better the educational and research activities and goals of the department and was approved by the University of Florida administration; the change is in name only as the same administrative structure continues in existence. On page 32, this same department name change is made once in paragraph 6.2.5(1), Composition and Qualifications, and three times in paragraph 6.2.5(2), Charter and Rules, subparagraph (a) of Membership.

Finally, on page 37, at the end of Section 6.6.1 (Operating Reports), the Attention Line is moved to the second line of the NRC's Washington, DC address. In addition, the address for submission of annual reports to Region II is deleted to reflect the transfer of the non-power reactor inspection program from the NRC Region II Office to the Office of Nuclear Reactor Regulation per a letter from Luis A. Reyes, Region II Regional Administrator dated August 1, 1997.

This change as requested is not considered to have any safety significance and involves a nomenclature change only. This change has been reviewed by UFTR management and by the Reactor Safety Review Subcommittee who concur on this evaluation.

This entire submittal consists of one signed original and thirteen copies of this letter of transmittal with the three-page proposed change to the UFTR Technical Specifications.

We appreciate your consideration of this amendment. Please let us know if you need additional information.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

WGV/dms
Enclosures (13 sets)

Copies: T. S. Michaels, NRC Project Manager
Reactor Safety Review Subcommittee
J. Powers, Acting Reactor Manager

Sworn and subscribed this 22nd day of August 1997.

Notary Public

MARY LYNN SLONE
MY COMMISSION # CC344109 EXPIRES
January 25, 1998
BONDED THRU TROY FAIN INSURANCE, INC.

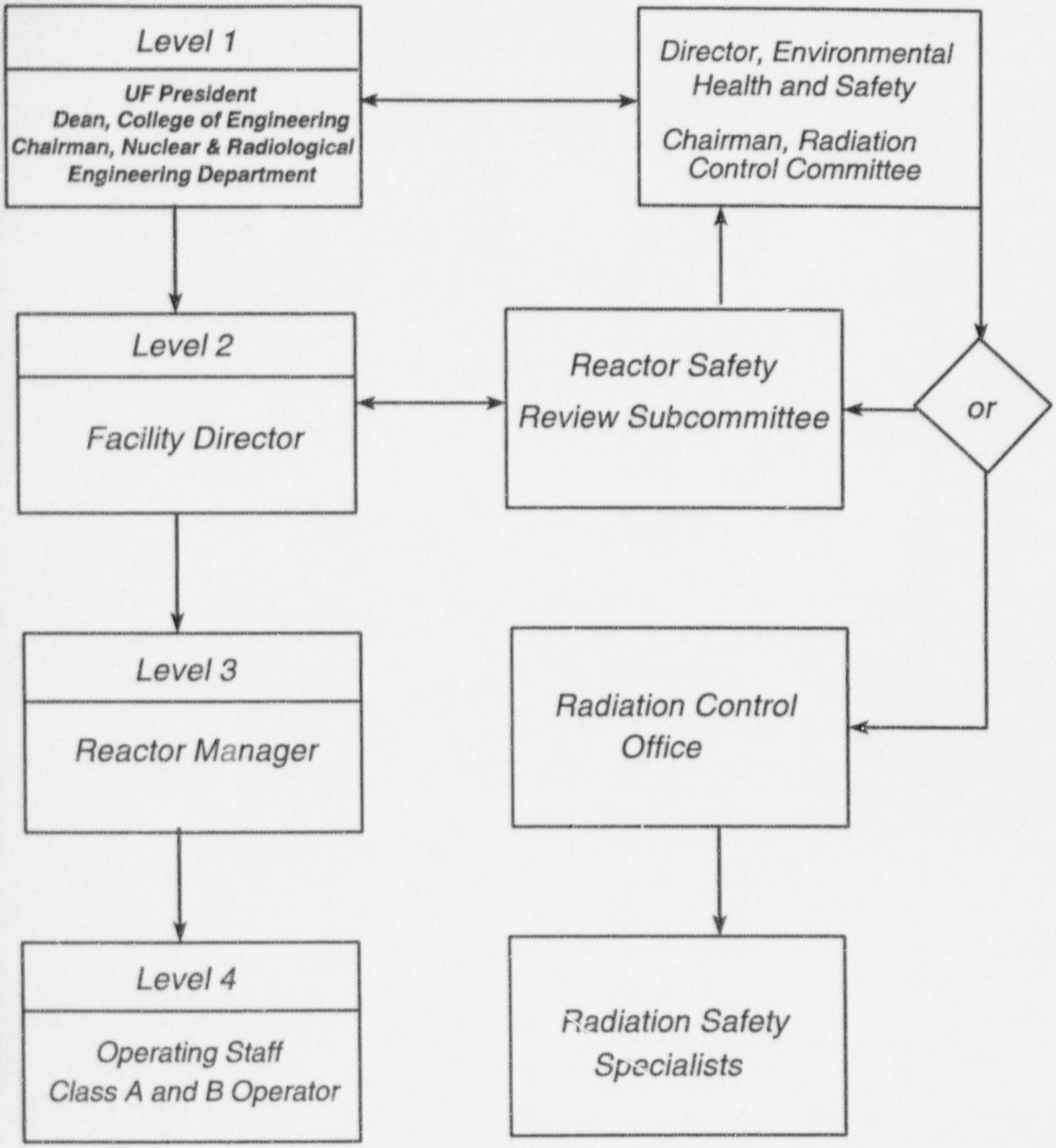


Figure 6.1 UFTR Organizational Chart

(1) Composition and Qualifications

The RSRS shall be composed of a minimum of five members, including the Reactor Manager and Radiation Control Officer (both ex-officio voting members), the Chairman of the Nuclear and Radiological Engineering Department and two other members having expertise in reactor technology and/or radiological safety.

(2) Charter and Rules

The review and audit functions shall be conducted in accordance with the following established charter:

Designation - The name of the Subcommittee is Reactor Safety Review Subcommittee (RSRS).

Accountability - The RSRS is a Subcommittee of and reports to the University Radiation Control Committee (URCC). The URCC provides radiological safety recommendations to the Director of Environmental Health and Safety.

Scope - The RSRS shall be responsible for the review of safety-related issues pertaining to the University of Florida Training Reactor (UFTR).

Purpose - The purpose of the RSRS is to ensure the safe operation of the UFTR through the discharge of the Subcommittee review and audit function.

Membership

(a) The RSRS shall consist of at least five members. Membership will include the Chairman of the Nuclear and Radiological Engineering Department, University Radiation Control Officer, Reactor Manager and two technical personnel familiar with the operation of reactors and with the design of the UFTR and radiological safety, at least one of whom is from outside the Department of Nuclear and Radiological Engineering. The two technical personnel will be recommended to the Chairman of the URCC by the Chairman of the Department of Nuclear and Radiological Engineering. Any member may designate a duly qualified representative from a standing URCC approved list to act in his absence.

(b) An Executive RSRS Committee will consist of the Reactor Manager, University Radiation Control Officer and Chairman of the RSRS.

(c) The Chairman of the RSRS will be appointed by the Chairman of the URCC. The Chairman of the RSRS is an ex-officio voting member of the URCC and will serve as liaison between the RSRS and the URCC.

(d) Members appointed to the RSRS shall be reviewed, and as appropriate, new appointments made by October 1 of each calendar year.

(5) A summary of the nature and amount of radioactive effluents released or discharged to the environs beyond the effective control of the facility operators as determined at or before the point of such release or discharge. (The summary shall include to the extent practicable an estimate of individual radionuclides present in the effluent. If the estimated average release after dilution or diffusion is less than 25% of the concentration allowed, a statement to this effect is sufficient.)

(6) A summarized result of environmental surveys performed outside the facility.

(7) A summary of exposure received by facility personnel and visitors where such exposures are greater than 25% of that allowed.

The annual report shall be submitted with a cover letter to:

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

6.6.2 Special Reports

There shall be a report not later than the following working day by telephone and confirmed in writing by telegraph or similar conveyance to the Commission, to be followed by a written report that describes the circumstances of the event within 14 days of any of the following:

(1) Release of radioactivity from the site above allowed limits.

(2) Violation of safety limits (see Section 6.5.1).

(3) Any of the following:

(a) Operation with actual safety-system settings for required systems less conservative than the limiting safety-system settings specified in the Technical Specifications.

(b) Operation in violation of limiting conditions for operation established in the Technical Specifications unless prompt remedial action is taken.

(c) A reactor safety system component malfunction that renders the reactor safety system incapable of performing its intended safety function, unless the malfunction or condition is discovered during maintenance test or periods of reactor shutdowns. (Note: Where components or systems are provided in addition to those required by the Technical Specifications, the failure of the extra components or systems is not considered reportable provided that the minimum number of components or systems specified or required perform their intended reactor safety function).

(d) An unanticipated or uncontrolled change in reactivity greater than one dollar (reactor trips resulting from a known cause are excluded).

APPENDIX C

DOCUMENTATION FOR
UFTR SAFETY ANALYSIS REPORT
REVISION 10

UNIVERSITY OF FLORIDA

Nuclear Reactor Facility
Department of Nuclear and Radiological Engineering

202 Nuclear Sciences Center
P.O. Box 118300
Gainesville, Florida 32611-8300
Tel: (352) 392-1429
Fax: (352) 392-3380
E-mail: vernet@server.nuceng.ufl.edu

March 17, 1997

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

UFTR Safety Analysis Report
Revision 10, 3/97

Dear Sir/Madam:

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

Enclosed is Revision 10 to the UFTR Safety Analysis Report (SAR) dated January 1981 submitted as part of our last relicensing effort. Revision 10 consists of changes to a single page. The revision was initiated as a result of comments from a staff member checking material for training purposes. This change has been reviewed by UFTR management and the UFTR Safety Review Subcommittee and is not considered to involve any unreviewed safety question or to impact the UFTR Safety Analysis as outlined below.

Essentially, the change was made because Figure 7-2 (Operating Range of UFTR Neutron/Power Level Detectors) on page 7-5 was noted to be inconsistent. The figure has two scales—Power Level (Percent) on the left-side axis and Power Level (Watts) on the right-side axis—but the two axes did not agree for the four detectors noted. Basically, the power level (percent) on the left axis had been mistyped so it disagreed with the actual power level (Watts) by an order of magnitude. This error was apparently made during the drawing production process for the SAR submitted in 1981; since references to the figure are usually for power level purposes, the obvious error was not previously noted. The reworked computer-generated figure is now stored for easy incorporation elsewhere and is better set up for user reference.

As indicated, this Revision 10 change has been fully reviewed by UFTR management and by the Reactor Safety Review Subcommittee to assure no unreviewed safety questions were involved and so is not considered to relax the requirements for assuring protection of the health and safety of the public and of the reactor facility. The change simply updates the Safety Analysis Report to reflect the existing facility and its operations by correcting an incorrect figure.

Equal Opportunity/Affirmative Action Institution

The entire transmittal consists of one signed original letter with enclosure plus ten copies of the entire set. If further information is required, please advise.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

WGV/dms
Enclosures

Copies: USNRC Region II
T. Michaels, NRC Senior Project Manager
Reactor Safety Review Subcommittee
D. Cronin, UFTR Reactor Manager

Sworn and subscribed this 17th day of March 1997.

Kathleen A. Wilson
Notary Public

KATHLEEN A. WILSON
MY COMMISSION # CC 453395
EXPIRES: April 17, 1999
Bonded Thru Notary Public Underwriters

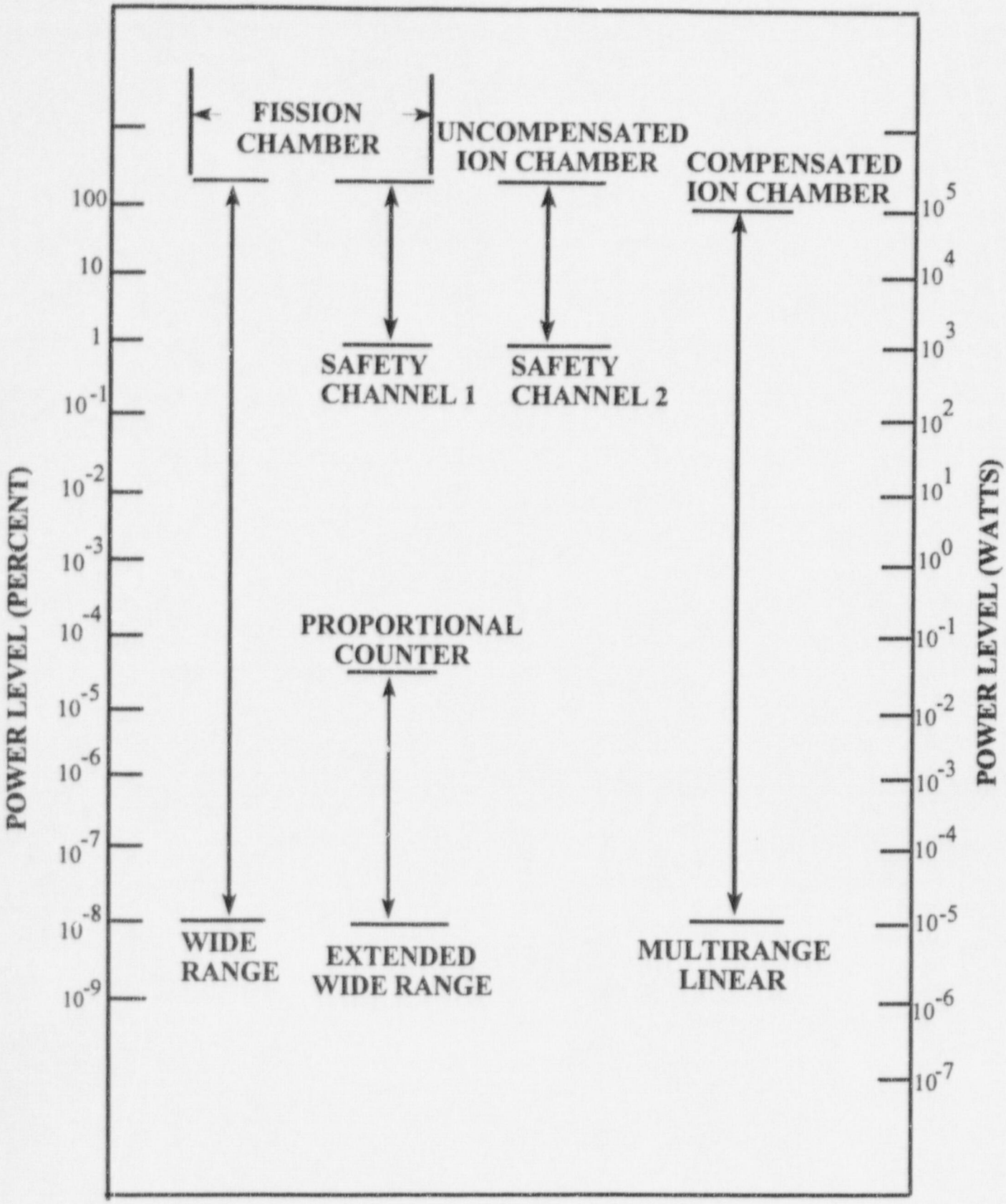


Figure 7-2. Operating Range of UFTR Neutron/Power Level Detectors.

APPENDIX D

UFTR STANDARD OPERATING PROCEDURES MAJOR REVISIONS GENERATED FOR 1996-97 REPORTING YEAR:

1. **UFTR SOP-A.1, "PRE-OPERATIONAL CHECKS" (REV 16, 2/97)**

2. **UFTR SOP-B.4, "FLOOD" (REV 2, 8/97)**

3. **UFTR SOP-C.3, "FUEL INVENTORY PROCEDURE" (REV 4, 8/97)**

UFTR OPERATING PROCEDURE A.1

1.0 Pre-operational Checks

2.0 Approval

Reactor Safety Review Subcommittee .... [signature] 2/7/97 Date

Director, Nuclear Facilities ..... William G. Vernetson 2/6/97 Date

3.0 Purpose and Discussion

3.1 General

3.1.1 The pre-operational checks shall be performed by a licensed reactor operator or trainee(s) under the direct supervision of a licensed reactor operator.

3.1.2 Pre-operational checkoff sheets and other materials documenting completion of the checkouts shall be maintained in accordance with the Technical Specifications.

3.1.3 The following conventions shall be used with this procedure:

3.1.3.1 An underlined statement implies a command, or action to be taken.

3.1.3.2 Quotation marks indicate annunciation at the console.

3.1.3.3 Parentheses are used to denote the required indication or instrument reading.

3.1.3.4 Discrepancies shall be noted with an asterisk in the blank provided on the check off sheet and explained in the "comments" section of the respective weekly or daily checkoff sheets.

3.1.3.5 Asterisks (*) are used to indicate items requiring values to be recorded within the instructions sections of this procedure, or on the Weekly Pre-operational Check Sheet (UFTR Form SOP-A.1A), or on the Daily Pre-operational Check Sheet (UFTR Form SOP-A.1B) when used to record the results of the weekly and daily checkouts.

3.1.4 The reactor console key must be under the control of a licensed reactor operator at all times. If the console is left unattended, the key shall be secured by being in the actual possession of a licensed reactor operator or locked in the designated key cabinet.

3.2 Weekly Pre-operational Checks

3.2.1 The weekly pre-operational checkout of the UFTR will be performed routinely on the first working day of the week when the reactor is operable. During extended shutdown periods for administrative purposes, maintenance, or modifications, the weekly pre-operational checks will be performed each week on the operable systems.

3.2.1.1 A single page abbreviated form (UFTR Form SOP-A.1A) as contained in Appendix I will normally be used to record these checkout actions and results, but

3.2.1.2 A copy of SOP-A.1 (Steps 7.0 through 7.1.25) may be used to document performance of the weekly checkout.

3.2.2 The weekly pre-operational checks (SOP-A.1, Steps 7.0 to 7.1.25) shall have been completely performed within seven (7) days prior to reactor startup except that any item or situation not required by Technical Specifications for operation or to make the reactor operable may be omitted provided that:

3.2.2.1 The deviation is noted on UFTR Form SOP-A.1A Weekly Pre-Operational Check Sheet or on the copy of SOP-A.1 (Steps 7.0 through 7.1.25) used to document the performance of the weekly checkout in the comments section when the deviation occurs during the performance of the weekly checkout, and upon discovery in the Daily Operations Log; and,

3.2.2.2 All operations that involve making the reactor operable must be specifically authorized by the Reactor Manager or the Facility Director and noted as a line item in the Daily Operations Log.

3.3 Daily Pre-operational Checks

3.3.1 The daily pre-operational checkout of the UFTR will be performed in accordance with the checklist starting with Step 7.2.

3.3.1.1 A two page abbreviated form (UFTR Form SOP-A.1B) as contained in Appendix I will normally be used to record these checkout actions and results, but

3.3.1.2 A copy of SOP A.1 (Steps 7.2 to 7.2.6.4) may be used to document completion of the daily checkout.

3.3.2 A daily pre-operational check must have been started and satisfactorily completed within eight (8) hours prior to reactor startup. Items or situations checked by SOP-A.1, Steps 7.2 to 7.2.6.4 may be omitted for satisfactory completion of the Daily Pre-Operational Check, provided that:

3.3.2.1 Such deviation is noted in the comments section of UFTR Form SOP-A.1B or the copy of SOP-A.1 (Steps 7.2 to 7.2.6.4) used to document the daily checkout; and

3.3.2.2 The operation that the startup supports has been specifically authorized by the Reactor Manager or the Facility Director, who shall indicate with the authorization that:

3.3.2.2.1 The Reactor Manager and/or the Facility Director is fully cognizant of the deviating condition, and

3.3.2.2.2 The deviating condition is compatible with the Technical Specifications requirements for startup or reactor operability.

3.3.3 The requirements for actual completion of the daily and weekly checkouts may be waived providing that the reactor startup is made within six (6) hours of a normal reactor shutdown. For these purposes, a normal reactor shutdown means that the reactor had been critical with proper functioning of all instruments and components, and that a shutdown had been effected under normal conditions.

3.3.4 A deenergization of the nuclear instrumentation (loss of electrical power or opening of the circuit breaker behind the console rear center door) or electrical transient which drops out a scram relay requires a subsequent completion of the daily pre-operational check before the reactor may be started. This startup must be authorized by a licensed senior reactor operator to include "documented verbal concurrence," which must be entered in the reactor operations log.

3.4 Successful completion of a weekly pre-operational checkout or a daily pre-operational checkout is defined as performance of all steps listed in the appropriate checklist with attendant observation of required equipment conditions and response except as noted in Sections 3.2.2 and 3.3.2.

4.0 Limits and Precautions

4.1 General

4.1.1 After reactor operation at power, it may take up to 12 hours for the Argon-41 in the core to decay to a background level (about 1 cps). If the diluting and/or vent fans are stopped while Argon-41 levels are still high, the radiation levels in the reactor cell may become high enough to set off the low level trip on the area monitors. Section 3.3.1 of the UFTR Technical Specifications states that the vent system shall be operated until the stack monitor indicates less than 10 counts per second unless otherwise indicated by facility conditions to include:

4.1.1.1 Loss of building electrical power.

4.1.1.2 Equipment failure.

4.1.1.3 Cycling console power to dump primary coolant.

4.1.1.4 Performance of tests and surveillances.

4.1.1.5 Initiation of evacuation alarm for tests and surveillances including emergency drills.

NOTE: If the stack count rate monitor indicates 10 cps or higher, the time these fans are secured for these reasons should be minimized.

CAUTION

When the stack count rate monitor indicates 10 cps or higher, the diluting and/or vent fans shall not be secured except for one of the conditions delineated in items 4.1.1.1 through 4.1.1.5.

4.1.2 Prior to a startup, no known condition may exist which has the capability of preventing a successful completion of a weekly or daily checkout except as noted in Sections 3.2.2 and 3.3.2.

4.2 Weekly Pre-operational Checks

4.2.1 Entry into the equipment pit is to be controlled by the guidelines enumerated in UFTR SOP-D.3, "Primary Equipment Pit Entry."

4.2.2 Entry into the equipment pit shall be made no sooner than 15 minutes after shutdown from a power run above 1 kW to allow Nitrogen-16 activity to decay. The radiation level shall be checked prior to and during each initial entry. Twenty-four hours after shutdown, gamma levels are normally less than 5 mR/hr. However, contact gamma level at the demineralizer can remain as high as 100 mR/hr.

4.2.3 Prior to entry into the equipment pit, a check shall be made for evidence of primary water leakage. If wet spots or water marks are visible, full Anti-C's will be required until Radiation Control determines that no surface contamination exists above limits specified in UFTR SOP-D.1. All primary coolant leakage must be reported immediately to the Reactor Manager and Radiation Control.

4.2.4 Upon initial entry into the equipment pit, partial Anti-C's shall be worn and swipes taken to determine the level of contamination. Checks shall be made routinely for visible leaks. UFTR surface contamination limits are 100 DPM/100 cm^2 beta-gamma and 50 DPM/100 cm^2 alpha. If actual levels of contamination are less than these limits, subsequent pit entry does not require Anti-C protection.

4.2.5 Shortly after power operation, a few drops of primary coolant can contaminate a swipe to 450 cpm beta-gamma (adjusted to a detector efficiency of 45%). This corresponds to 1000 DPM or 10 times the permissible UFTR limit. Any radiation level above background in the pit could indicate a potentially hazardous condition with regard to handling primary coolant.

5.0 References

5.1 UFTR Safety Analysis Report

5.2 UFTR Technical Specifications

5.3 UFTR Emergency Response Plan

5.4 UFTR Physical Security Plan

5.5 UFTR Operation and Maintenance Manual

5.6 UFTR SOP-D.1 (Radiation Protection and Control)

5.7 UFTR SOP-D.2 (Radiation Work Permit)

5.8 UFTR SOP-D.3 (Primary Equipment Pit Entry)

5.9 UFTR SOP-E.1 (Changing Primary Purification Demineralizer Resins)

5.10 UFTR ALARA Program

6.0 Records Required

6.1 UFTR Operations Log entry

6.2 Weekly Pre-operational Checkout List (UFTR Form SOP-A.1A)

6.3 Daily Pre-operational Checkout List (UFTR Form SOP-A.1B)

7.0 Instructions

7.1 Weekly Pre-operational Checks

Record start time on UFTR Form SOP-A.1A (if UFTR Form SOP-A.1A is used to record the performance of the weekly pre-operational checks) . . . . . *_____

The time taken to accomplish checkouts following this procedure is needed to accurately reflect utilization and training time at the UFTR and should be entered into the Reactor Operations Log.

7.1.1 Stop Core Vent and Stack Dilute Fans . . . . . _____

7.1.2 Diluting Fan System (access from the reactor building annex basement)

7.1.2.1 Check Diluting Fan Drive Belts (condition and tension) . . . . . _____

(Proper tension is indicated by a deflection of about 1 inch.)

7.1.2.2 Check temperature of motor and diluting fan bearings by touch for excessive heat . . . . . _____

7.1.2.3 Check integrity of fabric coupling between blower housing and ductwork . . . . . _____

7.1.2.4 Check for deterioration of mechanical tachometer generator rubber coupling . . . . . _____

7.1.2.5 Check optical tachometer including reflective tape . . . . . _____

7.1.3 Check blade gear box oil levels . . . . . _____

(Oil level should just be visible. If breather cap air hole is plugged, it may cause abnormal level indication. Add oil as needed with Macoma No. 33 [Shell Oil] or equivalent. Add only the amount of oil required to establish a visible level. A maintenance log page should be used to control oil addition.)

7.1.4 Check zero level of inclined manometers and the Magnehelic gage . . . . . _____

7.1.5 Source Check portal monitor for proper response (each detector should be confirmed to yield a light and an alarm for proper operation) . . . . . _____

7.1.6 Core Vent and Diluting Fan Systems

7.1.6.1 Depress Core Vent Fan Switch to check core vent fan interlock . . . . . _____

(With the dilutant fan deenergized, the lower half of the core vent light will illuminate with the upper half deenergized.)

7.1.6.2 Start Stack Diluting Fan (460 rpm minimum) and record rpm indications . . . . . *____/*____rpm

7.1.6.3 Verify proper operation of the core vent damper by either of two methods:

7.1.6.3.1 Verify that a significant length of time elapses between fan start and stable flow indication; or . . . . . _____

7.1.6.3.2 Observe that the core vent damper opens slowly as the core vent fan is energized . . . . . _____

7.1.6.4 Record D/P indications for core vent filters and vent flow rate:

Rough Filter (D/P in green range of manometer) . . . . . *_____in

Absolute Filter (D/P in blue range of manometer) . . . . . *_____in

Vent flow (D/P consistent with flow desired--refer to chart posted under instrument) . . . . . *_____in

7.1.7 Start Shield Water Recirculation Pump . . . . . _____

7.1.8 Start Demineralizer Pump . . . . . _____

7.1.9 Reset Magnet Power Key and release (maintain slight down pressure on the key while turning it) . . . . . _____

[CAUTION — See Next Page]

CAUTION

Prior to energizing control blade circuits (drive or clutch), an authorizing signature is required to be entered in the Daily Operations Log, a qualified second person is required to be present in the UFTR complex, and a designated SRO is required to be readily available on call.

NOTE: Any deenergized scram relay ensures that control blade circuits remain deenergized.

(If the dump valve buzzes excessively, cycle console "POWER ON" switch, and repeat Step 7.1.9.)

7.1.10 Check "REACTOR ON" exterior lights (4) . . . . . _____

7.1.11 Start log/linear neutron recorder and check for proper operation and adequate ink and chart supply . . . . . _____

(The log/linear recorder is placed into operation to provide a record of the neutron level during core filling [Step 7.1.12]. The addition of water adds positive reactivity and therefore reduces shutdown margin.)

7.1.12 Start Primary Coolant Pump and record flow, when stable . . . . . *_____gpm

(Normal flow is about 40-45 gpm; stable flow rate is achieved in about 2 minutes of pump operation.)

7.1.13 Source Alarm Check

7.1.13.1 Depress Source In/Out Alarm Switch and leave in the "IN" position to energize the source alarm. Rotate Safety 1 Calibration Switch to Position 3. Operate Safety 1 Trip Test Control to advance indication on log power scale. Verify that at 10^{-1}% power indication, audible alarm annunciates. Return Source In/Out Alarm Switch to the "OUT" position (if applicable). Return Safety 1 Controls to OFF or OPERATE . . . . . _____

7.1.14 Primary Coolant Resistivity Determinations

7.1.14.1 Check in line primary coolant resistivity at SOLU-Bridge mounted on the control room wall. Set compensating temperature to temperature indicated by Point 7 (primary coolant inlet) on temperature monitoring panel . . . . . _____

7.1.14.2 Check resistivity at inlet to demineralizer . . . . . * _____Megohm-cm

7.1.14.3 Check resistivity at outlet from demineralizer and return sensor to monitor inlet to demineralizer . . . . . * _____Megohm-cm

(When outlet resistivity drops and stays below 1 Megohm-cm, demineralizer resins should be changed. A Radiation Work Permit (RWP) must be prepared (see UFTR SOP-D.2) and used for changing of primary resins, as per UFTR SOP-E.1.)

7.1.15 Blade Withdrawal Time Measurements

NOTE: Commencement of this step requires that a qualified second person be entered in the daily operating log, and present in the Reactor Building Complex, and that an authorizing signature be made by the Reactor Manager or his assigned representative approving the reactor operation of putting the UFTR in a non-secured status. A designated SRO is also required to be readily available on call.

These checks verify proper operation of the blade drive motors and digital indicators.

CAUTION

Ensure no personnel are in the equipment pit during these checks.

7.1.15.1 Sequentially measure and record elapsed time for a full withdrawal of each blade as indicated by the red upper limit light illuminated, record the blade position at fully inserted and fully withdrawn and return the blade to the fully inserted position (white down light illuminated).

NOTE: As one blade is being inserted, the next in the test sequence may be withdrawn.

NOTE: Proper functioning of neutron instrumentation should always be observed during reactivity changes such as these; abnormalities should be noted by log entry for further investigation.

BLADE	BLADE POSITION Full In	Full Out	WITHDRAWAL TIME (Seconds)
Safety 1	_____	_____	_____
Safety 2	_____	_____	_____
Safety 3	_____	_____	_____
Regulating	_____	_____	_____

7.1.16 Dump primary coolant as per UFTR SOP-A.4 Step 7.9 . . . . . _____

7.1.17 Secure the console Magnet Power Key . . . . . _____

The reactor console key must always be under direct control of a licensed operator or locked in the key cabinet mounted on the east side of the reactor.

7.1.18 Secure log/linear recorder and temperature recorder. Secure core vent and stack dilution fans if appropriate. See Argon-41 Caution in Item 4.1.1.

Log/linear recorder is normally left with chart drive off and both pens lifted.

Place temperature recorder print wheel in down position and turn off chart drive switch . . . . . _____

7.1.19 Equipment Pit Checkout

7.1.19.1 Preparation for equipment pit checkout:

7.1.19.1.1 Remove the shielding from the primary equipment pit . . . _____

7.1.19.1.2 Assemble three (3) capped, labelled plastic bottles for sample collection, one (1) one liter bottle and two (2) bottles of at least 100 ml capacity. Rinse sample bottles with demineralized water prior to entry into the pit. Verify that the capped bottles do not leak.

7.1.19.1.3 Fill a fourth large bottle about one-half full of tap water for an equipment pit alarm check. Place all bottles on the stepoff pad for the primary equipment pit.

7.1.19.1.4 Place a low level beta gamma survey meter on the equipment pit stepoff pad. Record survey instrument and serial number . . . . . *_____/*_____

7.1.19.1.5 Prepare four (4) or more swipes for contamination survey and place on the equipment pit stepoff pad.

7.1.19.1.6 Perform a pit entry per SOP-D.3 . . . . . _____

7.1.19.2 Gamma Radiation Levels

7.1.19.2.1 Check Primary Coolant Tank (Maximum Gamma Level) . . . . . *_____mR/hr

(Normally at or near background -- abnormal reading could indicate fuel meat is exposed to cooling water or possible secondary to primary leak. A pin hole leak in the fuel cladding could cause a noticeable increase in the radiation level of the storage tank. Radiation levels will normally be higher than background for a time after shutdown.)

7.1.19.2.2 Check Core Vent Filters (Maximum Gamma Level) externally, on contact . . . . . *_____mR/hr

(Normally at or near background -- abnormal reading could be the result of radioactive products from an experiment that is vented to the core vent system, from a coolant leak (during operation) near the core, or from fission products or activation products in the primary coolant storage tank.)

7.1.19.2.3 Check Primary Purification Demineralizer (Maximum Gamma Level) . . . . . * _____ mR/hr

(Levels can be as high as 100 mR/hr, depending on recent operational history.)

7.1.19.3 Check operation of equipment pit alarm . . . . . _____

(Verify alarm occurs when sump is filled with prepared tap water, clears when sump is drained - the bottle will now be used as a purge volume for water samples.)

7.1.19.4 Obtain primary, secondary sample tank, and secondary heat exchanger water samples . . . . . _____

Partially fill purge bottle prior to sampling each point to flush the sample lines; then fill the sample bottle about 3/4 full. Properly cap bottles.

The primary sample is taken from the inlet side of the demineralizer system into the one liter bottle and is representative of the water in the coolant storage tank.

The sample tank collects a sample of secondary cooling water anytime the secondary cooling system is in operation. This sample is collected in a 1000 ml or larger bottle and is representative of the radioactive content of effluent discharged to the storm drains in the event of a primary to secondary leak.

The secondary heat exchanger sample is a sample representative of conditions in the secondary heat exchanger at the time of sampling. This sample is collected into a 100 ml or larger bottle.

7.1.19.5 Check Demineralizer Flow . . . . . * _____ gpm

(Flow is read at the indicator line near the middle of the flow indicator and taken with the demineralizer pump running. Normal flow for the demineralizer pump is about 0.7 gpm if all filters in line are clean.)

7.1.19.6 Check Rupture Disk for Moisture . . . . . _____

(Feel bottom surface gently; moisture could indicate a leak or crack in the disk.)

7.1.19.7 Check Dump Valve . . . . . _____

(Dump valve should operate freely when operated by hand. Check for water leakage along stem.)

7.1.19.8 Check Primary Coolant Storage Tank Level (20 inches minimum) . . . . . *_____in

CAUTION

Water shall not be added to the Primary Coolant Storage Tank after reactor startup commences.

NOTE: Starting the Primary Coolant Pump causes water level to drop about 7 inches in the storage tank, corresponding to 44 gal. of water. During power operation, primary coolant is lost due to evaporation at the rate of about 10-30 gal/week for 50 hours of 100 kW operation.

7.1.19.9 Perform swipe survey of the equipment pit . . . . . _____

7.1.20 Water Sample Analysis

7.1.20.1 Prepare resistivity bridge:

7.1.20.1.1 Monitor resistivity of demineralized water flow at 1.0 gpm until resistivity is one Megohm-cm or higher.

7.1.20.1.2 Leave the probe immersed in demineralized water; rinse all equipment to be used in collection or analysis.

7.1.20.2 Determine primary coolant sample resistivity:

Add sufficient primary coolant to the beaker to cover the probe electrodes and the vent hole. Record a resistivity value when all air is vented from the probe. (Resistivity shall be greater than 0.4 Megohm-cm.) . . . . . *_____Megohm-cm

Empty beaker into reactor cell sink (sink drains to radiological waste storage tanks) and rinse sink. Rinse beaker and probe with demineralized water to decontaminate them.

NOTE: Because secondary water pressure in the heat exchanger is greater than that of the primary, first evidence of a primary-secondary lea should be a large reduction of primary water resistivity.

7.1.20.3 Deliver remaining primary sample (100 ml minimum in a properly capped bottle) to Radiation Control for activity analysis as per UFTR SOP-D.1 . . . . . _____

Primary coolant activity analysis consists of:

1. Gross beta-gamma for general activity.
2. Alpha to detect possible fuel plate leakage.
3. Gross beta-gamma to check for the presence of long-lived activity.

Note: Additional spectral analysis on a high purity germanium (HPGe) or equivalent detector system may be performed as deemed advisable. Such spectral analysis should be performed whenever the sample indicates an unusually or unexpectedly high level of activity.

7.1.20.4 Obtain shield water sample.

7.1.20.5 Check shield water system resistivity (0.6 Megohm-cm minimum) . . . . . *_____Megohm-cm

7.1.20.6 Deliver a sample of shield water (100 ml minimum) to Radiation Control to be checked for gross activity as per UFTR SOP-D.1 . . . . . _____

7.1.20.7 Deliver a sample of water (100 ml minimum) from the heat exchanger to Radiation Control for analysis of gross activity as per UFTR SOP-D.1 . . . . . _____

7.1.20.8 Deliver a sample of water (up to 100 ml) from the Secondary Sample Tank to Radiation Control for analysis of gross activity as per UFTR SOP-D.1 . . . . . _____

7.1.21 Air Particulate Detectors

Note: Only one of two air particulate detectors is required to be operating to meet the requirements for a valid weekly checkout.

> CAUTION
>
> Great care must be taken when changing the APD filter paper. Insertion of fingers or foreign objects into the unit may destroy the thin Mylar window of the detector.

7.1.21.1 Stop air pump, replace filter paper, restart pump for each APD (AIM-3BL/AMS[4]) . . . . . _____/_____

(The removed filter paper should be treated as potentially contaminated material and given to cognizant Radiation Control personnel for counting.)

7.1.21.2 For Air Particulate Detector #1 (AIM-3BL):

7.1.21.2.1 Turn screw on the bail so the filter holder is snug against inner gasket to ensure air flow does not bypass filter paper.

Check alarm by turning pointer upscale to contact meter pointer. Alarm indications consist of an intermittent ringing bell and a red light. Range switch is normally left on the X10 range

Move pointer to 0% of scale and reset alarm by depressing reset switch . . . . . _____

7.1.21.2.2 Check air flow at middle of the ball (10-45 liters per minute) . . . . . *_____lpm

7.1.21.3 For Air Particulate Detector #2 (AMS^4):

7.1.21.3.1 Press the detector lid until the latch is engaged. Using the front panel keypad, test the inputs and outputs of the unit to include alarm function. Return the unit to normal operation . . . . . _____

7.1.21.3.2 Check airflow via front panel indications (required to be above 10 liters per minute) (AMS^4) . . . . . *_____lpm

7.1.21.4 Check proper operation of each recorder (AIM-3BL/AMS^4) . . _____/_____

7.1.22 Radiation Monitor Console

7.1.22.1 Stack Effluent Monitors

7.1.22.1.1 Check adjustable alarm on Auxiliary Alarm Panel by bringing red pointer of meter down to contact the black indicating pointer. Red light should illuminate and bell should ring. Clear alarm by raising alarm pointer . . . . . _____

7.1.22.1.2 Check high level non-adjustable alarm by turning switch on stack monitor control module to TRIP ADJ position and holding. Trip 2 (yellow light) and Trip 1 (red light) should illuminate and sonalert alarm should activate. Release switch. Press TRIP lights to reset stack module if needed . . . . . _____

7.1.22.2 Area Radiation Monitors

NOTE: Occupants in Annex and Reactor Building should be notified that the siren will be tested.

Place siren in bypass on auxiliary alarm panel . . . . . _____

Check response of each area monitor trip unit (Trip 2, yellow light; Trip 1, red light and audible alarm) by placing test switch in CHECK SOURCE position.

	East	North	South	
Trip 2 (2.5 mR/hr)	_____	_____	_____	mR/hr
Trip 1 (10 mR/hr)	_____	_____	_____	mR/hr

Check coincidence circuitry by placing two (2) test switches in CHECK SOURCE to lock in the Trip 1 signal for two area monitors in the following combinations:

1. East and South
2. East and North
3. North and South

Observe red flashing light indicating siren is operative each time (siren should not sound) . . . . . _____

7.1.22.3 With two area monitors alarming at 10 mR/hr and red siren light flashing on, quickly turn siren bypass key to normal and back to bypass for siren test. (Check that green power lights on auxiliary alarm panel labelled "UFTR" and "Annex" go out as sirens activate to indicate proper functioning of both sirens. Minimize length of time that sirens are on so this exercise can be recognized as a test.) Clear alarm lights on area monitor modules and return bypass key switch to normal and remove key . . . . . _____

Check that red light on air conditioning control box is on, and check that core diluting and vent fans are tripped (bottom halves of control switches energized, top halves deenergized) . . . . . _____

7.1.22.4 Test manual evacuation alarm, momentarily activating the manual alarm switch (red toggle switch) on the auxiliary alarm panel. Observe red light. Check that the Green indicating lights go out momentarily . . . . . _____

7.1.22.5 Reset air conditioner (A/C) (red light on A/C control box goes out) by pressing switch on the bottom of the A/C control box; reset diluting and vent fans by depressing "Reset Fans" button on auxiliary alarm panel . . . . . _____

7.1.23 Secure or check secured secondary water, and clean secondary strainer . . . . . _____

7.1.24 Check for proper operation of security system monitors . . . . . _____

7.1.25 Complete Records

7.1.25.1 Complete UFTR Form SOP-A.1A (if used):

7.1.25.1.1 Record operator of record and trainees.

7.1.25.1.2 Record time and date checkout was completed.

7.1.25.1.3 Record any discrepancies in the comments section.

7.1.25.2 Complete Operations Log (Pre-operational Check, Weekly Checks Section):

7.1.25.2.1 Record operator of record (trainees may be noted).

7.1.25.2.2 Record time and date the weekly checkout was completed as recorded in Step 7.1.25.1.2.

7.1.25.2.3 Complete Section labelled "Comments."

If the Weekly Checkout was completed satisfactorily, indicate satisfactory completion; if the Weekly Checkout could not be completely performed as written, note any discrepancies and/or abnormalities . . . . . *_____

7.1.25.3 If SOP-A.1 Steps 7.1 to 7.1.24 are used as a record of completion of the daily pre-operational check, complete the following information:

Time Completed: _____ Date Completed: _____

Operator: _____

Trainee: _____

Comments: _____

_____

_____

_____ _____

7.2 Daily Pre-operational Checks

Record start time in the indicated space at the top of form UFTR-SOP-A.1B (if used to record the performance of the daily pre-operational checks) . . . . . * _____

7.2.1 Console and Equipment Power

7.2.1.1 Ensure both east wall electrical power breakers are on . . . . . _____

7.2.1.2 Ensure well pump motor breaker on, unless on city water . . . . _____

7.2.1.3 Depress console "POWER ON" backlit switch, if off, to illuminate . . . . . _____

NOTE: If console appears to be completely deenergized, check overload trip breaker, inside rear center door of console. If tripped, reset. If it trips again, stop; proceed no further with the checkout. Notify Senior Reactor Operator or Reactor Manager of the situation.

7.2.1.4 Light Bulb Check

7.2.1.4.1 Cycle green "POWER ON" switch to illuminate all scram annunciator lamps on left panel . . . . . _____

NOTE: "INT'LK," "PERIOD," and "SOURCE" lights indicate interlocks (not scrams) and may not illuminate at this time.

7.2.1.4.2 Depress any unlit switch on right motor control annunciator panel . . . . . _____

NOTE: "DUMP VALVE," "FLOW SCRAM," and "WARN WELL" indicators are not switches, but should illuminate due to system conditions.

7.2.1.4.3 Cycle mode selector switch, and leave in "MANUAL" position to verify lamps in both modes are functional . . . . . _____

7.2.1.4.4 Verify illumination of control blade "DOWN" lights . . . . . _____

7.2.1.5 Recorder Checkouts

7.2.1.5.1 Check for sufficient chart and ink supply on Log/Linear recorder. If off, turn amplifier power and chart drive power on. Lower both pens and check for proper operation . . . . . _____

NOTE: If pens are not inking properly, they should be replaced with on-hand spares from the reactor use only locker.

7.2.1.5.2 Check for chart paper supply and proper operation on Area Monitor, Stack Monitor and Air Particulate Detector(s) . . _____

CAUTION

The striker pointers of these Rustrak recorders are very easily damaged by improper chart loading.

7.2.1.5.3 Check for adequate chart supply on temperature recorder . . _____

7.2.1.6 Radiation Monitor Console Checkout

7.2.1.6.1 Verify Stack and Radiation Monitor meters are properly functioning with live zeros . . . . . _____

7.2.1.6.2 Verify illumination of green "NO FAIL" lights (4 lamps) . . _____

7.2.1.6.3 Position fail toggle switch in OFF, trip 2 toggle switch in OFF and alarm toggle switch in ALARM on alarm module . _____

7.2.1.6.4 Depress black push button test switch on alarm module and check illumination of all low and high level alarm lamps and operation of audible alarm . . . . . _____

7.2.1.6.5 Verify illumination of 2 green lamps and 1 yellow lamp on both units of 24 volt DC power supplies. Open lower panel and verify illumination of 2 red lamps on each battery charger . . . . . _____

7.2.1.7 Auxiliary Alarm Panel Checkout

7.2.1.7.1 Verify that 4 green lights are on . . . . . _____

7.2.1.8 Dump Valve

> **CAUTION**
>
> Do not perform this step within 3 minutes of a prior interruption of primary flow. Closing of dump valve while water is draining from core will result in a water hammer which will break the rupture disk.

7.2.1.8.1 Rotate Magnet Power Key to RESET (maintaining slight down pressure on key) and release (see Note below). Check "DUMP VALVE" light goes out (key has returned to OPERATE position) . . . . . _____

NOTE: Prior to energizing control blade circuits (clutch or drive) an authorizing signature is required to be entered in the daily operations log, a qualified second person is required to be present at the UFTR building complex and a designated SRO is required to be readily available on call.

If the dump valve buzzes excessively after closing, cycle console "POWER ON" switch and reclose the valve. Repeat as necessary.

7.2.1.8.2 Rotate console Magnet Power Key to OFF; remove and secure the key . . . . . _____

NOTE: Any deenergized scram relay ensures that control blade circuits remain deenergized.

7.2.1.9 Operational Equipment Startup and Checkout

Start the following equipment items, and note that the corresponding lights go out:

7.2.1.9.1 Diluting Fan, "STACK DILUTE" (>460 rpm); record values . . . . . *____/*____rpm

7.2.1.9.2 Core Vent Fan, "CORE VENT" . . . . . _____

7.2.1.9.3 Demineralizer Pump, "DEMIN PUMP" . . . . . _____

7.2.1.9.4 Primary Coolant Pump, "PRI COOLANT" (lower half of "DEMIN PUMP" light illuminates); check that primary flow indication stabilizes at normal value; record value . . *_____gpm

7.2.1.9.5 Shield Water Pump . . . . . _____

7.2.1.10 Shield Tank Recirculation System

7.2.1.10.1 Check system for no leaks or abnormal noises in pump or water line . . . . . _____

7.2.1.10.2 Check for proper flow (rotameter flow indicator ball should be at or near the top of the indicator scale) . . . . . _____

7.2.1.10.3 Check for proper valve alignment . . . . . _____

7.2.1.11 Air Particulate Detectors

7.2.1.11.1 Check meter, recorder and motor for proper functioning; filter holder screwed up snug; some count level indicated on instrument for AIM-3BL system . . . . . _____

Check meter, recorder and motor for proper functioning; filter holder snug for AMS^4 system . . . . . _____

7.2.1.11.2 Check and record air flow rate for AIM-3BL system (normally 10-45 liters/minute) and also check and record air flow rate for AMS^4 system (normally above 10 liters/minute) . . . . . *____lpm/*____lpm

7.2.1.11.3 Check range switch at normal setting for AIM-3BL system (x10) . . . . . *_____

7.2.1.11.4 Check "READY" light on, "MALFUNCTION" light off for AMS^4 system . . . . . _____

7.2.1.12 Check portal monitor for power on and no malfunction or alarm indicated . . . . . _____

7.2.1.13 In-line Primary Resistivity Bridge Checks

7.2.1.13.1 Verify power switch is on and green lamp is illuminated; check for operability of red lamp . . . . . _____

7.2.1.13.2 Set compensating temperature (from point 7 of temperature recorder), place selector switch at INLET, read resistivity by turning indicating pointer until red light comes on and record resistivity indicated . . . . . *_____Megohm-cm

7.2.1.13.3 Place selector switch at OUTLET, read and record resistivity as above . . . . . *_____Megohm-cm

7.2.1.13.4 Place instrument in use by setting switch to INLET and indicating pointer at about 1 Megohm-cm with green light on . . . . . _____

7.2.2 Operational Checks

NOTE: Commencement of the operational checks requires an authorizing signature by the Reactor Manager or his designated representative to be entered in the operations log approving the reactor operation and further requires that a qualified second person (name also entered in the Daily Operations Log) be present in the UFTR complex and that a designated SRO be readily available on-call.

7.2.2.1 Rotate console Magnet Power Key to RESET and hold . . . . . _____

7.2.2.1.1 Verify magnet clutch yellow "ON" lights remain extinguished . . . . . _____

7.2.2.2 Return Console Magnet Key Switch to OPERATE (holding slight down pressure) and verify that:

7.2.2.2.1 All scram lights are out on left annunciator panel . . . . . _____

7.2.2.2.2 Magnetic clutch "ON" lights are illuminated . . . . . _____

7.2.2.2.3 Red rotating beacon is in operation . . . . . _____

7.2.2.2.4 Temperature recorder is in operation . . . . . _____

7.2.3 Blade Interlock Checks (Table 4.1 of UFTR Technical Specifications):

NOTE: Before beginning these checks, clear any indicated scram by operation of the console Magnet Power Key to RESET.

7.2.3.1 Place all Calibrate and Trip Test switches in OPERATE or OFF . . . . . _____

7.2.3.2 Record whether "SOURCE" interlock light is on (illuminated) or off . . . . . *_____

7.2.3.2.1 If "SOURCE" interlock light is on, verify that no control blade can be withdrawn . . . . . _____

7.2.3.2.2 Observe neutron count level; if below 2 cps, insert PuBe source into a vertical port (CVP preferred). Record neutron count level (should be >2 cps) . . . . . *_____cps

> **CAUTION**
>
> If PuBe source is inserted, depress source alarm to display red light, post warning sign, and document source insertion in the operations log.

7.2.3.2.3 Clear "SOURCE" interlock (if needed) by operation of Safety-1/Log Calibrate Switch to position 2 and return to OPERATE . . . . . _____

7.2.3.3 Calibrate and Trip Test Switches

7.2.3.3.1 Rotate Safety 1 Calibrate Switch to ZERO and verify "INT'LK" (interlock) light comes on and return to OPERATE . . . . . _____

7.2.3.3.2 Momentarily activate Period Calibrate Switch to verify that "INT'LK" light comes on. Release switch and verify "INT'LK" light goes out . . . . . _____

7.2.3.3.3 Hold Safety 2 Calibrate Switch in ZERO position to verify that "INT'LK" light comes on. Release switch and verify "INT'LK" light goes out . . . . . _____

7.2.3.3.4 Activate Safety-1 Trip Test Switch (rotate switch only until it clears the OFF position) and verify that no control blade can be withdrawn. Return switch to OFF . . . . . _____

7.2.3.4 Ten Second Period Interlock

7.2.3.4.1 Activate Period Trip Test Control circuit and verify that "FAST PERIOD" interlock comes on at 10 seconds . . . . _____

7.2.3.4.2 Advance the control to keep indicated period between 10 and 3 seconds and verify that no control blade can be withdrawn. Return control to OFF . . . . . _____

7.2.3.5 Multiple Blade Withdrawal Interlocks

7.2.3.5.1 Verify that no combination of 2 blades can simultaneously be withdrawn. Check all six (6) combinations of 2 blades . . . . . _____

7.2.4 Nuclear Instrument and Calibration Checks

7.2.4.1 Hold Period Calibrate Switch in CALIBRATE position and verify period meter indicates 3 seconds. (If meter advances only part way and then drops back, release switch momentarily and repeat.) Release switch for return to OPERATE . . . . . *_____sec

7.2.4.2 Safety Channel 1 Calibrate Meter Indications

7.2.4.2.1 Place Safety 1 Calibrate Switch in ZERO position and verify Safety Channel 1 meter indicates 0% . . . . . *_____%

7.2.4.2.2 Place Safety 1 Calibrate Switch in CALIBRATE and verify Safety Channel 1 meter indicates 100% . . . . . *_____%

7.2.4.2.3 Place switch consecutively in positions 1 through 6. Verify that Wide Range Meter indicates approximately at successive red marks, and that the green pen of the recorder follows. Verify that "EXTENDED RANGE" light goes out at position 2. Return switch to OPERATE . . . . . _____

7.2.4.3 Linear Range Selector Switch

7.2.4.3.1 Rotate to ZERO, and verify red pen of recorder indicates 0%. Record results . . . . . *_____%

7.2.4.3.2 Record previously determined linear pen calibration level . *_____%

Rotate to CALIBRATE and verify red pen of recorder indicates calibration level determined by SOP-E.4, UFTR Nuclear Instrumentation Calibration Check ±2%. Record results . . . . . *_____%

7.2.4.3.3 Return switch to operating range (red pen somewhere on scale) . . . . . _____

7.2.4.4 Safety Channel 2 Calibrate Switch

7.2.4.4.1 Hold in ZERO and verify Safety Channel 2 meter indicates 0%. Release switch and record results . . . . . * _____ %

7.2.4.4.2 Hold in CALIBRATE and verify meter indicates 100%. Release switch and record results . . . . . * _____ %

7.2.5 Scram and Annunciation Checks

NOTE: Before beginning these checks, clear any indicated scram by operation of the console Magnet Power Key to RESET.

7.2.5.1 Secondary Pressure (Secondary Water Flow) Scram

7.2.5.1.1 Rotate Safety 1 Calibrate Switch to Position 4. Operate Safety-1 Trip Test Control to advance indication on log power scale. Verify that at 1% power indication, "SEC PRESS" scram illuminates (on well water, a red warning light will illuminate about 10 seconds before the scram occurs) and "ON" lights go out . . . . . _____

7.2.5.1.2 Start secondary flow and verify flow indication. Operate console Magnet Power Key to RESET and verify that "SEC PRESS" clears . . . . . _____

7.2.5.1.3 Return both controls to OFF or OPERATE . . . . . _____

7.2.5.2 High Primary Coolant Temperature Scram

7.2.5.2.1 Open temperature recorder door and swing out chart drive mechanism. Depress test switch when microswitch roller is on flat of cam and hold depressed. Manually rotate bull gear for upscale temperature indication. Verify that audible alarm annunciates at 150° F. Record results . . . . * _____ °F

7.2.5.2.2 Rotate bull gear further up scale and verify that "HI PC TEMP" scram is indicated at 155° F. Release switch, record results . . . . . * _____ °F

7.2.5.2.3 Restore recorder to normal configuration . . . . . _____

7.2.5.3 Manual Scram

7.2.5.3.1 Operate console Magnet Power Key to clear all scrams. Raise Safety Blade 1 to about 40 units . . . . . _____

7.2.5.3.2 Depress "SCRAM" Bar and verify that "ON" lights go out, "MANUAL" scram illuminates and Safety Blade 1 drops to the bottom position, illuminating "DOWN" lights . _____

7.2.5.4 Safety Channel 1 High Power Scram

7.2.5.4.1 Operate console Magnet Power Key to clear all scrams. Raise Safety Blade 2 to about 40 units . . . . . _____

7.2.5.4.2 Rotate Safety 1 Calibrate Switch to Position 1 (to stabilize the period circuitry) . . . . . _____

7.2.5.4.3 Rotate Safety Channel 1 Trip Test Control to advance indication on Safety Channel 1 Percent Power Meter. Verify and record that at 125%, "SAFETY 1" scram illuminates, "ON" lights go out and Safety Blade 2 drops to bottom illuminating "DOWN" lights . . . . . *_____%

7.2.5.4.4 Return both switches to OFF or OPERATE . . . . . _____

7.2.5.5 Period Scram

7.2.5.5.1 Operate console Magnet Power Key to clear all scrams. Raise Safety Blade 3 to about 40 units . . . . . _____

7.2.5.5.2 Rotate Safety 1 Calibrate Switch to Position 1 . . . . . _____

7.2.5.5.3 Rotate Period Trip Test Control and verify and record that at an indicated 3 second period, "PERIOD" scram illuminates, "ON" lights go out and Safety-3 drops to bottom, illuminating "DOWN" lights . . . . . *_____sec

7.2.5.5.4 Return both switches to OFF or OPERATE . . . . . _____

7.2.5.6 Safety Channel 2 High Power Scram

7.2.5.6.1 Operate console Magnet Power Key to clear all scrams. Raise Regulating Blade and any Safety Blade to about 40 units . . . . . _____

7.2.5.6.2 Rotate Safety Channel 2 Trip Test Control to advance indication on Safety Channel 2 Percent Power meter. Verify and record that at indicated 125%, "SAFETY 2" scram illuminates . . . . . * _____ %

"DUMP VALVE" illuminates (right panel) . . . . . _____

Lower half of "PRI COOLANT" illuminates (right panel) . . _____

Three (3) primary coolant scrams illuminate ("COOLANT PUMP," "COOLANT FLOW" and "COOLANT LEVEL") . . . . . _____

All control blade magnetic clutch "ON" lights go out . . . . . _____

All control blade "DOWN" lights illuminate with all control blades at bottom positions . . . . . _____

WARNING

At this point, DO NOT operate the console magnet power key to RESET. It may be rotated only to the OFF position. Premature operation (<3 minutes) to the RESET position may result in breakage of the rupture disc because of water hammer.

7.2.5.6.3 Return Safety Channel 2 Trip Test Control to OFF . . . . . _____

7.2.5.6.4 Indicate whether secondary water is shut off or left on (ON/OFF) . . . . . * _____

7.2.5.6.5 Secure console Magnet Power Key to proper control . . . . . _____

7.2.5.6.6 Operate temperature recorder chart drive switch so that print wheel is not in an up position (failure to do so may result in a slow upscale drift with eventual activation of audible alarm) . . . . . _____

7.2.5.6.7 Secure the Log/Linear recorder unless there is a need for its continued operation; shut off the chart drive and lift both pens . . . . . _____

7.2.5.6.8 If the source is to remain inserted in the reactor, ensure the PuBe source light is on (red) and the reminder sign is on display . . . . . _____

7.2.5.6.9 Mark all control room charts with time and date . . . . . _____

7.2.6 Complete Records

7.2.6.1 Complete UFTR Form SOP-A.1B (if used).

7.2.6.1.1 Record operator of record and trainees.

7.2.6.1.2 Record time and date checkout was completed as indicated by Step 7.2.5.6.9.

7.2.6.1.3 Record any discrepancies in the comments section.

7.2.6.2 Complete Operations Log (Pre-operational Check, Daily Check Section).

7.2.6.2.1 Record operator of record (Trainees should be noted).

7.2.6.2.2 Record time daily checkout was begun as recorded in Step 7.2 and time and date the daily checkout was completed as recorded in Step 7.2.5.6.9.

7.2.6.2.3 Complete Section labelled "Comments."

If the Daily Checkout was completed satisfactorily, indicate satisfactory completion; if the Daily Checkout could not be completely performed as written, note any discrepancies and/or abnormalities.

7.2.6.3 If SOP-A.1 Steps 7.2 to 7.2.6 are used as a record of completion of the Daily Pre-operational Check, complete the following information:

Time Completed: _____ Date Completed: _____

Operator: _____

Trainee: _____

Comments: _____

_____

_____

_____

7.2.6.4 On the Daily Operations Log for the end of the previous week, ensure "FPH this month," and "FPH this sheet" are completed.

If 'FPH this month" as noted is above 4,500 kW-hr, then that fact shall be noted in the comments section of the Daily Operations Log, and the Reactor Manager shall be informed prior to reactor startup to prevent exceeding the posted monthly limit on energy generation.

APPENDIX I

WEEKLY AND DAILY CHECKOUT FORMS

UFTR FORM SOP-A.1A
WEEKLY PRE-OPERATIONAL CHECKOUT LIST

DATE START: ___ _____

7.1 RECORD Start Time ..... _____*

7.1.1 STOP Core Vent/Stack Dilute Fans ..... _____

7.1.2.1 CHECK Dilute Fan Drive Belts ..... _____

7.1.2.2 CHECK Motor/Fan Bearing Temps ..... _____

7.1.2.3 CHECK Blower-Stack Coupling ..... _____

7.1.2.4 CHECK Mechanical Tachometer Coupling ..... _____

7.1.2.5 CHECK Optical Tachometer ..... _____

7.1.3 CHECK Blade Drive Gear Box Oil ..... _____

7.1.4 CHECK Manometers/Magnehelic Zero ..... _____

7.1.5 SOURCE CHECK Portal Monitor ..... _____

7.1.6.1 CHECK Vent/Dilute Fan Interlock ..... _____

7.1.6.2 START Stack Dilute Fan ..... ____*/____*

7.1.6.3.1 VERIFY Delay Fan Start to Flow ..... _____
or
7.1.6.3.2 OBSERVE Slow Opening Vent Damper ..... _____

7.1.6.4 RECORD D/P
- Rough Filter ..... _____*
- Absolute Filter ..... _____*
- Vent Flow ..... _____*

7.1.7 START Shield Water Recirculation Pump ..... _____

7.1.8 START Demineralizer Pump ..... _____

7.1.9 RESET Magnet Power (requires authorization) ... _____

7.1.10 CHECK "REACTOR ON" Lights ..... _____

7.1.11 START Log/Linear Recorder ..... _____

7.1.12 START PC Pump, RECORD Flow ..... _____*

7.1.13.1 CHECK Source Alarm ..... _____

7.1.14.1 SET Compensating Temp ..... _____

7.1.14.2 CHECK Demin. Inlet Resistivity ..... _____*

7.1.14.3 CHECK Demin. Outlet Resistivity ..... _____*

7.1.15.1 MEASURE AND RECORD:

	Blade Position Full In	Blade Position Full Out	Withdrawal Time to Full Out
S-1			
S-2			
S-3			
Regulating			

7.1.16 DUMP Primary Coolant ..... _____

7.1.17 SECURE Console Magnet Power Key ..... _____

7.1.18 SECURE Temperature-Log/Linear Recorders .... _____

7.1.19.1.1 REMOVE Pit Shielding ..... _____

7.1.19.1.4 RECORD Survey Instrument/Serial Number .. _____*/_____*

7.1.19.1.6 ENTER Equipment Pit ..... _____

7.1.19.2.1 CHECK Primary Coolant Tank Gamma Rad Level _____*

7.1.19.2.2 CHECK Core Vent Filters Gamma Radiation Level _____*

7.1.19.2.3 CHECK Demin. Gamma Radiation Level ..... _____*

7.1.19.3 CHECK Pit Alarm ..... _____

7.1.19.4 OBTAIN Water Samples (Primary Coolant, Secondary Heat Exchanger, Secondary Sample Tank) ..... _____

7.1.19.5 CHECK Demin. Flow ..... _____*

7.1.19.6 CHECK Rupture Disk ..... _____

7.1.19.7 CHECK Dump Valve ..... _____

7.1.19.8 CHECK Storage Tank Level (20" min) ..... _____*

7.1.19.9 PERFORM Pit Swipe Survey ..... _____

7.1.20.2 CHECK PC Resistivity from Grab Sample ..... _____*

7.1.20.3 DELIVER Remaining PC Sample to Radcon ..... _____

7.1.20.5 CHECK Shield Tank Sample Resistivity ..... _____*

7.1.20.6 DELIVER Shield Tank Sample to Radcon ..... _____

7.1.20.7 DELIVER Heat Exch. Sample to Radcon ..... _____

7.1.20.8 DELIVER Sec. Samp. Tank Sample to Radcon ... _____

7.1.21.1 CHANGE APD Filter Paper (AIM-3BL/AMS[4]) ... ____/____

7.1.21.2.1 CHECK APD Alarm (AIM-3BL) ..... _____

7.1.21.2.2 CHECK APD Air Flow (AIM-3BL) ..... _____*

7.1.21.3.1 CHECK APD Inputs/Outputs (AMS[4]) ..... _____

7.1.21.3.2 CHECK APD Air Flow (AMS[4]) ..... _____*

7.1.21.4 CHECK APD Recorders Operation(AIM-3BL/AMS[4]) ____/____

7.1.22.1.1 CHECK Stack Alarm (Aux Alarm Panel) ..... _____

7.1.22.1.2 CHECK Stack Alarm (Rad Mon Console) ..... _____

7.1.22.2 PLACE Siren in Bypass, SOURCE CHECK Area Monitors:

	East	North	South	
Trip 2	_____	_____	_____	mR/Hr
Trip 1	_____	_____	_____	mR/Hr

7.1.22.3 CHECK Coincidence Circuitry/Red Flashing Light _____
TEST Siren in Automatic Mode ..... _____
CHECK Siren/Ventilation Interlock ..... _____

7.1.22.4 TEST Siren in Manual Mode ..... _____
OBSERVE Evacuation Siren Indicator (Constant Red Light) ..... _____

7.1.22.5 RESET Fans/Air Conditioner ..... _____

7.1.23 CLEAN Secondary Strainer ..... _____

7.1.24 CHECK Security System Operation ..... _____

7.1.25.1.1 RECORD Operator/Trainees _____

_____

7.1.25.1.2 RECORD Completion Time/Date _____

7.1.25.1.3 RECORD Discrepancies (use reverse side as needed) _____

_____

7.1.25.2.1 RECORD Operator/Trainees (Daily OPS Log) ... _____

7.1.25.2.2 RECORD Completion Time/Date (Daily OPS Log) ____: ___

7.1.25.2.3 RECORD Comments (Daily OPS Log) SAT/UNSAT _____

UFTR FORM SOP-A.1B
DAILY PRE-OPERATIONAL CHECKOUT LIST

DATE: _____

7.2 RECORD Start Time ..... _____*

Console and Equipment Power

7.2.1.1 CHECK East Wall Power Breakers ON ..... _____

7.2.1.2 CHECK Well Pump Breaker ON ..... _____

7.2.1.3 ILLUMINATE Console "POWER ON" Backlit Switch _____

7.2.1.4.1 CYCLE Console "POWER ON" Backlit Switch .... _____

7.2.1.4.2 DEPRESS Unlit Switches, Right Motor Control Annunciator Panel ..... _____

7.2.1.4.3 CYCLE Mode Selector Switch, Leave in "MANUAL" _____

7.2.1.4.4 VERIFY "DOWN" Lights ON ..... _____

Recorder Checkouts

7.2.1.5.1 MAKE and/or CHECK Log/Lin Recorder Operational; Amplifier Power, Chart Drive, Chart Paper ..... _____

7.2.1.5.2 CHECK Operation, Chart Paper for Area Monitors, Stack Monitor, and APD(s) ..... _____

7.2.1.5.3 CHECK Chart Paper for Temperature Monitor .... _____

Radiation Monitor Console

7.2.1.6.1 VERIFY Operation Stack/Radiation Monitors ..... _____

7.2.1.6.2 VERIFY "NO FAIL" Lights Illuminated ..... _____

7.2.1.6.3 POSITION Radiation Monitor Power Supply Toggle Switches: "FAIL" in OFF, "TRIP 2" in OFF, "ALARM" in ALARM ..... _____

7.2.1.6.4 DEPRESS Push Button, CHECK Illumination of Alarm Lights on Modules and Audible Alarm ..... _____

7.2.1.6.5 VERIFY all AC and DC Power Supplies Functional _____

Auxiliary Alarm Panel

7.2.1.7 VERIFY 4 Green Lights ON ..... _____

Dump Valve

7.2.1.8.1 RESET Console Magnet Power Key, CHECK "DUMP VALVE" Light Out, Key in OPERATE ..... _____

7.2.1.8.2 REMOVE, SECURE Console Magnet Power Key .. _____

Operational Equipment Startup and Checkout

7.2.1.9.1 START Duct Fan, RECORD RPM ..... ____*/____*

7.2.1.9.2 START Core Vent Fan ..... _____

7.2.1.9.3 START Demineralizer Pump ..... _____

7.2.1.9.4 START Primary Coolant Pump, RECORD Flow ... _____*

7.2.1.9.5 START Shield Water Pump ..... _____

Shield Tank Recirculation

7.2.1.10.1 CHECK Shield Water Recirc Operation ..... _____

7.2.1.10.2 CHECK for Proper Flow ..... _____

7.2.1.10.3 CHECK for Proper Valve Alignment ..... _____

Air Particulate Detectors

7.2.1.11.1 CHECK APD Operation (AIM3BL/AMS[4]) ..... ____/____

7.2.1.11.2 CHECK APD Air Flow (AIM3BL/AMS[4]) ... _____*/_____*

7.2.1.11.3 CHECK Range Switch (x10) (AIM3BL) ..... _____*

7.2.1.11.4 CHECK "READY" Light On, "MALFUNCTION" Light Off (AMS[4]) ..... _____

7.2.1.12 CHECK Portal Monitor ..... _____

Resistivity Bridge

7.2.1.13.1 CHECK Resistivity Bridge Power ON, Red Light Functional ..... _____

7.2.1.13.2 CHECK Demin Inlet Resistivity ..... _____*

7.2.1.13.3 CHECK Demin Outlet Resistivity ..... _____*

7.2.1.13.4 SET Switch to Inlet/Alarm to 1 Megohm-cm ..... _____

Operational Checks

7.2.2.1 ROTATE Console Magnet Power Key to RESET .. _____

7.2.2.1.1 VERIFY Scram Lights Out ..... _____

7.2.2.2.1 RETURN Console Magnet Power Key to OPERATE, VERIFY Scram Lights Out ..... _____

7.2.2.2.2 VERIFY Clutch Lights ON ..... _____

7.2.2.2.3 VERIFY Red Rotating Beacon On ..... _____

7.2.2.2.4 VERIFY Temperature Recorder Operating ..... _____

Blade Interlock Checks

7.2.3.1 PLACE Calibrate and Test Switches to OPERATE or OFF ..... _____

7.2.3.2 RECORD "SOURCE" Light ON or OFF ..... _____*

7.2.3.2.1 IF "SOURCE" Interlock ON, VERIFY No Control Blade Can Be Withdrawn ..... _____

7.2.3.2.2 IF Less than 2 CPS, INSERT PuBe Source, RECORD Counts ..... _____*

7.2.3.2.3 CLEAR "SOURCE" Interlock. ..... _____

7.2.3.3.1 ROTATE Safety 1 Calibrate Switch to ZERO, VERIFY "INT'LK" Light ON ..... _____

7.2.3.3.2 ACTIVATE Period Calibrate Switch, VERIFY "INT'LK" Light ON ..... _____

UFTR FORM SOP-A.1B
DAILY PRE-OPERATIONAL CHECKOUT LIST (continued)

2.3.3.3 HOLD Safety 2 Cal in Zero, "INT'LK" ON ..... _____

2.3.3.4 ACTIVATE Safety 1 Trip Test Switch, VERIFY No Control Blade Can Be Withdrawn ... _____

2.3.4.1 ACTIVATE Period Trip Test Control Switch, VERIFY "FAST PERIOD" On at 10 Sec Period ... _____

2.3.4.2 VERIFY No Control Blade Can Be Withdrawn .... _____

2.3.5.1 VERIFY Multiple Blade Interlock ..... _____

Nuclear Instrument and Calibration Checks

2.4.1 Period Switch in Calibrate, Indicated 3 Sec Period . _____*

2.4.2.1 Safety 1 Cal in Zero, 0% Indicated ..... _____*

2.4.2.2 Safety 1 Cal in Cal, 100% Indicated ..... _____*

2.4.2.3 Safety 1 Cal in Positions 1-6, VERIFY Wide Range Meter at Red Marks, "EXTENDED RANGE" Light Out at Position 2, Log Pen Follows ..... _____

2.4.3.1 Linear Range to Zero, 0% Indicated ..... _____*

2.4.3.2 Linear Range to Calibrate, _____* ..... _____*

2.4.3.3 Linear Range to Range of Operation ..... _____

2.4.4.1 Safety 2 Calibrate in Zero, 0% Indicated ..... _____*

2.4.4.2 Safety 2 Calibrate in Cal, 100% Indicated ..... _____*

Scram and Annunciation Checks

7.2.5.1.1 Safety 1 Cal to Position 4, Safety 1 Trip Test to 1%: VERIFY "SEC PRESS" (~10 Sec Delay) and "ON" Lights Out ..... _____

7.2.5.1.2 START Secondary Cooling, VERIFY Flow, RESET Magnet Power Key, VERIFY "SEC PRESS" Clears ..... _____

7.2.5.1.3 Controls to OPERATE or OFF ..... _____

7.2.5.2.1 ROTATE Temperature Monitor, VERIFY and RECORD Audible Alarm at 150°F ..... _____*

7.2.5.2.2 ROTATE Temperature Monitor, VERIFY and RECORD "HI PC TEMP" Scram On, "ON" Lights Out at 155°F ..... _____*

7.2.5.2.3 RESTORE Recorder to Normal ..... _____

7.2.5.3.1 RESET Console Magnet Power Key, RAISE Safety Blade 1 to 40 Units ..... _____

7.2.5.3.2 DEPRESS Manual Scram Bar, VERIFY "ON" Lights Out, "DOWN" Lights On, "MANUAL" Scram On . _____

7.2.5.4.1 RESET Console Magnet Power Key, RAISE Safety Blade 2 to 40 Units ..... _____

7.2.5.4.2 Safety 1 Cal to Position 1 ..... _____

7.2.5.4.3 ROTATE Safety Channel 1 Trip Test, at 125%: "ON" Lights Out, "DOWN" Lights On, "SAFETY 1" Scram Indicator ON ..... _____*

7.2.5.4.4 Switches to OPERATE or OFF ..... _____

7.2.5.5.1 RESET Console Magnet Power Key, RAISE Safety Blade 3 to 40 Units ..... _____

7.2.5.5.2 ROTATE Safety 1 Cal to Position 1 ..... _____

7.2.5.5.3 ROTATE Period Trip Test, at 3 Sec Period: "ON" Lights Out, "DOWN" Lights On, "PERIOD" Scram Illuminates ..... _____*

7.2.5.5.4 RETURN Switches to OFF or OPERATE ..... _____

7.2.5.6.1 RESET Console Magnet Power Key, RAISE Regulating and any Safety Blade to 40 Units ..... _____

7.2.5.6.2 ROTATE Safety Channel 2 Trip Test, at 125%: "SAFETY 2" Scram On, "DUMP VALVE" On, Lower Half "PRI COOLANT" On, "COOLANT PUMP," "COOLANT FLOW," "COOLANT LEVEL" Scram Lights On, "ON" Lights Out, "DOWN" Lights On .. _____*

7.2.5.6.3 RETURN Safety 2 Trip Test Switch to OFF ..... _____

7.2.5.6.4 Secondary Cooling Status (ON/OFF) ..... _____*

7.2.5.6.5 SECURE Console Magnet Power Key ..... _____

7.2.5.6.6 ASSURE Temperature Print Wheel Down ..... _____

7.2.5.6.7 SECURE Log/Lin Recorder Drive, LIFT Pens .... _____

7.2.5.6.8 IF PuBe Source In, CHECK Red Light On, Sign on Display ..... _____

7.2.5.6.9 MARK Control Room Charts with Time/Date ..... _____

Complete Records

7.2.6.1.1 RECORD Operator/Trainees _____

_____

7.2.6.1.2 RECORD Completion Time/Date _____

7.2.6.1.3 RECORD Discrepancies (use reverse side as needed) _____

_____

_____

7.2.6.2.1 RECORD Operator (in Operations Log) ..... _____

7.2.6.2.2 RECORD Time Checkout was Begun, Time and Date Completed (in Operations Log). ..... _____

7.2.6.2.3 RECORD Comments (in Operations Log) ..... _____

7.2.6.4 CHECK "FPH THIS MONTH," "FPH THIS SHEET" (in Operations Log); IF necessary, CONTACT Reactor Manager ..... _____

UFTR OPERATING PROCEDURE B.4

1.0 Emergency Procedure – Flood

2.0 Approval

Reactor Safety Review Subcommittee . . . . [signature] 8/21/97
Date

Facility Director . . . . . William G. Ventson 8/13/97
Date

3.0 Purpose and Discussion

3.1 This procedure is intended to address actual and potential flooding conditions in the UFTR facility to include guidance as to when the procedure is to be initiated as well as guidance on reactivity control.

3.2 This procedure shall be implemented in the event that flooding of the reactor site (more than 6 inches of water above floor level in the reactor cell) becomes likely.

3.3 From accumulated experience at the UFTR site, it has been established that no actual flooding conditions (water intrusion into the reactor cell) will exist in the UFTR site from an accumulated precipitation of 8 inches of rainfall over a 24 hour period.

3.4 Definitions:

3.4.1 "Flooding Condition" shall mean that a hurricane or other severe storm is deemed capable of depositing more than 8 inches of rain in any 24 hour period.

3.4.2 "Hurricane Rods" is the designation for the three cadmium-covered aluminum rods normally stored in the spent fuel pit in location number 20.

3.4.2.1 Hurricane rods individually contain enough neutron absorber to be worth several dollars in negative reactivity.

3.4.2.2 The insertion of the hurricane rods assures the UFTR core will have a shutdown margin larger than 1% $\Delta k/k$ with water in the core and all control blades removed.

3.4.3 Implementation of this procedure in the event of a flooding condition requires securing the UFTR; insertion of the hurricane rods is then allowed but not necessarily required depending on the nature of flooding condition.

4.0 Limits and Precautions

4.1 All personnel associated with the reactor shall ensure that the Reactor Manager or his authorized representative is aware of any actual or probable flooding condition of the reactor cell.

4.2 If the U.S. Weather Bureau indicates a significant probability for a hurricane or other severe storm to produce an accumulated rainfall of more than 8 inches of rain in a 24-hour period or conditions exist that have or could, with a high degree of probability, result in a flooding of the reactor site (more than 6 inches of water above floor level in the reactor cell), then UFTR personnel shall implement this procedure.

4.3 Because of their large negative reactivity, an attempt to withdraw a hurricane rod with the reactor operational (or control rods withdrawn or partially withdrawn) could result in a power excursion.

4.3.1 The hurricane rods should be locked in place, and/or a barrier placed so that the removal of those rods cannot be accomplished without very deliberate action.

4.3.2 It is imperative that no hurricane rod be removed from the core unless authorized by the Reactor Manager, and unless the reactor is secured (all control blades fully inserted) and all water drained from the core.

5.0 References

5.1 UFTR Safety Analysis Report

5.2 UFTR Technical Specifications

5.3 UFTR Emergency Plan

6.0 Records Required

6.1 UFTR Operating Log

7.0 Instructions

7.1 Assessing Potential for Flooding Condition

7.1.1 If a hurricane or any other severe storm is deemed capable of depositing more than 8 inches of rain in any 24-hour period, the cognizant personnel will obtain forecast information from the U.S. Weather Bureau in Jacksonville (direct telephone with 24-hour service for recorded forecast information is 904-741-4311, and 24-hour telephone communication with weather station personnel is 904-741-4411) that will be used to assess the situation. The applicable telephone numbers are on Emergency Call List #2 posted in the Control Room, with the console copy of the SOP Manual, and at the Emergency Support Center as well as other locations throughout the facility. Equivalent sources of forecast data may also be used.

7.1.2 The Reactor Operator shall, anytime a likely emergency flooding condition is established, insure that the reactor is secured.

7.2 Inserting the Hurricane Rods

7.2.1 If conditions indicate the possibility of flooding conditions, any reactor operator may (preferably at the request of the Reactor Manager or Facility Director) insert the hurricane rods into the vertical ports; the following steps shall be followed:

7.2.1.1 Unlock the three vertical ports and remove both shield plugs from each port.

7.2.1.2 Unlock and remove the hurricane rods from the spent fuel pit.

7.2.1.3 Lower one hurricane rod carefully into each if the vertical ports, using the attached line.

7.2.1.4 Place the vertical port locking devices in place (the vertical ports should also be physically blocked or barricaded, if possible).

7.2.1.5 Enter into the operating log that the hurricane rods are installed in the reactor vertical ports.

CAUTION

The hurricane rods shall only be removed using Section 7.4 of this procedure (UFTR SOP-B.4). They may be removed only when authorized by the Reactor Manager or duly authorized representative.

7.3 Termination of a Flooding Condition

7.3.1 Only the Reactor Manager or a duly authorized representative shall determine that the flooding condition is terminated; termination of the flooding condition shall be verified by an entry to this effect in the UFTR Operating Log.

7.4 Removing the Hurricane Rods from the Core

7.4.1 No attempt is to be made to remove any of the hurricane rods from the vertical ports unless ALL of the following conditions are satisfied:

7.4.1.1 The Reactor Manager or duly authorized representative has terminated the flooding condition.

7.4.1.2 The Reactor Manager or duly authorized representative has authorized removal of the hurricane rods and the authorization is entered in the UFTR Operating Log.

7.4.1.3 Only a licensed Reactor Operator may remove a hurricane rod.

7.4.1.4 The reactor operator removing a hurricane rod as per this procedure shall verify and note by operating log entry the following reactor status:

7.4.1.4.1 The reactor is secured (includes full insertion of all control blades and removal of the control console key).

7.4.1.4.2 Water is drained from the core.

7.4.2 When the conditions for hurricane rod removal are met as listed in Section 7.4.1, the reactor operator may remove the rods; the following steps shall be utilized for the removal.

7.4.2.1 Lay absorbent paper near the vertical ports.

7.4.2.2 Remove the barriers from the vertical ports.

7.4.2.3 Unlock the vertical ports.

7.4.2.4 Using appropriate radiological precautions, remove the hurricane rods slowly from the reactor and place them on the absorbent paper.

7.4.2.5 Check the hurricane rods for contamination and (if necessary) decontaminate them before storing.

7.4.2.6 Store the hurricane rods in the assigned spent fuel pit location.

7.4.2.7 Restore the vertical ports to normal status.

7.4.2.8 Record removal and disposition of the hurricane rods in the UFTR Operating Log.

7.4.2.9 Inform the Reactor Manager or duly authorized representative when action is completed.

UFTR OPERATING PROCEDURE C.3

1.0 Fuel Inventory Procedure

2.0 Approval

Reactor Safety Review Subcommittee ..... _____ 8/21/97
Date

Facility Director ..... _____ 8/13/97
Date

3.0 Purpose and Discussion

3.1 The nuclear fuel under reactor facility license R-56 shall be inventoried semiannually as of March 31 and September 30 of each year and a summary report transmitted to the Radiation Control Office so a Materials Status Report can be filed within 30 days after the end of the period covered by the report.

3.2 The Facility Director or Reactor Manager will personally conduct the inventory. Only the Facility Director or Reactor Manager may be given access to the fuel safe combination.

4.0 Limits and Precautions

4.1 A representative of the Nuclear and Radiological Engineering Department or Radiation Control Office will accompany the Facility Director or Reactor Manager and audit the fuel inventory.

4.2 The minimum radiation protection equipment to conduct the inventory shall include: gloves, film badge and/or dosimeters and a calibrated radiation survey instrument suitable for the radiation levels to be expected.

4.3 All fuel shall be handled in accordance with UFTR SOP-C.1.

4.4 All fuel inventory verification forms require **two (2) signatures**.

5.0 References

5.1 Title 10 Code of Federal Regulations, Chapter 1, Part 40 and Part 70 (10CFR40 and 10CFR70).

5.2 UFTR SOP-C.1, "Irradiated Fuel Handling."

5.3 UFTR Operating Log.

5.4 UFTR Monthly Reports for previous six-month reporting period.

5.5 UFTR Physical Security Plan.

6.0 Records Required

6.1 UFTR Fuel Safe Inventory Verification Form (UFTR Form SOP-C.3A).

6.2 UFTR Fuel Pit Inventory Verification Form (UFTR Form SOP-C.3B).

6.3 UFTR Fuel Inventory and Burnup Determination for Materials Status Report (UFTR Form SOP-C.3C).

6.4 UFTR Materials Status Report.

7.0 Instructions

7.1 Obtain fuel inventory files which are located in the office of the Director of Nuclear Facilities, Room 105, UFTR Building.

7.2 Inventory the fuel contained in the fuel safe.

7.2.1 Inventory the fuel plates, assembled fuel elements, fuel samples and fuel dummies in the fuel safe. Visual verification of every fuel plate I.D. is required.

7.2.2 Make appropriate entries on UFTR Form SOP-C.3A (UFTR Fuel Safe Inventory Verification) and on UFTR Form SOP-C.3C (UFTR Fuel Inventory and Burnup Determination for Material Status Report).

7.3 Inventory the fuel contained in the UFTR irradiated fuel storage pits.

7.3.1 Verify the quantity of irradiated fuel plates in the irradiated fuel storage pits. Verify by visually counting the plates, when possible, and by comparing radiation levels. No I.D. of the plates is required.

7.3.2 Update the status board above the irradiated fuel storage pits.

7.3.3 Make appropriate entries on UFTR Form SOP-C.3B (UFTR Fuel Pit Inventory Verification) and on UFTR Form SOP-C.3C (UFTR Fuel Inventory and Burnup Determination for Material Status Report).

7.4 Inventory the fuel contained in the core.

7.4.1 Verify the actual fuel loading in the reactor from fuel loading records and verify current critical position to be the expected value for the current fuel loading. (Unstacking the core is not required.)

7.4.2 Make appropriate entries on UFTR Form SOP-C.3C (UFTR Fuel Inventory and Burnup Determination for Material Status Report).

7.5 Compare the results of this inventory with the previous inventory; **immediately communicate** any discrepancies to the Facility Director, Chairman of the Department of Nuclear and Radiological Engineering and to NRC Region II.

7.6 Complete the burnup calculation on UFTR Form SOP-C.3C to account for loss of fuel to burnup and parasitic absorption in the previous six-month period.

7.7 Transmit the current UFTR Fuel Inventory results accounting for burnup to the Radiation Control Officer for inclusion in the University of Florida Materials Status Report sent to the Nuclear Regulatory Commission and the Department of Energy.

UFTR FORM SOP-C.3A

FUEL SAFE INVENTORY VERIFICATION FORM

Date of Inventory	Facility Director/ Reactor Manager	NRE Department Auditor	Comments

UFTR FORM SOP-C.3B

FUEL STORAGE PIT INVENTORY VERIFICATION FORM

Date of Inventory	Facility Director/ Reactor Manager	NRE Department Auditor	Comments

UFTR FORM SOP-C.3C

FUEL INVENTORY AND BURNUP DETERMINATION FOR MATERIAL STATUS REPORT

C.3Ca: Fuel Inventory Before This Burnup Calculation

	93% Fuel		19.8% Fuel	
	gm U	gm U-235	gm U	gm U-235
Fuel Safe				
Fuel Pit				
UFTR Core				

(Signatures and dates must be on individual inventory forms.)

C.3Cb: Fuel Burnup Calculation

A. Fuel Burnup Brought Forward *(Not reported last reporting period.)*

1. Grams of U Destroyed (Fissioned): _____ gm

2. Grams of U-235 Lost to Fission and Transmutation to U-236: _____ gm

B. KW-HR for This Six Month Reporting Period

	Month	KW-HR
1.		
2.		
3.		
4.		
5.		
6.		

Total KW-HR: _____

(continued next page)

UFTR FORM SOP-C.3C
(continued)

C. Fuel Burnup for This Period

1. KW-HR (4.614×10^{-5} gm/kwhr) = Grams U lost to fission

_____ kwhr (4.614×10^{-5} gm/kwhr) = _____ gm
(This period) (This period)

2. KW-HR (4.614×10^{-5} gm/kwhr) $\left(\frac{683}{582}\right)$ = U-235 lost to fission and U-236

_____ $\left(\frac{683}{582}\right)$ = _____ gm
(C.1 above) (This period)

D. Fuel Burnup Report

1. A.1 + C.1 = Total Grams U Fissioned

_____ gm + _____ gm = _____ gm

2. A.2 + C.2 = Total U-235 Lost to Fission and U-236

_____ gm + _____ gm = _____ gm

3. Burnup Reported *(Report only whole grams. Fractions of grams will be brought forward to the next reporting period.)*

_____ Grams U Fissioned
_____ Grams U-235 Lost to Fission and U-236

4. Burnup Brought Forward to Next Period

_____ Grams U Fissioned
_____ Grams U-235 Lost to Fission and U-236

Report of inventory and burnup calculation should be transmitted as the UFTR Material Status Report to the Radiation Control Officer for inclusion in the University of Florida Material Status Report for the current reporting period.

Completed By	**Date**	**Acknowledged**	**Date**

APPENDIX E

UFTR EMERGENCY PLAN
REVISION 10 DOCUMENTATION

UNIVERSITY OF FLORIDA

Nuclear Reactor Facility
Department of Nuclear and Radiological Engineering

202 Nuclear Sciences Center
P.O. Box 118300
Gainesville, Florida 32611-8300
Tel: (352) 392-1429
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April 10, 1997

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

UFTR Emergency Plan
Revision 10

Dear Sir/Madam:

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

The enclosed package contains Revision 10 to the approved UFTR Emergency Plan. Revision 10 has been reviewed by UFTR management and the Reactor Safety Review Subcommittee (RSRS) to assure Revision 10 does not decrease the effectiveness of the UFTR Emergency Plan. All the changes are considered relatively minor in nature; they are the result of reviews of the Plan and our plans for and response to simulated emergencies. Most are simple changes to account for name changes or correct typographical errors.

Revision 10 consists of a set of updates and revisions to thirteen (13) pages: ii, iv, 1-11, 3-1, 3-2, 3-3, 3-4, 3-5, 3-8, 7-1, 8-1, 8-4 and 8-5, as well as Appendix I - Shands Teaching Hospital and Clinics, Inc. Plan for Emergency Handling of Radiological Accident Cases and Appendix II - Agreement Letters. Page changes are marked with the usual vertical lines for easy location.

First, Figure 1.8 on page 1-11 is updated to show a large addition made to the J.W. Reitz Union building and show its location a little better. This addition has no effect on UFTR building access routes.

Second, there are a number of changes on six pages in Chapter 3, all updating the Plan to account for various department name changes. On page 3-1, section 3.1, paragraph 1 is updated in two places to reflect the name change from the "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering" and also to correct a misspelling where "eduction" should be "education." On page 3-2, the UFTR Organization Chart in Figure 3.1 is updated to reflect the name change from the "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering" in the Level 1 organization box. On page 3-3, section 3.2.3, line 4 is updated to reflect the name change from the "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering" and section 3.3 is updated in two places to reflect the name change from the "State of Florida Department of Health and Rehabilitative Services Office of Radiation Control" to the "State of Florida Department of Health, Bureau of Radiation Control." On page 3-4, section 3.4.3 is changed to

correct a typographical error in the reference to the Shands Hospital "Plan for Emergency Handling of Radiation Accident Cases" which is changed to the "Plan for Emergency Handling of *Radiological* Accident Cases." In addition, on page 3-4, section 3.4.4 is updated to correct an incorrect word in line 2 so that "of" the environs now reads "to" the environs. Also on page 3-4, section 3.4.5 is updated as the section title changes from "State of Florida Office of Radiation Control" to the "State of Florida Bureau of Radiation Control" and the first line of the section 3.4.5 text is updated to reflect the name change from the "State of Florida Department of Health and Rehabilitative Services Office of Radiation Control" to the "State of Florida Department of Health, Bureau of Radiation Control." On page 3-5, section 3.5 is updated near the end of the first paragraph to reflect the name change from the "State of Florida Department of Health and Rehabilitative Services Office of Radiation Control" to the "State of Florida Department of Health, Bureau of Radiation Control." On page 3-8, section 3.9 is updated to reflect the name change from the "State of Florida Department of Health and Rehabilitative Services Office of Radiation Control" to the "State of Florida Department of Health, Bureau of Radiation Control."

Third, on page 7-1, section 7.1.1, paragraph 4 is updated to reflect the name change from the "Department of Health and Rehabilitative Services" to the "Department of Health."

Fourth, there are changes to three pages in Chapter 8, one to account for a name change and two to correct typographical errors. On page 8-1, section 8.2, paragraph 2 is updated to reflect the name change from "Department of Nuclear Engineering Sciences" to the "Department of Nuclear and Radiological Engineering." On page 8-4, section 8.3, paragraph 1 is changed to correct a typographical error in two references to the "Plan for Emergency Handling of Radiation Accident Cases" which are changed to the "Plan for Emergency Handling of *Radiological* Accident Cases." Similarly, on page 8-5, section 8.3.4 is also changed to correct the typographical error in the reference to the "Plan for Emergency Handling of Radiation Accident Cases" which is changed to the "Plan for Emergency Handling of *Radiological* Accident Cases." Also on page 8-5, section 8.4, paragraph 1, the area code for the telephone in the Emergency Support Center is noted to be changed to reflect the new Gainesville area code so the number becomes "*352*-392-1428" versus "904-392-1428."

Fifth, Appendix I of the UFTR Emergency Plan is updated by removing the version dated 12/94 and adding the latest updated version of the Shands Hospital "Plan for Emergency Handling of Radiological Accident Cases" dated 12/95. The Appendix I cover sheet is also updated to reflect the typeface used for other changes.

Sixth, Appendix II of the UFTR Emergency Plan is updated by removing older versions of agreement letters for the Alachua County Office of Emergency Management and Shands Teaching Hospital and Clinics Inc. and replacing them with current letters dated December 10, 1996 for the Office of Emergency Management and March 20, 1997 for Shands. The delay in receiving this latter letter is why the revision was approved by the Reactor Safety Review Subcommittee in February but not submitted until April 1997. Here again, the Appendix II cover sheet is also updated to reflect the typeface used for other changes. The Alachua County Office of Emergency Management letter contains several attachments supplied by that office with only one page withheld as not for public release.

Finally, the Table of Contents is updated on page ii to reflect the name change in section 3.4.5 from the "State of Florida Office of Radiation Control" to the "State of Florida Bureau of Radiation Control" and on page iv to add back Appendix II - Agreement Letters, removed inadvertently with Revision 9.

In the UFTR Emergency Procedures, which are no longer contained in the Emergency Plan document but are maintained separately, several changes are being made in SOP-B.1 (Radiological Emergency) primarily as a result of the recent name changes. These are addressed in the following discussion for information purposes only. On page 3, in paragraph 4.9, the State of Florida Bureau of Radiation Control is added as a notification requested by that Bureau in December 1996. Similarly, on page 7, in paragraph 7.1.1.6.3.1.3, the State of Florida Bureau of Radiation Control is added as a notification, with those listed rearranged to match the Call List order in Appendix I of SOP-B.1. Again, on page 8, in paragraph 7.1.1.6.3.2.3, this same change is made along with correcting the reference to the Department of Health and Rehabilitative Services to the Department of Health. Finally, in SOP-B.1, Appendix I, Instructions for Radiological Emergencies, the Bureau of Radiation Control is added after the County Warning Point as an entity to be called, per their request. These procedure changes are not being submitted since they are not part of Revision 10 of the Emergency Plan.

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

If there are any questions, please let us know. Thank you for your consideration.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

WGV/dms
Enclosures

Copies: NRC Region II (2 copies)
Reactor Safety Review Subcommittee
J. Powers

Sworn and subscribed this 10th day of April 1997.

Notary Public

MARY LYNN SLONE
MY COMMISSION # CC344196 EXPIRES
January 25, 1998
BONDED THRU TROY FAIN INSURANCE, INC.

UFTR EMERGENCY PLAN

Contents

		Page
1.0	INTRODUCTION	1-1
1.1	Scope of the UFTR Emergency Plan	1-1
1.2	Basis for the UFTR Emergency Plan	1-1
1.3	Characteristics of the UFTR Facility	1-1
1.3.1	Reactor Characteristics	1-1
1.3.2	UFTR Building Structural Design	1-3
1.3.3	Experimental Facilities	1-3
1.4	UFTR Facility Location	1-6
1.5	Credible Accidents and Consequences	1-6
2.0	DEFINITIONS	2-1
3.0	ORGANIZATIONS AND RESPONSIBILITIES	3-1
3.1	UFTR Administrative Structure	3-1
3.2	UFTR Operating Organization	3-1
3.2.1	Director of Nuclear Facilities and Reactor Manager	3-1
3.2.2	UFTR Safety Review Subcommittee	3-3
3.2.3	Radiation Safety Organization	3-3
3.3	Interactions with Governmental Agencies	3-3
3.4	Coordination with On-site and Off-site Authorities	3-3
3.4.1	University Police Department	3-4
3.4.2	Gainesville Fire Department	3-4
3.4.3	Shands Teaching Hospital and Clinics, Inc.	3-4
3.4.4	Alachua County Emergency Planning Office	3-4
3.4.5	State of Florida Bureau of Radiation Control	3-4
3.5	Reactor Emergency Response Organization and Extensions	3-5
3.6	Prolonged Emergencies and Management Endurance	3-7
3.7	Reactor Emergency Director, Authority and Responsibility	3-7
3.8	Emergency Coordinator	3-7
3.9	Radiological Assessment	3-8
3.10	Recovery Operations	3-8
3.11	Termination of Operations and Recovery	3-8
3.12	Authorization of Exposures Beyond Normal Occupational Limits	3-8
4.0	EMERGENCY CLASSIFICATION SYSTEM	4-1
4.1	Events Less Severe Than the Lowest Category (Class 0)	4-1
4.2	Notification of Unusual Event (Class I)	4-1
4.3	Alert (Class II)	4-2
4.4	Site Area Emergency (Class III)	4-3
4.5	General Emergency (Class IV)	4-4
5.0	EMERGENCY ACTION LEVELS (EALs)	5-1

Page

10.0 MAINTAINING EMERGENCY PREPAREDNESS 10-1

10.1 Training and Drills 10-1
10.1.1 On-Site Personnel Training and Retraining 10-1
10.1.2 Emergency Drills 10-1
10.1.3 Evaluation of Drills 10-2
10.2 Emergency Plan Review and Update 10-2
10.3 Equipment Maintenance 10-2

11.0 WRITTEN PROCEDURES 11-1

11.1 Establishment of Written Emergency Procedures 11-1
11.2 Review and Update of Emergency Procedures 11-1

12.0 REFERENCES 12-1

APPENDIX I - Shands Hospital Emergency Department Plan for Emergency Handling of Radiological Accident Cases

APPENDIX II - Agreement Letters

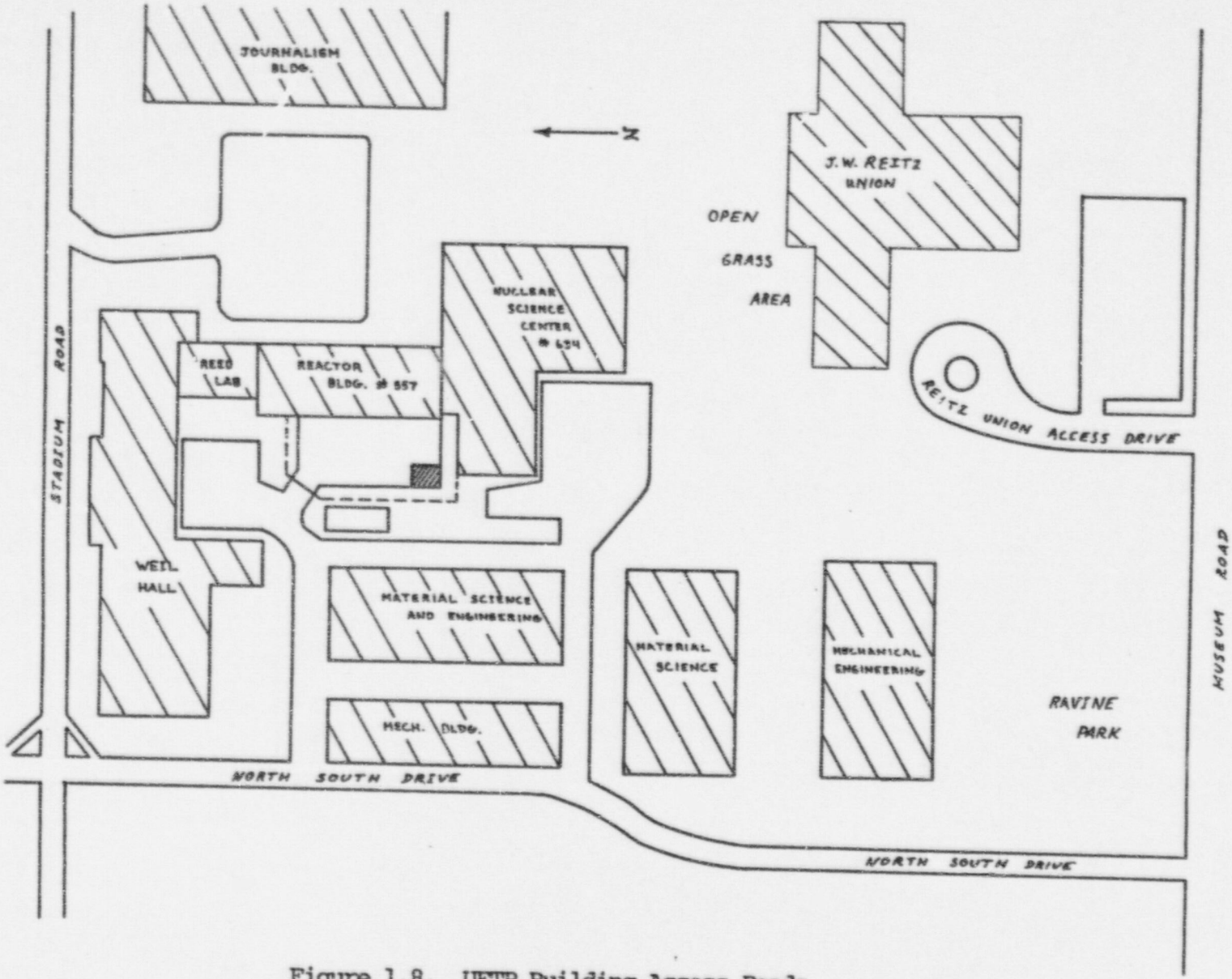

Figure 1.8. UFTR Building Access Roads.

3.0 ORGANIZATION AND RESPONSIBILITIES

3.1 UFTR Administrative Structure

The UFTR is operated by the Department of Nuclear and Radiological Engineering of the University of Florida for the academic purposes of instruction and research with some operations to serve industry needs, primarily for training and education purposes. The President of the University, the Dean of the College of Engineering, the Chairman of the Department of Nuclear and Radiological Engineering, the Director of Nuclear Facilities and the Reactor Manager all have line responsibility for the administrative control of the reactor facility, for safeguarding the general public and facility personnel from radiation exposure and adhering to all requirements of the Facility License and the Technical Specifications. Line responsibility for administrative control of the UFTR is depicted in the UFTR organization chart shown in Figure 3.1.

Direct supervision over the University of Florida, its policies and affairs is vested with the Board of Regents. All University affairs are administered by the President with the advice and assistance of the Administrative Council. The organization for the management and operation of the reactor facility includes the management structure shown in Figure 3.1 where four levels of authority are provided.

Level 1 consists of individuals responsible for the UFTR licenses, character and site administration. Level 2 is the individual responsible for reactor facility management (Facility Director or his designated alternate). Level 3 is the individual responsible for reactor operations and supervision of day-to-day facility activities (Reactor Manager or his designated alternate). Level 4 consists of the rest of the facility operating staff (reactor operators and senior reactor operators). In parallel with the facility administrative and operating staff, the radiation control and radiological safety functions are represented by the right half of Figure 3.1. The Reactor Safety Review Subcommittee (RSRS) is appointed by, and reports to, the Chairman of the University Radiation Control Committee (URCC) who reports to the Director of Environmental Health and Safety who, in turn, reports to the Vice-president for Administrative Affairs.

3.2 UFTR Operating Organization

3.2.1 Director of Nuclear Facilities and Reactor Manager

The Director of Nuclear Facilities and the Reactor Manager are in complete charge of the reactor facility. They are responsible for the safe operation of the reactor, the physical protection of the facility, the scheduling and supervision of experiments using the reactor, the control of the reactor fuel, the keeping of logs and records, and the maintenance of the physical condition of the facility. They are also responsible for liaison with the NRC and other regulatory bodies, and for coordinating the teaching and research programs within the facility. The Director of Nuclear Facilities (or his duly authorized representative such as the Reactor Manager) has overall responsibility for the handling of emergency situations, including coordination with Law Enforcement, Emergency Preparedness, Local and State Health Agencies and the Nuclear Regulatory Commission.

REV 5, 12/89; REV 8, 12/92
REV 10, 2/97

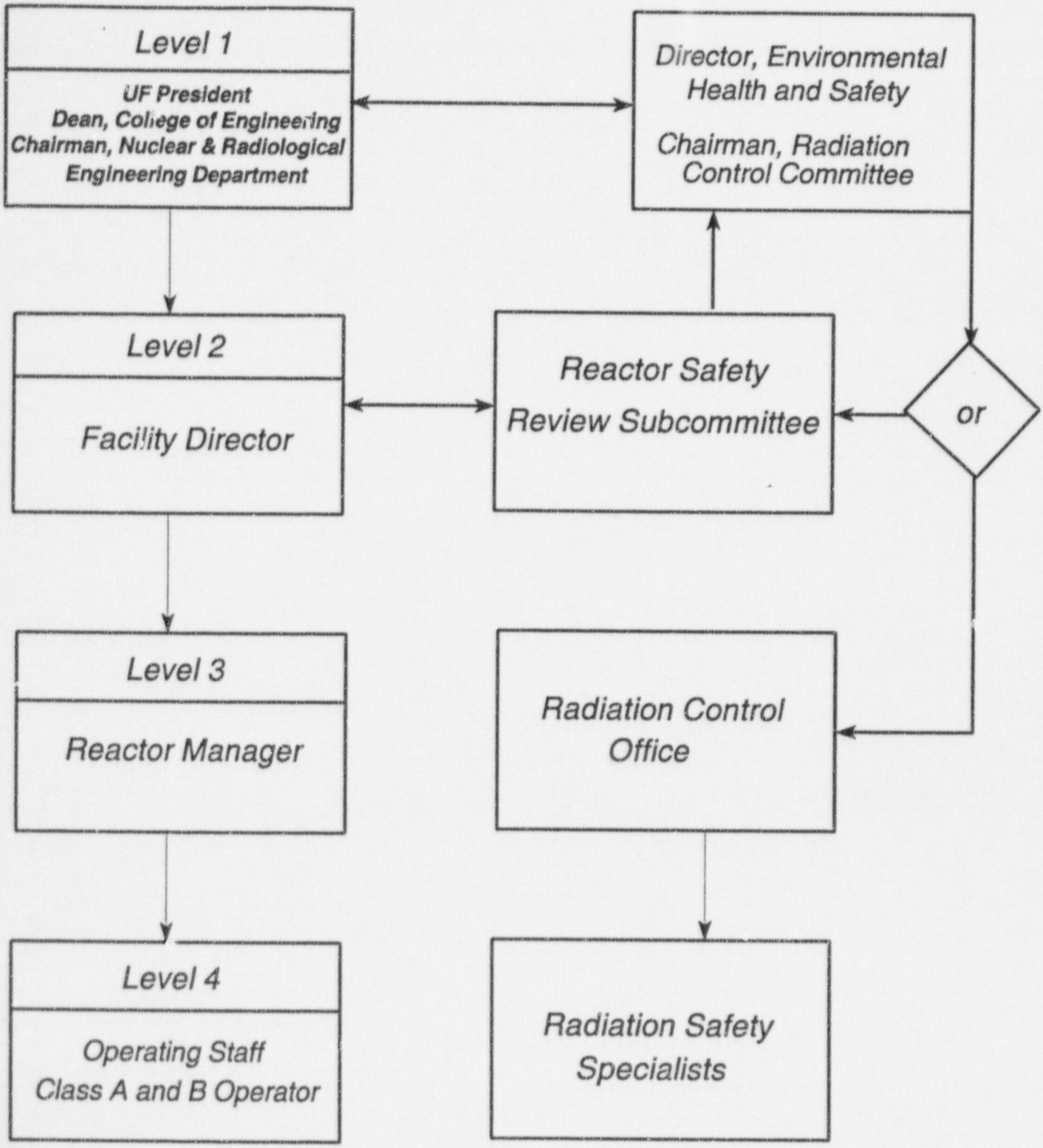

Figure 3.1 UFTR Organization Chart

REV 8, 12/92
REV 10, 2/97

3.2.2 UFTR Safety Review Subcommittee

The UFTR Reactor Safety Review Subcommittee (RSRS) is a part of and answers to the University Radiation Control Committee (URCC). The basic purpose of the RSRS is to review and audit UFTR operations for conformance of operations with good radiological safety practices. The RSRS reports directly to the Chairman of the URCC and provides its recommendations to the Director of Environmental Health and Safety. The Director of Nuclear Facilities and/or the Reactor Manager report safety-related problems and activities concerning the reactor to the UFTR RSRS for review.

3.2.3 Radiation Safety Organization

The radiation safety organization at the University of Florida is directed and overseen by the University Radiation Control Committee (URCC). The Committee is appointed by the Director of Environmental Health and Safety Division and presently includes professors from the Departments of Biological Sciences, Radiological Health, Nuclear and Radiological Engineering and Environmental Engineering Sciences, as well as the Radiation Control Officer (ex-officio member). The URC Committee is responsible for advising the President on all matters related to radiation safety.

The radiation control office (headed by the Radiation Control Officer) within the Environmental Health and Safety Division is the organization responsible for surveillance of health physics for reactor operations. This office trains all UFTR staff members in health physics areas and supplies health physicists or other health physics technical personnel on an as needed basis to oversee operations and to assure the health physics function is properly implemented in all reactor-related operations.

The Radiation Control Officer assists the Director of Nuclear Facilities and/or the Reactor Manager in all matters which concern the health and safety of the public during any emergency.

3.3 Interaction with Governmental Organizations

There are no credible UFTR-related events that will require direct interaction with offsite governmental agencies. The University of Florida is a quasi-governmental agency and, as such, the Division of Environmental Health and Safety is engaged in emergency planning. That Division, through the Radiation Control Office shown in Figure 3.1, is involved in assuring the safe operation of the UFTR. Emergency planning is permissive of special situations and no planning conflict exists. Provisions are made, however, to interact with the Alachua County Emergency Planning Office which is tied to the Florida Department of Community Affairs, Division of Emergency Management. In addition, the State of Florida Department of Health, Bureau of Radiation Control is notified of all radiological emergencies through the Department of Community Affairs, Division of Emergency Management State Warning Point to assure proper communications are maintained with the State Bureau of Radiation Control to afford this office the opportunity for offsite monitoring and assessment and to assure availability and access to resources through this office should they be deemed appropriate. This response, however, is not considered essential for the UFTR Emergency Response Plan to be effective.

3.4 Coordination with Onsite and Offsite Authorities

The five (5) key emergency support organizations for the UFTR are: University Police Department (UPD), Gainesville Fire Department, Shands Teaching Hospital and Clinics, the Alachua

County Emergency Planning Office, and the State of Florida Department of Health and Rehabilitative Services (HRS) Office of Radiation Control.

3.4.1 University Police Department

The UPD provides basic law enforcement support, including access control, communications with different agencies, coordination with other law enforcement agencies, evacuation of affected areas and support of the emergency action. All emergency communications begin with notification of the UPD Dispatch Center (telephone number: 2-1111) which serves as the Campus Communications Center for onsite and offsite notifications in response to radiological emergencies.

3.4.2 Gainesville Fire Department

The Gainesville Fire Department provides basic firefighting, lifesaving and support actions. The GFD is equipped and trained to work within the confines of a radiological accident and can support many of the required actions, in coordination with the Emergency Support Center (see Section 8.1) from which actions to evaluate and respond to radiological emergencies are directed.

3.4.3 Shands Teaching Hospital and Clinics

Shands Teaching Hospital and Clinics, Inc., has overall responsibility for treating any injured persons, whether contaminated, irradiated or just physically injured. The Shands' Plan for Emergency Handling of Radiological Accident Cases is enclosed as Appendix I.

3.4.4 Alachua County Emergency Planning Office

The Alachua County Emergency Planning Office has overall responsibility in handling situations that could or have resulted in a significant release of radioactivity to the environs. The Alachua County Emergency Planning Office is responsible through the Florida Department of Community Affairs, Division of Emergency Planning, for all offsite communications and coordination of support. Although not expected to be necessary for credible UFTR accident conditions, this organization will serve as a communications and information resource in the event of a UFTR-related radiological emergency.

3.4.5 State of Florida Bureau of Radiation Control

The State of Florida Department of Health, Bureau of Radiation Control is notified of radiological emergencies through the Department of Community Affairs, Division of Emergency Management State Warning Point. This Office is informed of all UFTR radiological emergencies and will normally be informed of emergency drills as well. The Office of Radiation Control maintains a full spectrum of response capabilities for offsite monitoring and dose assessment and can be expected to respond to any significant radiological emergencies associated with the UFTR to assure documentation of offsite monitoring and assessment activities and to provide such backup radiation protection and control services as may be deemed appropriate. This response is not considered essential for the UFTR Emergency Response Plan to be effective.

3.5 Reactor Emergency Response Organization and Extensions

The UFTR Emergency organization, as it relates to the normal organization, is shown in Figure 3.2. Lines of responsibility are shown by solid lines while lines of communication are shown by dashed lines. Figure 3.2 shows extensions to other organizations and groups that will augment and extend the capability of the facility emergency staff. The Director of Nuclear Facilities or his duly authorized representative has overall responsibility for reactor-related emergencies; the Radiation Control Officer or his duly authorized representative has overall responsibility for radiation control actions (specifically Protective Action Guides). The University of Florida Police Department has overall law enforcement and communications responsibility through its dispatch center which serves as the campus emergency operations center. The Alachua County Emergency Planning Office under the Florida Department of Community Affairs, Division of Emergency Planning has offsite responsibility. However, through the State Warning Point, the State of Florida Bureau of Radiation Control in the Department of Health is notified of all radiological emergencies to provide the opportunity for offsite monitoring and assessment and to provide a communications link for such technical support as may be deemed appropriate for optimal radiation protection and control. Again this response is not considered essential for implementation of the UFTR Emergency Response Plan.

The small size of the reactor operating staff and the probability of absences because of illness, vacation, or leave necessitates a flexible internal emergency organization. However, most of the credible emergencies that have radiological release implications will arise from reactor operations, failure of an experiment-in-progress, or fuel handling. Under these circumstances, there will be a designated Senior Reactor Operator and one or more Reactor Operators available. To provide reasonable assurance that an emergency management organization will exist to meet operational emergencies, the following succession is specified as depicted in Figure 3.2:

Emergency Director (normally the Facility Director)
- Reactor Manager
- Onsite Senior Reactor Operator
- The most technically experienced onsite UFTR staff member
- The Radiation Control Officer or designated alternate

Emergency Coordinator (normally the Reactor Manager)
- Onsite Senior Reactor Operator
- Others as above

The Emergency Director and the Emergency Coordinator may be the same individual.

There are two situations in which the preceding succession can fail:

a. An event occurs and is perceived during non-working hours;
b. A catastrophic accident (fire or explosion) causes disablement of the organization.

If an event is perceived at the UPD Dispatch (Campus Communication Center) by alarm/annunciator or by telephone, the Communication Center will notify the Division of Environmental Health and Safety and will attempt to locate and advise at least one staff member each from the UFTR and the Radiation Control Office. The UPD Dispatch is provided with a UFTR emergency call list for

3.9 Radiological Assessment

Radiological assessment shall be performed by the Reactor Manager or that individual's alternate and with the assistance of the Radiation Control Officer or an alternate provided by the University of Florida Radiation Control Office. The UFTR line of succession shall follow Figure 3.2. Supporting personnel from the Radiation Control Office are to be determined by that Office. There are no credible accidents requiring offsite dose assessments or protective actions. However, the State of Florida Bureau of Radiation Control in the Department of Health will be notified of all significant radiological emergencies to assure a timely opportunity to provide documentation of any offsite monitoring and assessment as may be deemed appropriate and to assure communications channels are established for such technical support as may be deemed appropriate.

3.10 Recovery Operations

Recovery operations shall be directed by the Reactor Emergency Director. This individual shall be assisted by:

a. The Emergency Coordinator (for personnel, supplies and equipment); and

b. The Radiation Control Officer and an onsite Health Physicist (for decontamination, and assessment of radiation exposure) with Radiation Control Office personnel as backup and to provide general health physics support.

3.11 Termination of Emergency and Recovery

Decisions regarding termination of emergency, initiation of recovery and completion of recovery shall be made by the Emergency Coordinator or Emergency Director (as available) in consultation with Radiation Control Officer and supporting personnel. Planned organizational changes or actions are to be approved by the Emergency Coordinator who shall inform impacted agencies and coordinate those changes.

3.12 Authorization of Exposures Beyond Normal Occupational Limits

The Emergency Director, with the consent of the Radiation Control Officer or the designated RCO alternate, may authorize exposures to volunteer workers in excess of normal occupational limits. All such volunteers should be cognizant of risks involved.

7.0 EMERGENCY RESPONSE

This chapter of the UFTR Emergency Plan identifies emergency response measures for each emergency class. These response measures are based upon the emergency class and action levels that specify what measures are to be implemented. In particular, this chapter describes the specific actions to notify and activate the emergency organization and the applicable support organizations for each class of credible UFTR emergency to include Class 0 (Events Less Serious than the Lowest Category), Class I (Notification of Unusual Events) and Class II (Emergency Alert).

7.1 Generic Emergency Response

Before delineating emergency responses for specific emergency classes, certain generic assessment responsibilities and protective actions are applicable for all levels of radiation emergencies in the UFTR facility.

7.1.1 Assessment Responsibilities

Assessment functions during a radiological emergency are assigned as follows:

Reactor facility staff are responsible for the safety of the reactor and measures to prevent or mitigate hazards to the reactor, reactor personnel and the general public.

Personnel representing the Radiation Control Office are responsible for onsite radiological safety. The details of the radiological assessment function are incorporated in rad con procedures. The procedures include a description of the methodologies and techniques to be used to an extent sufficient to demonstrate, in a timely manner, that there is reasonable assurance (1) that the magnitudes of releases of radioactive materials can be determined, (2) that the magnitude of any resulting radioactive contamination can be determined, (3) that projected exposures to persons within or beyond the facility boundaries can be estimated, and (4) that emergency action levels specified can be determined.

The Alachua County Emergency Planning Office is responsible for offsite radiological safety. The State of Florida (an Agreement State) and the Department of Health and Department of Community Affairs (Division of Emergency Management) hold joint and primary responsibility for protection of public health and safety in matters relating to radiological incidents.

7.1.2 Protective Actions

A series of generic protective actions are delineated in this section as applied to all levels of UFTR-related emergencies.

7.1.2.1 Evacuation Considerations

7.1.2.1.1 Evacuation from Operations Boundary - The reactor personnel and other persons in the cell, control room, operator's room and throughout the UFTR building (operations boundary) and the Reactor Annex are evacuated by activation of the evacuation siren (automatic or manual). The

8.0 EMERGENCY FACILITIES AND EQUIPMENT

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

8.1 Emergency Support Center

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

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

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

8.2 Assessment Facilities

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

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

8.3 First Aid and Medical Facilities

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

8.3.1 Decontamination Facilities

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

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

8.3.2 First Aid

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

8.3.3 Ambulance Service

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

8.3.4 Shands Teaching Hospital and Clinics

The Shands Emergency Room handles all emergency cases and is also a designated radiation accident emergency facility with the capability of handling radiation exposed and contaminated victims. This facility previously served as the designated radiation accident emergency facility for the Crystal River 3 nuclear power plant on the coast of Florida about 75 miles away. Although this facility no longer serves as such a radiation accident emergency facility for the Crystal River Facility, it maintains the capability to address the handling of radiation exposed or contaminated victims as outlined in its "Plan for Emergency Handling of Radiological Accident Cases" included as Appendix I to the UFTR Emergency Plan. Shands is a regional resource facility for handling radiation accident related cases, even as a backup to the primary facility for the Crystal River Plant should a major accident occur.

8.3.5 Other Medical Support

All conceivable medical assistance requirements can be supplied by Shands Teaching Hospital and Clinics so that assurance of services from off-site agencies is unnecessary.

8.4 Communication Equipment

The Decontamination Room (Room 108 NSC) outside the UFTR building is equipped with a normal telephone for primary communications (352-392-1428). Shands Hospital has a red emergency phone which is to be used to notify Shands directly of radiation accident or other victims about to be transported and to keep proper records on such personnel. Walkie-talkies are used for communicating with support groups around the facility, using Physical Plant frequency. The UPD will be the primary communication center and can provide communications assistance via portable, hand-held radio equipment. If Civil Defense actions are warranted, then they become the primary control center and direction/communications originate from this office.

The UFTR Building intercom system links the reactor control room, the facility director's office and the operating staff office for internal communications. Telephones also connect various areas of the UFTR Building to the control room, main Nuclear Engineering office and the outside. Word-of-mouth communications will provide back-up for internal communications.

APPENDIX I

SHANDS HOSPITAL EMERGENCY DEPARTMENT

PLAN FOR EMERGENCY HANDLING OF

RADIOLOGICAL ACCIDENT CASES

Shands Hospital Emergency Department

POLICY: **PLAN FOR EMERGENCY HANDLING OF RADIOLOGICAL ACCIDENT CASES**

PURPOSE: To provide instructions and procedures for personnel to prepare for the admission of a patient involved in a radiological accident.

I. INTRODUCTION

The increasing use of radioactive materials and radiation-producing devices and machines on the University of Florida campus, the needs generated by the generally increasing use and transportation of radioactive materials and radiation sources and the construction and operation of nuclear power plants in Florida all contribute to the need for a plan for the emergency handling of radiological accident cases at this facility.

Shands Hospital has made a commitment to institutions to admit personnel for treatment and/or observation required in the event of any radiological incident that may occur at their facilities.

This document is intended to be the plan of the Shands Hospital and its medical staff for coping with irradiated and/or contaminated patients originating at the University of Florida campus, admitted under the State of Florida Radiological Response Plan, referred by practicing physicians, or admitted under agreements with specific nuclear facilities.

II. DEFINITION OF RADIOLOGICAL ACCIDENT CASES

There are four types of radiological accident patients:

A. **Radiation Exposure**
The individual who has received whole or partial body external radiation may have received a potentially lethal dose of radiation, but he/she is no hazard to attendants, other patients, or the environment. He/she is no different than the diagnostic x-ray patient or general radiation therapy patient.

B. **Internal Contamination**
Such contamination results from inhalation or ingestion of radioactive material. Usually such a person is no hazard to attendants, other patients or the environment. Following cleansing of minor amounts of contaminated material deposited on the body surface from airborne exposure, this person should be handled similar to a chemical poisoning case. Body wastes should be collected and saved in order that measurements of the amount of radioactive materials present can be made to assist in determining appropriate therapy.

C. **External Contamination**
External contamination of body surface and/or clothing by radioactive liquids and dirt particles presents a type of case with problems similar to vermin infestation. Surgical isolation techniques to protect other patients and the hospital environment must be employed in order to confine and remove any potential hazard.

D. **Contaminated Wounds**
When external contamination is complicated by a wound, care must be taken not to cross-contaminate surrounding surfaces from the wound and vice versa. The wound and surrounding surfaces are cleansed separately and sealed off when clean.

These radiation and/or contamination problems may or may not be complicated by injury.

APPENDIX II

AGREEMENT LETTERS

RECEIVED APR 0 4 1997

UNIVERSITY OF FLORIDA

College of Medicine
Division of Emergency Medicine

1600 SW Archer Road
PO Box 100392
Gainesville, Florida 32610-0254
Tele: (352)395-0049
Fax: (352)338-9827
email: sobel@emergency.anest.ufl.edu

March 20, 1997

Dr. William G. Vernetson
Associate Engineer, Reactor Manager
Room 202, Nuclear Science Center
University of Florida
Gainesville, FL

Dear Dr. Vernetson:

This is to advise that the University of Florida College of Medicine and Shands Teaching Hospital are appropriately staffed, equipped and prepared to provide to the University of Florida Department of Nuclear Engineering emergency medical care and treatment in the event of radiation injury and/or personnel contamination.

We are pleased to make this commitment to the Department of Nuclear Engineering and look forward to a continued positive relationship between your facility, the College of Medicine and Shands.

Sincerely,

A. Joseph Layon, MD
Chair, Division of Emergency Medicine

Richard M. Sobel, MD, MPH
Medical Director, Division of Emergency Medicine & ShandsCair

/pws

Equal Opportunity/Affirmative Action Institution

ALACHUA COUNTY
"Caring People Providing Quality Service"

DEPARTMENT OF FIRE/RESCUE SERVICES

Emergency Management	• 374-5223
Emergency Medical Services	• 955-2435
9-1-1 Addressing	• 338-7361
Emergency Medical Billing	• 955-2462
Fire Services	• 955-2435

P.O. Box 548
Gainesville, Florida 32602
Tel.: (352) 955-2435
Fax: (352) 955-2492
Fax: (352) 334-0104

Will G. May, Jr.
Chief of Fire/Rescue

December 10, 1996

Dr. W.G. Vernetson
Director of Nuclear Facilities
University of Florida

Dear Dr. Vernetson,

This letter is an update to your records for emergency notifications in case of a situation involving the University of Florida Training Reactor (UFTR). All request for Fire or Emergency Medical Services (EMS) should be reported through 911.

The Office of Emergency Management can be reached through the County Warning Point (CWP) at (352) 955-2413 or 955-2414. The CWP is a 24 hour day facility that provides centralized notifications in the event of a community emergency event. The CWP maintains a direct link to the State Warning Point (SWP) through the State of Florida's Emergency Satellite Communications System or ESATCOM. ESATCOM provides two way voice and data links between the SWP, CWP, the National Weather Service Office in Jacksonville, and the Emergency Alert Station (EAS) for Alachua County, WRUF AM/FM. [Note: The EAS has replace the old EBS per the Federal Communication Commission.]

The Office of Emergency Management is available to assist the University of Florida in the event of an actual emergency and for drills involving the UFTR. I have enclosed a copy of the CWP operations plan for the UFTR and a diagram of the communications system in the event of an incident involving the UFTR. We also have our nuclear reactor operational plan online at: http://www.co.alachua.fl.us/~acem/nuclear.html

If I can be of further assistance, please give me a call.

Sincerely,

Craig Fugate
Emergency Manager
acem@ns1.co.alachua.fl.us

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 22, 1997

RECEIVED AUG 2 8 1997

Dr. William Vernetson
Director of Nuclear Facilities
102 Nuclear Reactor Building
Department of Nuclear Engineering Sciences
University of Florida
Gainesville, Florida 32611

SUBJECT: REVISION 10 TO THE UNIVERSITY OF FLORIDA TRAINING REACTOR EMERGENCY PLAN (TAC NO. 98483)

Dear Dr. Vernetson:

This letter acknowledges receipt of your letter dated April 10, 1997, which enclosed Revision 10 to the University of Florida Training Reactor Emergency Plan submitted under the provisions of 10 CFR 50.54(q).

Based on your determination that the changes do not decrease the effectiveness of your emergency plan, and that it continues to meet the requirements of Appendix E to Part 50, NRC approval is not required.

Our initial review of these changes indicates them to be in accordance with 10 CFR 50.54(q). Implementation of these changes will be subject to inspection to confirm that they did not decrease the effectiveness of your emergency plan.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of the letter will be placed in the NRC Public Document Room.

If your have any questions, please call me at (301) 415-1102.

Sincerely,

for Theodore S. Michaels, Senior Project Manager
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 50-83

cc: See next page

cc:

Mr. James S. Tulenko, Chairman
Nuclear Engineering Sciences
Department
University of Florida
202 Nuclear Sciences Center
Gainesville, Florida 32611

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

Mr. Pedro B. Perez, Associate Director
Nuclear Reactor Program
North Carolina State University
P. O. Box 7909
Raleigh, North Carolina 27695-7909

Dr. R. U. Mulder, Director
UVA Reactor Facility
Dept. of Nuclear Engineering
Charlottesville, Virginia 22903-2442

Administrator
Department of Environmental Regulation
Power Plant Siting Section
State of Florida
2600 Blair Stone Road
Tallahassee, Florida 32301

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

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

APPENDIX F

REQUALIFICATION AND RECERTIFICATION TRAINING PROGRAM DOCUMENTATION

UNIVERSITY OF FLORIDA

Nuclear Reactor Facility
Department of Nuclear and Radiological Engineering

202 Nuclear Sciences Center
P.O. Box 118300
Gainesville, Florida 32611-8300
Tel: (352) 392-1429
Fax: (352) 392-3380
E-mail: vernet@server.nuceng.ufl.edu

May 29, 1997

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

Requalification Training Program

Dear Sir/Madam:

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

The current operator requalification and recertification program training cycle for the University of Florida Training Reactor as submitted with a letter dated May 31, 1995 is scheduled to end in June 1997. Therefore, we propose to renew the current plan with minor changes as well as new dates. In effect, the revised plan will be essentially the same as that currently being used for the two-year training cycle with only the name of the Department of Nuclear Engineering Sciences changed to *Department of Nuclear and Radiological Engineering* in paragraph 3 on page 1 to reflect a department name change in 1996, and the two training sessions on Annual Reports being moved from November to the following February in each year in the Schedules in Appendix A to account for a change in UFTR Tech Specs delaying required submittal of UFTR Annual Reports. A copy of this revised plan is enclosed for reference purposes. This renewed plan as included here will cover the UFTR operator requalification and recertification program from July 1997 through June 1999.

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-year requalification and recertification program training cycle every two years beginning in July 1999.

Equal Opportunity/Affirmative Action Institution

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,

William G. Vernetson

William G. Vernetson
Director of Nuclear Facilities

WGV/dms
Enclosure

Copies: USNRC Region II
Reactor Safety Review Subcommittee
J. Powers

Sworn and subscribed this 29 day of May 1997.

Notary Public

KIMBERLY S. NESMITH
MY COMMISSION # CC475324 EXPIRES
June 21, 1999
BONDED THRU TROY FAIN INSURANCE, INC.

UNIVERSITY OF FLORIDA TRAINING REACTOR
OPERATOR REQUALIFICATION AND
RECERTIFICATION TRAINING PROGRAM PLAN

JULY 1997 through JUNE 1999

Submitted by

Dr. William G. Vernetson

Director of Nuclear Facilities

Department of Nuclear and Radiological Engineering

University of Florida

Gainesville, Florida

MAY 29, 1997

OPERATOR REQUALIFICATION AND RECERTIFICATION

TRAINING PROGRAM PLAN

(July 1997 through June 1999)

1.0 GENERAL

A training program for the periodic requalification of UFTR operators shall be conducted in accordance with the requirements established by this document. The requalification and recertification training for UFTR personnel meets or exceeds the requalification training requirements established by 10 CFR 55 and the ANSI/ANS-15.4-1988 standard entitled, "Selection and Training of Personnel for Research Reactors."

The objectives of this program are to refresh in areas of infrequent operation, to review facility and procedure changes, to address subject matters not usually reinforced by direct use, and to improve in areas of performance or knowledge weakness. The Program is designed to evaluate an operator's knowledge and proficiency for his duties and to provide and assure retraining where necessary in order to assure improvement. Emphasis is on those subjects considered necessary for continued proficiency. In addition, the Program takes into consideration the specialized nature and mode of operation of the UFTR as well as the background, skill, degree of responsibility, and participation of certified personnel in related facility activities. The Program also reflects facility modifications and changes in procedures.

Responsibility for the administration of the program shall rest with the Director of Nuclear Facilities for the Department of Nuclear and Radiological Engineering and his/her duly designated representative. Requalification examinations shall be administered by one knowledgeable of facility operation and applicable subject matter.

All licensed and certified operators are required to participate in all phases of this program except where specifically exempted. Normally exemptions are allowed only for the individual responsible to produce and administer the examinations. Persons in training for an operator's license also participate in the requalification program. An operator receiving a license during a requalification period is required to complete only those portions occurring after the effective date of the license received.

The requalification training program effective at the UFTR shall consist of ten(10) component areas described in the following sections and listed in Table 1. The requirements that must be met in order to complete the requalification program successfully are delineated in these sections.

Table 1

Operator Requalification and Recertification Program Requirement Areas

1. Requalification Schedule
2. Lectures, Reviews and Examinations
3. Operations and Checkouts
4. Emergency Drills
5. Absence from Authorized Activities
6. Evaluation and Retraining of Operators
7. Certification
8. Requalification Documentation and Records
9. Requalification Document Review and Audit
10. References

1.1 REQUALIFICATION SCHEDULE

The UFTR requalification and recertification training program shall be conducted biennially and shall be followed by successive two-year programs. To assure that the program is effective, the various requirements should be executed according to the time schedules outlined in this program guide. The current two-year Requalification Training Schedule (July 1997 - June 1999) is contained in Appendix A of this Program Plan.

1.2 LECTURES, REVIEWS AND EXAMINATIONS

1.2.1 Lectures

The requalification and recertification training program is divided into the group of topics listed below in Table 2, for which preplanned training or preparation is scheduled. The schedule is set up so that the entire program covering the topics listed in Table 2 is completed over the two year period.

Table 2

Requalification Training Lecture Program Topics

1. Nuclear Theory and Principles of Operation
2. Design and Operating Characteristics
3. Instrumentation and Control Systems
4. Reactor Protection System
5. Normal, Abnormal and Emergency Operating Procedures (all procedures except certain security response procedures are covered once per year minimum, independent of emergency drills)
6. Radiation Control and Safety
7. Technical Specifications and Applicable Portions of Title 10, Code of Federal Regulations
8. Emergency Plan
9. Security Plan.

Self-study methods are also considered to be an adequate and appropriate training method for the lecture program topics when learning objectives are properly measured by examination or documentation of expertise. Self-study methods are especially advised in combination with lectures.

1.2.2 Examinations

1.2.2.1 Lecture Program Topics

An examination shall be administered at the end of each lecture session listed in Table 2; each examination should be administered no later than four weeks after the lecture or review session. For designated cases, a final examination covering all topics in a series of lectures may be substituted for individual examinations. Results of the certified individual's evaluation from the examinations is used as one input to determine the operator's proficiency, weakness or deficiency.

Examination is encouraged but not required for training sessions given but not required by this program.

The individual responsible for developing the examinations for the requalification program may be exempted from the examination. This exemption should be rotated among the eligible staff members as appropriate.

1.2.2.2 Biennial Comprehensive Examination

A comprehensive requalification written examination shall be required for all operators on a biennial schedule. A lecture may be given prior to this examination but is not required.

1.2.2.3 Annual Operations Test

Each reactor operator and senior reactor operator is required to take an annual operations test to demonstrate operational proficiency and understanding of system responses. This examination is administered by a designated Senior Reactor Operator.

1.2.2.4 Annual Walk-through Examination

Each licensed Reactor Operator and Senior Reactor Operator shall demonstrate satisfactory understanding of the operation of the facility systems, operating procedures and license as well as facility procedure and license changes during an annual walk-through examination administered by a designated Senior Reactor Operator.

1.2.3 Fuel Handling

Practical training in fuel handling shall be conducted biennially. Prior to any refueling operation and/or fuel handling operation, a special training session shall be held discussing/practicing the required operations and reviewing procedures to assure proficiency of all personnel involved, including emergency actions. This training may be credited as the required biennial fuel handling practical training.

1.2.4 Procedure/Technical Specifications Changes

Any changes in procedures, technical specifications, regulations, as well as any change with safety significance to the facility shall be reviewed by every licensed operator. Any procedural changes will be distributed directly to all licensed reactor operators and discussed as needed. Furthermore, a written

monthly report summarizing the activities in the reactor facility, including modifications, maintenance, results of calibrations and tests, as well as significant occurrences such as potential violations, failures of systems, etc. will be made available as required reading for all licensed operators.

1.2.5 Required Reading List

Documents, letters and memos pertinent to operational safety shall be maintained in the Required Reading List prior to permanent filing. Each operator is responsible for reviewing the list periodically and in a timely manner to remain current with the information contained in the Required Reading List. This reading list will be indexed with a master listing with spaces provided for initials of all required readers. This list should be reviewed at intervals not to exceed one month; when an item has been reviewed, the proper initials should be affixed to acknowledge completion of review.

1.2.6 Yearly Review

A yearly review of facility operations, maintenance, modifications, etc. is conducted with the operating staff by the Director of Nuclear Facilities or the Reactor Manager using the UFTR Annual Report as a basis for the review. More frequent reviews may be conducted as appropriate.

1.3 REQUALIFICATION OPERATIONS AND CHECKOUTS

1.3.1 Reactivity Control Manipulations

Over the two year requalification period, each certified individual shall perform at least ten reactivity control manipulations in any combination of reactor startups, shutdowns, or significant reactivity changes.

1.3.2 Schedule of Operations and Checkouts

To insure operator proficiency over a range of ordinary operations, the following schedule of operations and checkouts shall be maintained by all licensed operators when the reactor is operable.

1.3.2.1 Startups and Shutdowns

Each licensed operator shall perform at least one reactor startup quarterly at intervals not to exceed four months. This operation shall include at least one additional reactivity manipulation on a quarterly basis.

1.3.2.2 Daily Checkouts

Each licensed operator shall perform at least one daily checkout quarterly at intervals not to exceed four months.

1.3.2.3 Weekly Checkouts

Each licensed operator shall perform at least one weekly checkout semi-annually at intervals not to exceed eight months.

1.3.2.4 Quarterly Licensed Activities

To maintain certification, each licensed reactor operator shall exercise his/her operator's license for a minimum of four(4) hours of licensed activities during each calendar quarter.

1.3.2.5 Remediation Requirements

Any operator who fails to perform the required licensed activities listed in Section 1.3.2.1 through 1.3.2.4 must receive supervised practical training to meet each of these requirements prior to resuming solo operation for certified activities. In particular, if the requirement to exercise the operator's license for a minimum of four(4) hours of licensed activities during each calendar quarter is not met, then the license becomes inactive; prior to reactivation of the license (recertification), the Reactor Manager or alternate must verify that qualifications are current and the operator must perform six(6) hours of licensed activities under the direction of a licensed operator or senior reactor operator.

1.3.2.6 On-the-Job Training

The specific operational practices delineated in this Training Program Plan including the annual operations test, the annual walk-through examination, and the requirements for conducting facility checkouts, startups, shutdowns, reactivity manipulations including at least four(4) hours of certified activities per calendar quarter constitute the bulk of the operator on-the-job training requirements. In addition, the biennial fuel handling training as well as semi-annual training on emergency response equipment, quarterly emergency drills, and annual special equipment training are also considered a major portion of the practical on-the-job training and are considered adequate to assure safe operation of the facility.

1.3.3 Credit for Reactivity Control Manipulations

For the purpose of meeting minimum requalification and recertification requirements, other than the four(4) hours of licensed activities required per Section 1.3.2.4, each licensed operator may take credit only for reactivity control manipulations which they perform themselves. For senior reactor operators, direct supervision of these operations may be considered equivalent to actual performance.

1.3.4 Records

It is the responsibility of each operator to insure that Requalification Training Program's training requirements are met and logged in the operator's Requalification Notebook. Each operator shall also be responsible to ensure that monthly operating hours are logged in the same notebook.

1.4 EMERGENCY DRILLS

1.4.1 Scheduling and Participation

Emergency drills shall be held quarterly, per UFTR Technical Specifications Section 4.2.6(3). At least once per year these drills shall involve the participation of the University Police Department, the Gainesville Fire Department and other emergency assistance teams as appropriate for the drill in question. Each operator is required to participate in two emergency drills per year at intervals not to exceed eight months.

Any operator failing to meet this two-drill requirement must receive special training on proper response to emergencies and must receive a documented review of the last drill missed as well as a walkthrough of the facility related to proper emergency responses. This remediation shall be conducted prior to performing certified activities.

1.4.2 Postdrill Critique

A review of the drill and applicable emergency procedures shall be performed with all certified individuals within 30 days after completion of the drill. This review should include any deficiencies as well as recommendations for improvement and is normally conducted immediately after the drill for all operators and other staff and radiation control personnel involved in the drill. Nonparticipating certified individuals may perform this review using the drill record in the required reading file or participate in a special training session. Documentation is provided via initials in the Required Reading List or on forms documenting special training sessions.

1.5 ABSENCE FROM AUTHORIZED ACTIVITIES

An operator who has not been actively performing certified functions for a period in excess of four months shall be required to demonstrate to the Reactor Manager or duly authorized representative that his/her knowledge and understanding of the operation and administration of the facility are satisfactory before returning to certified duties. This shall be accomplished through an interview and evaluation or a written, oral or operational examination or a suitable combination thereof. Any deficiencies uncovered must be corrected before the individual resumes performance of certified functions.

1.6 EVALUATION AND RETRAINING OF OPERATORS

1.6.1 Grade Requirements

The acceptance criterion on all graded examinations shall be 80%; all operators are required to complete each examination satisfactorily according to the following requirements:

1.6.1.1 A score on the written or other examinations equal to or greater than 80% may require no additional training. Nevertheless, the results of all examinations to include missed questions should be reviewed with the operator to assure proper understanding.

1.6.1.2 A score on the written or other examination in the range of 65%-79% requires additional training in those areas or topics where weaknesses or deficiencies are indicated. This retraining and retesting shall be completed within 60 days from the date the examination was administered and prior to the candidate being recertified. In this case the candidate need not be removed from licensed duties subject to the evaluation of the Reactor Manager or his/her duly authorized representative.

1.6.1.3 A score on the written or other examination of less than 65% requires that an evaluation be performed by the Facility Director or designated representative within one month. The evaluation shall determine if the deficiencies require that the individual's certification be withdrawn pending completion of any accelerated retraining effort. The evaluation shall take into account the individual's past performance record, the supervisor's evaluation, and past test scores as well as current deficiencies. Additional oral or operational examinations may also be given to aid in the evaluation. In any case certification shall be withdrawn within four months if the candidate does not achieve passing scores after reexamination.

1.6.2 Accelerated Training

Accelerated training programs shall be completed within four months following the grading of an examination. Furthermore, within one month after the grading of the examination, there shall be an evaluation by the Reactor Manager or a designated representative to determine if the deficiencies uncovered warrant withdrawal of the individual's certification pending completion of the accelerated training program. The evaluation shall consider the individual's past performance record, the supervisor's evaluation and past test scores as well as current deficiencies. Additional oral or operational exams may also be given to aid in the evaluation.

1.6.3 Additional Training Requirements

Additional training shall be provided whenever needed to correct weaknesses or deficiencies uncovered. Such additional training shall be completed prior to the conclusion of the specific requalification program or application for renewal of operator's license, whichever occurs first.

Additional appropriate training requirements in the form of formal lectures, tutoring, self-study or on-the-job training shall be based on the results of examinations conducted.

1.6.4 Deficiencies Affecting Safety

Regardless of the score, if the individual's test indicates a deficiency in a critical area that affects safety, training shall be promptly administered to correct the deficiency or the operator will be removed from performing certified duties in the affected area until the deficiency is corrected.

1.6.5 Evaluation Via Annual Examinations

The annual operations test and the annual walkthrough examination are key factors in evaluating the continued competence of the certified operator both for demonstrating operational proficiency and understanding of system responses and for demonstrating overall satisfactory understanding of the operations of the facility, operating procedures and facility license changes. The results of these two examinations should be utilized as primary input for evaluating operator performance for recertification purposes.

1.6.6 Biennial Evaluations

An in-depth evaluation of the operating performance of each licensed operator shall be performed and documented biennially as a minimum by a summary and judgmental statements. The operational evaluation provides an estimate of the knowledge, competence and dexterity of the operator to operate the reactor safely and to take appropriate actions in response to abnormal and emergency situations that may arise. Additional operational training shall be provided to correct performance weaknesses that may be identified.

The biennial evaluation shall include results from the written examinations, the annual operations test, the annual walkthrough examination and other on-the-job evaluation of operational proficiency as well as any other available indications of the operator's capability to discharge his/her duties in a safe and competent manner including participation in practical and special training, instructional activities and other work activities.

1.6.7 Additional Evaluations

An evaluation shall be made of an operator at any time his/her physical or mental condition appears impaired in a manner that his/her performance of duties as an operator appears to be affected. Any exemplary performances or additional duties performed by an operator should be noted in his/her Requalificational Folder/Notebook to aid later evaluations.

1.7 RECERTIFICATION

1.7.1 Certified individuals who have successfully completed the requalification program may be recertified by the Facility Director or designated alternate.

1.7.2 All certified individuals must be cognizant of facility technical specifications, design and procedure changes in a timely manner.

1.8 REQUALIFICATION DOCUMENTATION AND RECORDS

1.8.1 Operator Requalification Records

Operator requalification records shall be kept to assure that all the requirements of the "UFTR Operator Requalification and Recertification Program Plan" are met.

Each operator shall have an individual folder or notebook containing signature blocks for lectures attended, prepared or assigned self-study sessions, reactivity manipulations performed, weekly and daily checkouts performed, and quarterly drills participated in by the operator. The notebook shall also contain copies of written examinations administered, the answers given by the operator, results of any evaluations and documentation of any additional training administered in areas in which an operator has exhibited deficiencies. The performance of, or participation in, special training such as for fuel handling, use of emergency equipment, crane operation, etc., should also be logged in the applicable Requalification Notebook.

1.8.2 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.

1.8.3 Records Retention

Required documents and records pertaining to the Requalification and Recertification Program shall be maintained at the UFTR as part of the facility records for at least six years. Per 10 CFR 55.59(5)(i), these records including the master training file shall be retained for each reactor operator or senior reactor operator until the respective operator's license is renewed or surrendered.

1.9 REQUALIFICATION DOCUMENT REVIEW AND AUDIT

The individual Requalification Folders or Notebooks shall be reviewed on a semi-annual basis, at intervals not to exceed eight(8) months, by a designated Senior Reactor Operator and shall be noted by the inclusion of the SRO's dated signature. Any deficiencies noted during the review shall be brought to the attention of the Director of Nuclear Facilities or the Reactor Manager who will then ensure that appropriate corrective action is taken.

An audit of requalification program records shall be conducted by the Reactor Safety Review Subcommittee (RSRS) biennially at intervals not to exceed thirty (30) months. Such an audit should be performed annually at intervals not to exceed fifteen (15) months. All such audits shall be documented by the RSRS via its audit report or equivalent document.

1.10 REFERENCES

1.10.1 Title 10 Code of Federal Regulations, Part 55, "Operators' Licenses."

1.10.2 American National Standard ANSI/ANS-15.4-1988, "Selection and Training of Personnel for Research Reactors."

APPENDIX A

UFTR REQUALIFICATION

TRAINING PROGRAM SCHEDULE

1997-98 UFTR REQUALIFICATION TRAINING SCHEDULE

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	(L) Design and Operating Characteristics	(P) EMERGENCY DRILL	(P) Emergency Equipment Training	(L) Nuclear Theory and Principles of Operation	(P) EMERGENCY DRILL (involves outside agencies as appropriate)
			(P) Special Equipment Training (Rabbit System, Overhead Crane)		(L) Security Plan
					(I/P) Annual Operations Test

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
	(L) Normal, Abnormal and Emergency Procedures	(P) EMERGENCY DRILL	(L) Reactor Protection System	(I) Operator Walk-through Exams	(P) EMERGENCY DRILL
	(P) Fuel Handling Training		(P) Emergency Equipment Training		
	(S) Annual Report Review				

(P) = PRACTICAL TRAINING (S) = STAFF TRAINING (I) = INDIVIDUAL TRAINING (L) LECTURE/EXAM

1998-99 UFTR REQUALIFICATION TRAINING SCHEDULE

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
(L) Instrumentation and Control Systems	(L) Radiation Control and Safety	(P) EMERGENCY DRILL	(L) Technical Specifications		(L) Emergency Plan
			(P) Emergency Equipment Training		(P) EMERGENCY DRILL (involves outside agencies as appropriate)
			(P) Special Equipment Training (Rabbit System, Overhead Crane)		(I/P) Annual Operations Test
JANUARY	**FEBRUARY**	**MARCH**	**APRIL**	**MAY**	**JUNE**
	(I) Operator Walk-through Exams	(P) EMERGENCY DRILL	(L) Normal, Abnormal and Emergency Procedures		(P) EMERGENCY DRILL
	(S) Annual Report Review		(P) Emergency Equipment Training		BIENNIAL COMPREHENSIVE EXAM

(P) = PRACTICAL TRAINING (S) = STAFF TRAINING (I) = INDIVIDUAL TRAINING (L) LECTURE/EXAM

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C 20555-0001

RECEIVED JUL 1 4 199

July 9, 1997

Dr. William Vernetson
Director of Nuclear Facilities
102 Nuclear Reactor Building
Department of Nuclear Engineering Sciences
University of Florida
Gainesville, Florida 32611

SUBJECT: UNIVERSITY OF FLORIDA RESEARCH REACTOR OPERATOR REQUALIFICATION PLAN (TAC NO. M99110)

Dear Dr. Vernetson:

We have determined that the revisions to your Operator Requalification Plan (ORP), submitted by letter dated May 29, 1997, does not alter the intent of the presently approved ORP and therefore, your ORP, as submitted is acceptable.

Sincerely,

Theodore S. Michaels

Theodore S. Michaels, Senior Project Manager
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 50-83

cc: See next page

cc:

Mr. James S. Tulenko, Chairman
Nuclear Engineering Sciences
Department
University of Florida
202 Nuclear Sciences Center
Gainesville, Florida 32611

Dr. Ratib A. Karam, Director
Neely Nuclear Research Center
Georgia Institute of Technology
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Dr. R. U. Mulder, Director
UVA Reactor Facility
Dept. of Nuclear Engineering
Charlottesville, Virginia 22903-2442

Administrator
Department of Environmental Regulation
Power Plant Siting Section
State of Florida
2600 Blair Stone Road
Tallahassee, Florida 32301

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

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

APPENDIX G

FINAL REPORT TO NRC ON POTENTIAL TECH SPEC VIOLATION ON IMPROPER STACK MONITOR CALIBRATION

UNIVERSITY OF FLORIDA

Nuclear Reactor Facility
Department of Nuclear and Radiological Engineering

202 Nuclear Sciences Center
P.O. Box 118300
Gainesville, Florida 32611-8300
Tel: (352) 392-1429
Fax: (352) 392-3380
E-mail: vernet@server.nuceng.ufl.edu

January 27, 1997

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

14 Day Report:
Potential Tech Spec Violation—
Improper Stack Monitor Calibration

Dear Sir:

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

Pursuant to the reporting requirements of paragraph 6.6.2(g) of the UFTR Technical Specifications, a description of what is considered to be a potential violation of the technical specifications was reported by telephone and fax (Attachment I) on January 14, 1997 with a follow-up conversation on January 15, 1997. The required 14 day written report is submitted with this letter including occurrence scenario, NRC notification, evaluation of consequences, corrective action and current status. The potentially promptly reportable occurrence involved the improper calibration of the stack radiation monitor.

Scenario

During reactor operation on January 10, 1997 at full power, it was noted that the adjustable stack monitor was reading approximately 1000 cps higher than the fixed stack monitor. The fixed stack monitor was reading approximately 2800 cps which was consistent with recent previous runs at full power and thus was considered normal. The Reactor Manager and Facility Director concurred that the requirements of Table 3.3 in the Technical Specifications (see attached) were still being met. However, the decision was made to open a Maintenance Log Page (MLP) on the next working day and perform the stack monitor portion of the Q-2 surveillance to include calibration of the adjustable stack meter.

On January 13, 1997, review and comparison of the Stack Monitor Calibration procedure (on the Q-2 Surveillance Data Sheet) and the Radiation Control Technique (RCT) #37 procedure showed inconsistencies between the two and neither included a step to match calibration of the adjustable stack meter with the fixed stack monitor. Additionally, the following discrepancies/items were noted:

- No predicted stack count data sheet for the Cs-137 calibration source was included in RCT #37.
- Instructions on the Q-2 surveillance data sheet were incorrect. They were apparently not updated when the RCT was changed in April 1990 to change from the tedious and subject-to-error process of moving the Cs-137 calibration source to the proper decay-corrected position within the base of the stack each time the monitor was calibration checked to moving the Cs-137 source to the same position each time and simply decay correcting the Cs-137 source-produced count rate.
- Review of the Q-2 surveillance data sheets completed since March 1990 seems to indicate that the "Expected Results" portion of the procedure has continued to be performed as it was done prior to the RCT revision in April 1990. Instead of determining the predicted decay corrected count rate at the fixed "4000 cps position" and the fixed "100 cps position," a more difficult approach of empirically determining the distance, from the stack detector, necessary to get approximately 4000 cps and 100 cps was used.

After Reactor Manager discussions with the Radiation Control Officer and Facility Director about the calibration procedure to be performed, MLP #97-01 was opened and the Reactor Manager, an SRO-trainee, and a radiation control technician walked through and then calibrated the fixed and adjustable stack monitors making necessary changes to assure a proper Q-2 surveillance sheet as they proceeded. It should be noted that only minor adjustments were needed in the calibration performed on January 13, 1997.

A meeting was convened with the Reactor Safety Review Subcommittee (RSRS) Executive Committee later on January 13, 1997 to present and discuss the problem. The determination was made that this was a potentially reportable event. Some of the items discussed during the meeting included the fact that Argon-41 releases, as indicated by a minimum of three semiannual stack grab samples, have been normal over the entire period in question. Probable causes for why this problem may have existed for so long prior to discovery include the fact that two people are required to perform this procedure with communications between the base of the stack and the control room by hand-held radios; although each had their own copy of the procedure, both procedures were from different references and both procedures were flawed. The RSRS Executive Committee also considered whether the stack readings were conservative or nonconservative over

the period in question. Scenarios that would support both arguments were possible and were discussed; however, it was generally agreed that only a correct calibration of the stack monitor and follow-up operational test would provide real evidence. Therefore, the RSRS Executive Committee recommended contacting the NRC concerning a possible violation of Technical Specifications and that a one-hour operation at full power be conducted to determine how the stack monitor indication had changed following correcting the calibration.

The situation to this point concerning the improperly calibrated stack monitor including the plan for a one-hour run and the conclusion that the failure to properly calibrate the stack radiation monitor was a potentially reportable occurrence per UFTR Technical Specifications Section 6.6.2 was communicated by telephone to Mr. Ed. McAlpine of NRC Region II on January 14, 1997. Subsequently, the full-power reactor run on January 14 as authorized by the RSRS Executive Committee showed that recent stack monitor indications prior to January 13 were conservative, as expected since only minor adjustments were needed in the calibration performed on January 13, 1997. As a result, the approximate full-power steady-state stack monitor reading is now ~2200-2300 cps versus ~2700-2800 cps on previous recent full-power steady-state operations. The adjustable stack monitor meter also matches the fixed stack monitor indication. The fact that recent indicating values were conservative was conveyed to Mr. McAlpine in a following conversation on January 15, 1997 along with iterating that all stack grab samples to measure Argon-41 levels have been normal over this entire period.

NRC Notification

After the RSRS Executive Committee meeting on January 14, 1997, NRC Region II was informed of this event per a telephone conversation on January 14 with Mr. Ed McAlpine relative to the improper stack monitor calibration. At this time the potential tech spec violation was described and the key tech spec sections were reviewed. There was also agreement to treat the event as promptly reportable. Since it was late in the day and a one-hour full-power run was planned to determine whether the stack monitor had been indicating conservatively or nonconservatively, Mr. McAlpine agreed that the prompt one-day report confirming the telephone conversation could be delayed until January 15, 1997.

In a subsequent conversation on January 15, 1997, Mr. McAlpine of Region II was updated on the results of the full-power operation indicating that at least the most recent stack monitor indications had been conservative but that the status of stack monitor indications in the past could not be verified to be necessarily conservative. Subsequently, these communications were confirmed in a following fax and one-page letter to complete the prompt notification on January 15, 1997 (see Attachment I).

Evaluation/Corrective Action

Fssentially, the effort implemented in 1990 to have the Cs-137 monitor calibration source always placed consistently in the same position and be decay corrected versus trying to move the source for each quarterly calibration check of the stack monitor led to the problem as the new technique was not followed properly at some point. Essentially, it appears that the Cs-137 source was not decay corrected despite the fact that such decay corrections are, were and continue to be made consistently for the calibration checks of the reactor cell area radiation monitors which constitutes the first part of the Q-2 Surveillance (Quarterly Calibration Check of Area and Stack Radiation Monitors).

The UFTR Technical Specifications require calibration checks of the stack radiation monitor on a quarterly basis. Although always performed in a timely manner, the use of a flawed procedure that failed to correct for the decay of the Cs-137 calibration source led to a monitoring system that was not properly calibrated, at least for some periods of time including recently prior to January 13, 1997. The applicable section of the UFTR Technical Specifications requiring the quarterly calibration is Section 4.2.4(1) with the requirement for the monitor being in Table 3.3 in Section 3.4.2 of the Technical Specifications.

Some data gleaned from operations logs since 1990 show the operator-recorded stack count rate on the fixed monitor was recorded as varying somewhat for full-power runs of two hours or more after each calibration check of the stack monitor. Though the trend upward is clear in later years, it is not so in earlier years. In addition, there is some room for operator judgment in reading the meter since four orders of magnitude fit into little more than one inch of meter face. This situation (failure to properly calibrate the stack monitor) probably applied at least periodically since about mid-1990, though this is impossible to determine. Investigations of the operations logs for the period from early 1988 to the present generally show steady-state stack monitor count rates recorded at ~2000 cps for the first several years until September 1990 just after the new calibration procedure was implemented. From this point forward the full power equilibrium stack count rate varies from ~2000 cps to as high as 2800 cps but with most readings recorded at ~2000-2200 cps until mid-1992, with high values 2500-2800 cps in mid-1992 and most values since that time in the range 2100-2300 cps until the gradual rise over the past half year to the high rates noted earlier at 2600-2800 cps. Since Cs-137 has a 30.17 year half-life, discrepancies from failure to correct for decay would have occurred slowly over time. This means that improper calibrations would have only a small (~3%) effect per year which is part of the reason why the improper calibration was not noted earlier, though some jumps in the steady-state count rates are noted in the operations logs especially after the calibrations performed in August, 1992 as noted above. It is also possible that the decay corrections were made in the earlier years from mid-1990 because such corrections would be clearly needed and only later were consistently overlooked until the calibration check on January 13, 1997.

Other contributing factors to this failure to calibrate the stack monitor properly are the fact that there were two procedures in existence. A full Radiation Control Technique (RCT #37) developed by the Radiation Control Officer and a Surveillance Data Sheet (Q-2 Surveillance) with mini-procedure used to record the results of the Q-2 Surveillance at the UFTR facility certainly contributed to the problem, especially with one individual (typically a radiation control technician) performing the stack portion of the surveillance and a second individual (typically a reactor operator) performing the control room part of the surveillance and using the two procedures.

The full-power reactor run on January 14 authorized by the Reactor Safety Review Subcommittee showed at least recent stack monitor indications were conservative as only minor adjustments were needed in the calibration performed on January 13, 1997 and the approximate full-power steady-state stack monitor reading is now ~2200-2300 cps versus ~2700-2800 cps on previous recent full-power steady-state operations. Operations log values of the steady-state stack monitor indications recorded were typically ~2000-2100 cps prior to 1990. Then in later years there was a gradual increase leading to the 2700-2800 cps values recorded in early January 1997. Therefore, it is possible that earlier calibrations since mid-1990 were not all conservative though it is also felt that the stack detector system is also gradually aging and hence changing, though slowly, with time since the proper steady-state full-power count rate in 1990 was ~2000 cps but today it is in the ~2200-2300 cps range, still with a constant Argon-41 level within detection and measurement limits.

In addition, it should be noted that the monitor is simply a monitor (fixed) with an adjustable monitor taken off the fixed one. The actual determination and measurement of effluent is based on the semiannual stack grab samples analyzed for Argon-41 releases which have been consistently normal within detection limits.

Current Status/Consequences

After the Reactor Manager discussions with the Radiation Control Officer and Facility Director about the calibration procedure to be performed, MLP #97-01 was opened on January 13, 1997 and the Reactor Manager together with an SRO-trainee and a radiation control technician then calibrated the fixed and adjustable stack monitors making necessary changes to assure a proper Q-2 Surveillance was performed and documented as they proceeded. Since that date, the stack monitor has been considered to be properly calibrated to meet technical specifications. A "Coversheet/Change Request Form" (UFTR Form SOP-0.1A) was submitted to the RSRS Executive Committee to correct/update the Q-2 Surveillance Form. Similarly, copies of the Stack Monitor Source Decay Printout for the Cs-137 Source were submitted to Radiation Control for inclusion into the approved RCT #37.

The revised Q-2 Surveillance Data Sheet was approved at the RSRS Executive Committee meeting on January 13, 1997 and is now installed in the applicable UFTR document manuals. The key change here is to call out that the expected results from the RCT #37 data sheet are to be used in calibrating/checking the fixed stack and the adjustable stack monitors. The change to RCT #37 will be implemented by January 31, 1997 as the RSRS Executive Committee agreed that this correction was needed as well.

As indicated, the RSRS Executive Committee met on January 13, 1997 to review this event. At that time, the Committee essentially agreed with actions taken and with the initial staff evaluation that the occurrence did represent a potential violation of the UFTR Technical Specifications and should be treated as promptly reportable. The RSRS Executive Committee also met on January 27, 1997 to review the report submitted to NRC on this event and concurs with its conclusion. Therefore, Reactor Management and the RSRS Executive Committee agree there has been no significant compromise to reactor safety in the occurrence and no impact on the health and safety of the public. Other than considering the event in the next regular RSRS meeting, this occurrence is now considered closed.

If further information is needed, please advise.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

WGV/dms
Attachment

Copies: U.S. NRC Document Control Desk
Ted S. Michaels, NRC Project Manager
Reactor Safety Review Subcommittee
D. Cronin, Reactor Manager

Sworn and subscribed this 28th day of January 1997.

Notary Public

JOAN MOREHOUSE
MY COMMISSION # CC302416 EXPIRES
August 27, 1997
BONDED THRU TROY FAIN INSURANCE, INC.

ATTACHMENT I

UNIVERSITY OF FLORIDA

Nuclear Reactor Facility
Department of Nuclear and Radiological Engineering

202 Nuclear Sciences Center
P.O. Box 118300
Gainesville, Florida 32611-8300
Tel: (352) 392-1429
Fax: (352) 392-3380
E-mail: vernet@server.nuceng.ufl.edu

January 15, 1997

Attn: Luis Reyes, Regional Administrator
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street NW, Suite 2900
Atlanta GA 30323

Potential Tech Spec Violation - Improper Stack Monitor Calibration

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

As per a telephone conversation on January 14, 1997 with Mr. Ed McAlpine concerning an improperly calibrated stack radiation monitor, we have concluded that this failure to properly calibrate the stack radiation monitor is a potentially reportable occurrence per UFTR Technical Specifications Section 6.6.2 delineating requirements for special reports.

The UFTR Technical Specifications require calibration checks of the stack radiation monitor on a quarterly basis. Although always performed in a timely manner, the use of a flawed procedure that failed to correct for the decay of the Cs-137 calibration source since mid-1990 led to a monitoring system that was not properly calibrated. The applicable section of the UFTR Technical Specifications requiring the quarterly calibration is Section 4.2 4(1) with the requirement for the monitor being in Table 3.3 in Section 3.4.2 of the Technical Specifications.

A full-power reactor run on January 14 authorized by the Reactor Safety Review Subcommittee showed the recent stack monitor indications were conservative as only minor adjustments were needed in the calibration performed on January 13, 1997 and the approximate full-power steady-state stack monitor reading is now ~2200-2300 cps versus ~2700-2800 cps on previous recent

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full-power steady-state operations. The fact that recent values were conservative was conveyed to Mr. McAlpine in a following conversation on January 15, 1997 along with iterating that all stack grab samples to measure Argon-41 levels have been normal over this entire period. As of the afternoon of January 13, 1997 this monitor is properly calibrated.

If further information is needed, please let me know.

Sincerely,

William G. Vernetson
Director of Nuclear Facilities

WGV/dms

Copies: D. Cronin
RSRS

Sworn and subscribed this 15th day of January, 1997.

Kathleen A. Wilson
Notary Public

KATHLEEN A. WILSON
MY COMMISSION # CC 465705
EXPIRES: April 17, 1999
Bonded Thru Notary Public Underwriters

RECEIVED MAR 0 3 1997

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

February 27, 1997

University of Florida
ATTN: Dr. W. G. Vernetson
Director of Nuclear Facilities
202 Nuclear Science Center
Gainesville, FL 32611-2055

SUBJECT: ROOT CAUSE OF IMPROPER STACK MONITOR CALIBRATION

Dear Dr. Vernetson:

On January 27, 1997, you issued a letter detailing your review of an incident that occurred earlier that month. You indicated that, on January 13, 1997, your staff noted inconsistencies between the procedure for stack monitor calibration and the operations surveillance procedure typically used to calibrate the stack monitor. Because of the inconsistencies, it appeared that the stack monitor was not calibrated correctly. A meeting of the Reactor Safety Review Subcommittee Executive Committee was convened to discuss the problem. It was determined that an apparent violation of the Technical Specifications (TSs) had occurred and the NRC was subsequently notified. When this determination was made, you did not resume operation of the reactor until after a proper calibration of the stack monitor had been completed. After an investigation of the incident, you determined that the cause of the problem was failure to follow procedure. Contributing factors included the existence and inadequacy of two separate procedures used for calibration of the stack monitor.

The NRC staff performed a review of the incident and the documents you submitted as a result. It appears that you took adequate corrective actions following identification of the problem and properly reported the incident as was required. However, it is appears that you did not address a major contributing factor to the root causes of the incident. In your submittal to the NRC you made no mention of: 1) management's role in and responsibility for providing adequate procedures for the operators and technicians to follow, 2) ensuring that the operators and technicians were properly trained, and 3) auditing the procedures and the implementation thereof, when they were changed in 1990, to ensure that the actions completed accomplished the desired goal, i.e., proper calibration of the stack monitor. As an NRC licensee, you are expected to provide appropriate management guidance and oversight of the licensed activities like those involved in this incident at your facility. These concerns deserve your close attention both now and in the future.

If you have any questions regarding this matter, please contact me at (404) 331-5547.

Sincerely,

Edward J. McAlpine, Chief
Fuel Facilities Branch
Division of Nuclear Materials Safety

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

cc: Dr. J. S. Tulenko, Chairman
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Lyle E. Jerrett, Acting Chief
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1317 Winewood Boulevard
Tallahassee, FL 32999

APPENDIX H

INSPECTION REPORT NO. 50-83/97-201

RECEIVED SEP 15 1997

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 9, 1997

Dr. William G. Vernetson
Director of Nuclear Facilities
202 Nuclear Sciences Center
Gainesville, Florida 32611

SUBJECT: NRC INSPECTION REPORT NO. 50-83/97-201

Dear Dr. Vernetson:

A United States Nuclear Regulatory Commission (NRC) inspection was conducted from June 30 through July 3, 1997 at your University of Florida Test Reactor facility. The enclosed report represents the results of that inspection.

No significant safety issues were identified. No reply is required.

Your cooperation with us is appreciated.

Sincerely,

Seymour H. Weiss

Seymour H. Weiss, Director
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 50-83
License No. R-120

Enclosure: NRC Inspection Report No. 50-83/97-201

cc w/enclosure:
See next page

University of Florida
(NRC INSPECTION REPORT)

Docket No. 50-83

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No: 50-83

License No: R-120

Report No: 50-83/97-201

Licensee: University of Florida

Facility: University of Florida Test Reactor

Location: University of Florida, Gainesville, FL

Dates: June 30 through July 3, 1997

Inspector: Stephen W. Holmes, Radiation Specialist

Approved by: Seymour H. Weiss, Director
Non-Power Reactors and Decommissioning Project Directorate

EXECUTIVE SUMMARY

This routine, announced inspection consisted of the review of selected conditions and records since the last inspection, verification of corrective actions previously committed to by the licensee, and related discussions with licensee personnel. The inspection was conducted in accordance with the guidance of NRC Inspection Manual.

A Non Cited Violation was identified for failure to have all licensed operators medically examined by a physician every two years. A Violation for failure to submit a required report to the NRC on time and an inspector follow-up item on updating off-site emergency agreement letters, were closed.

The University of Florida Test Reactor was being maintained and operated as required by the license and applicable regulations.

Report Details

Summary of Plant Status

During the inspection the reactor was shut down while a 50.59 evaluation was being performed to fix a failed component, found during an observed daily start-up.

I. Operations

O1 Conduct of Operations

01.1 Reactor Staffing

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed senior reactor licenses, operations logs and records, selected events, and interviewed staff.

b. Observations and Findings

The staff consisted of the Facility Director (FD) and two other Senior Reactor Operators (SROs). The FD, who also filled the vacant Reactor Supervisor position, and the other SROs satisfied the training and experience required by the Technical Specifications (TS). Shift staffing met the minimum requirements of duty and on-call personnel.

c. Conclusions

Reactor operations staffing satisfied TS requirements.

01.2 Control and Performance of Experiments

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed approved experiment records, reactor log experimental data, Reactor Safety Review Subcommittee (RSRS) minutes, and interviewed staff.

b. Observations and Findings

Reviews of experiment requests required by TS had been performed by the RSRS as needed.

Review of the experiment data in the reactor logs indicated that experiments were constrained as required by the TS and experiment authorizations, were installed, performed, and removed as outlined in the experiment authorization and licensee's procedures.

c. Conclusions

License control and performance of experiments met TS and regulatory requirements.

01.3 Reactor Operations and Fuel Handling

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed reactor and fuel logs, reactor check-out, start-up, operations, and shutdown check-lists. A daily and weekly startup were also observed.

b. Observations and Findings

Reactor operations were performed in accordance with written procedures and TS. Information on operational status was recorded in log books and checklists as required by procedures and TS. Use of maintenance and repair logs, after a daily check-out identified failed equipment, adhered to the procedures and licensee requirements.

Data recorded for fuel movement was clear, concise and relevant. Fuel movement, inspection, log keeping and recording followed the facility's procedures.

c. Conclusions

Reactor operations conformed to TS and licensee procedural requirements. Fuel handling, record maintenance and documentation were accomplished as required by TS and licensee procedures. No safety concerns were identified.

O2 Operational Status of Facilities and Equipment

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed reactor check-out, start-up, operations and shutdown logs and check-lists, and observed the facility and equipment during an accompanied tour.

b. Observations and Findings

Housekeeping was good with little extraneous clutter. All required equipment and facilities observed by the inspector were operational.

c. Conclusions

Reactor and support facilities were operational as required.

O3 Operations Procedures and Documentation

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed operating procedures and updates, reactor operating records and logs, and safety committee minutes.

b. Observations and Findings

Written procedures required by the TS were available and used by the staff. Implementation of and adherence to the procedures met TS requirements. Procedure changes had been reviewed and approved by the RSRS and FD as required by TS.

Records of power level, operating periods, unusual events, calibration and maintenance procedures, installed experiments, and start-up and shut-down checks were being kept.

c. Conclusions

Facility procedures satisfied TS requirements and reactor operating records and logs were being maintained as required by TS.

05 Operator Training and Qualification Program

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed requalification program records, NRC licenses, training records, and interviewed staff.

b. Observations and Findings

All currently licensed SRO's were successfully completing the emergency procedure and abnormal events training, reactivity manipulations, and participating in the ongoing training as required by the NRC-approved requalification plan. Review of records indicated that operator performance and competence evaluation had been performed as required. Past test questions covered the material prescribed by the program and demonstrated technical depth. Required quarterly operation hours, as SRO, were being recorded. The licensees tracking system for operator training ensured requirements were meet.

Although all licensed operator medical exams were current at present, the FD identified that some previous medical exams, not-with-standing being given once during each biennial training cycle, had exceeded the two year interval required by 10 CFR Part 55. The licensee added the medical exam requirements to the training tracking system to ensure that subsequent medical exams would be performed as required by 10 CFR Part 55.

c. Conclusions

This licensee-identified and corrected violation is being treated as a Non-Cited Violation 50-83/97-01-01, consistent with Section VII.B.1 of the NRC Enforcement Policy.

The requalification program was being implemented acceptably. TS and NRC-approved requalification plan requirements were being met.

O6 Organization and Administration

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed organization, staffing and administrative controls and interviewed various management and support staff.

b. Observations and Findings

Since the last inspection there had been only one change in the management organization and administrative controls. The Reactor Manager (RM) left and the position was still vacant, all other TS required positions were currently filled with qualified personnel. The FD stated that he will continue to fill the RM slot until the end of this year when his senior SRO will have sufficient experience and will be appointed the RM.

c. Conclusions

Organizational and administrative controls remained consistent with license requirements and licensee commitments.

O7 Quality Assurance in Operations

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed RSRS minutes and Annual audits.

b. Observations and Findings

The meeting schedule and membership satisfied TS requirements and the Committee's procedural rules. Review of the minutes indicated the committee was active in providing guidance, direction and oversight of the reactor. The minutes were clear, and sufficiently detailed for a record of the safety oversight of reactor operations.

Audits were direct and practical. Audit instruction/check sheets were detailed and used very effectively by the auditors. Follow-up evaluation and determination to implement or reject recommendations was prompt.

c. Conclusions

The RSRS performed it's duties as required by license, TS, and administrative criteria.

O8 Miscellaneous Operations Issues

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed the annual reports and examined the implementation of the corrective actions to Violation 50-83/96-01-01, failure to submit annual reports within four months of the end of the prescribed year as required by TS 6.6.1.

b. Observations and Findings

The licensee, as a committed corrective action, had implemented a stand-alone streamlined report to satisfy TS reporting requirements and submitted a TS change changing the due date to 6 months after the end of the reporting year. The report would be submitted to the NRC in lieu of their full consolidated Annual report sent to multiple persons and agencies if the consolidated report was not completed in time. The TS change was approved and the 1995-1996 annual report was submitted as required by TS.

c. Conclusions

Licensee corrective actions were appropriately implemented and the subsequent report was submitted as required. Violation 50-83/96-01-01 is closed.

M1 Conduct of Maintenance

M1.1 Limiting Conditions for Operation and Surveillance

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed selected surveillance records, data sheets and tests, licensee procedures, and reactor logs, check-lists, and periodic reports.

The inspector interviewed staff.

b. Observations and Findings

Daily and other periodic checks, tests, and verifications for TS required limiting conditions for operation (LCO) were completed as required. All surveillance and LCO verifications were completed on schedule as required by TS and in accordance with licensee procedures. All were within TS and procedure parameters.

c. Conclusions

The licensee's program for surveillance and LCO confirmations satisfied TS requirements.

M2 Maintenance and Material Condition of Facilities and Equipment

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed maintenance and reactor logs, RSRS records, repair records, and observed facility and equipment during an accompanied tour.

b. Observations and Findings

Reactor maintenance was noted in the reactor logbook and recorded in facility files as required by procedures. Maintenance was performed and documented consistent with the TS and licensee procedures.

Control room equipment was operational. No missing or malfunctioning equipment was noted.

c. Conclusions

Maintenance logs, records, performance, and reviews satisfied TS and procedure requirements. Facility condition was well maintained for its intended function and use.

III. Engineering

E1 Conduct of Engineering, Design Changes

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed selected design change packages, associated procedures and drawings, and RSRS files. The inspector interviewed staff.

b. Observations and Findings

Design changes were reviewed and approved by the appropriate reactor staff and the RSRS or forwarded to the NRC for approvals as required. After the changes were made, testing was performed to verify operation was consistent with the safety analysis assumptions. Procedure and drawing changes were included when needed and were consistent with the observations of the inspector.

c. Conclusions

The licensee's design changes were reviewed, approved, implemented, tested, and controlled as required by TS, licensee procedures, and pertinent regulations.

III. Maintenance

M1 Conduct of Maintenance

M1.1 Limiting Conditions for Operation and Surveillance

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed selected surveillance records, data sheets and tests, licensee procedures, and reactor logs, check-lists, and periodic reports.

The inspector interviewed the FD.

b. Observations and Findings

Daily and other periodic checks, tests, and verifications were done to ensure TS required LCOs were validated and that surveillances were completed as required. All surveillance and LCO verifications were completed on schedule as required by TS and in accordance with licensee procedures. All were within TS and procedure parameters.

c. Conclusions

The licensee's program for surveillance and LCO confirmations satisfied TS requirements.

M2 Maintenance and Material Condition of Facilities and Equipment

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed maintenance and reactor logs, RSRS records, modification records and observed facility and equipment during an accompanied tour.

b. Observations and Findings

Reactor maintenance records were recorded in the reactor logbook. Maintenance was performed and documented consistent with the TS and licensee procedures. Modification 50.59 safety evaluations were acceptable and were performed when required.

Control room equipment was operational. No missing or malfunctioning equipment was noted. The interior reactor structure appeared sound.

c. Conclusions

Maintenance logs, records, performance, and modification 50.59 safety evaluations reviews satisfied TS and procedure requirements. Facility condition was well maintained for its intended function and use.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls

R1.2 Effluent Monitoring and Release

a. Scope (Inspection Procedure 40750)

The inspector reviewed annual reports, release records, counting and analyses results.

b. Observations and Findings

Gaseous Releases were calculated as outlined in the Final Safety Analysis Report (FSAR) and licence, adequately documented, and well within the annual dose constraint of 20.1101(d), Appendix B concentrations and TS limits. Liquid releases were approved by the Radiation Control Officer (RCO) after analyses determined the release would meet regulatory requirements for discharge to the sanitary sewer.

c. Conclusions

Effluent monitoring satisfied license and regulatory requirements.

R1.3 Radiation Protection Surveys

a. Scope (Inspection Procedure 40750)

The inspector reviewed HP and reactor surveillances/survey procedures, survey records, and interviewed staff.

b. Observations and Findings

Weekly, quarterly, and other periodic contamination or radiation surveys were performed by reactor and university staffs as required by TS and licensee procedures. Results were evaluated and corrective actions taken and documented when readings/results exceeded set action levels.

c. Conclusions

Surveys were performed and documented in a manner sufficient to evaluate, as required by 10 CFR 20, the radiation hazards that might exist. TS and licensee requirements were met.

R1.4 Personnel Dosimetry

a. Scope (Inspection Procedure 40750)

The inspector reviewed dosimetry records, licensee procedures, observed issuance of dosimetry, and interviewed staff.

b. Observations and Findings

The licensee used a National Voluntary Laboratory Accreditation Program - accredited vendor to process personnel thermoluminescent dosimetry. The RCO maintained and reviewed both the exposure records of the reactor and campus staffs. An examination of records for the past two years indicated that all exposures were within NRC limits, with most showing no exposure above background.

c. Conclusions

Doses were in conformance with licensee limits and 10 CFR Part 20. The dosimetry program was conducted in accordance with 10 CFR 20.1501, 20.1502, and licensee procedures.

R2 Status of RP&C Facilities and Equipment

a. Scope (Inspection Procedure 40750)

The inspector reviewed calibration, periodic checks , quality control, and test source certification records for radiation monitoring and counting lab instruments and interviewed HP staff.

b. Observations and Findings

The calibration of the portable survey meters was performed in-house by the licensee. Calibration frequency met TS and licensee directives. Calibration procedures were consistent with American National Standards Institute or the manufacturers' recommendations. Calibration and check sources were traceable to the National Institutes of Standards and Technology. Radiation monitoring and counting lab instruments were also calibrated as recommended by ANSI or the manufacturer. All instruments checked were in calibration. Calibration records were in order.

c. Conclusions

RPP equipment was being maintained and calibrated according to industry and equipment manufacturer standards. Calibration satisfied TS requirements.

R3 RP&C Procedures and Documentation

a. Scope (Inspection Procedure 40750)

The inspector reviewed Radiation Protection Program documentation and various HP procedures and interviewed HP staff.

b. Observations and Findings

The formal radiation protection program (RPP) is provided by the university staff. While the reactor staff performs some reoccurring surveys and limited job coverage, Radiation Control technicians were under the supervision of the RCO.

HP procedures were available for those tasks and items required by the TS, license, and facility directives. Changes were reviewed and approved as required.

c. Conclusions

The RPP satisfied the requirements of 10 CFR 20.1101. Oversight and review was provided by the reactor and university staffs as required by TS and licensee procedures. HP procedures met TS.

R6. RP&C Organization and Administration

a. Scope (Inspection Procedure 40750)

The inspector reviewed RPP documentation, the FSAR and the TS and interviewed staff.

b. Observations and Findings

The university radiation safety staff consisted of the RCO, the assistant RCO, and a number of HP technicians. Their training and experience, met the qualifications required by TS. The university staff provided independent surveys, on-call support surveys, required safety oversight surveys and specialized training to the reactor staff. No lapse in coordination between the HP and reactor staffs was noted.

c. Conclusions

HP staffing met regulatory requirements and licensee commitments.

R7 Quality Assurance in RP&C Activities

a. Inspection Scope (Inspection Procedure 40755)

The inspector reviewed Radiation Control Committees' minutes and licensee procedures.

b. Observations and Findings

The meeting schedule and membership satisfied licensee requirements. Examination of records confirmed that the committee was reviewing HP operation as required. The committees provided appropriate guidance, direction and oversight to the radiation safety program.

c. Conclusions

Oversight of the radiation safety program by the committee satisfied licensee requirements.

P8 Miscellaneous EP Issues

a. Inspection Scope (Inspection Procedure 40755)

The inspector reviewed inspector follow-up item IFI 50-83/96-01-02, and verified that emergency plan (EP) agreement letter had been updated as required by paragraph 6.a of the EP.

b. Observations and Findings

Updated agreement letters were on hand for those agencies/services required by the EP.

c. Conclusions

Licensees agreement files satisfied the NRC-approved EP.

V. Management Meetings

X1 Exit Meeting Summary

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on July 3, 1997. The licensee acknowledged the findings presented.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

C. Guincho	Radiation Control Technician
K. Hinterlang	Assistant Radiation Control Officer
J. Power	Senior Reactor Operator
J. Tulenko	Chairman Nuclear and Radiological Engineering Department
W. Vernetson	Director of Nuclear Facilities
R. Widargo	Facility Technician
J. Wolf	Senior Reactor Operator

INSPECTION PROCEDURE (IP) USED

IP 40750: CLASS II NON-POWER REACTORS

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

none

Closed

50-83/96-01-01	VIO	Failure to submit annual reports within four months of the end of the prescribed year as required by TS 6.6.1.
50-83/97-201-01	NCV	Failure to have licensed operator medical exams performed biannual as required by 10 CFR Part 55.
50-83/96-01-02	IFI	Failure to have emergency plan agreement letters updated as required by paragraph 6.a of the EP.