



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

Report No.: 50-160/85-02

Licensee: Georgia Institute of Technology  
225 North Avenue  
Atlanta, GA 30332

Docket No.: 50-160

License No.: R-97

Facility Name: Georgia Institute of Technology Research Reactor (GTRR)

Inspection Conducted: July 8 - 16, 1985

Inspector: David P. Loveless  
D. P. Loveless

8/12/85  
Date Signed

Approved by: Bruce Wilson  
Bruce Wilson, Section Chief  
Operator Licensing  
Division of Reactor Safety

8/12/85  
Date Signed

SUMMARY

Scope: This routine, unannounced inspection involved 46 inspector-hours on site in the areas of logs and records, organization, review and audit, requalification training, procedures, refueling, surveillance testing, experiments, observation of operations, plant tours of the GTRR and AGN-201, open items and previous enforcement actions. Also, one area involved licensed operator examinations, which resulted in an enforcement conference conducted in the Region II office.

Results: Of the eleven areas inspected, no violations or deviations were identified in five areas. Five violations were identified in five areas (Logs and Records - Paragraph 7; Procedures - Paragraphs 5 and 6; Requalification Training - Paragraph 9; Surveillance Testing - Paragraph 6; and Review and Audit - Paragraph 11). One deviation was identified in one area (Licensed Operator Examinations - Paragraph 15).

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## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*R. A. Karam, Director, Nuclear Research Center
- \*L. D. McDowell, Reactor Supervisor
- W. H. Downs, Reactor Operator
- R. M. Boyd, Radiological Safety Officer
- M. F. Mercer, Electronics Specialist
- J. E. Taylor, Manager, Hot Cell Operations
- P. Sharpe, Safety Engineering Assistant
- J. L. Rodgers, Administrative Secretary

Other licensee employees contacted included technicians and office personnel.

#### NRC Regional Personnel

- \*P. E. Fredrickson, Section Chief
- \*A. K. Hardin, Project Engineer

\*Attended exit interview

### 2. Exit Interview

The inspection scope and findings for all items excluding the deviation were summarized on July 16, 1985, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings listed below. The licensee acknowledged the inspection findings without exception. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection. The licensee was notified by telephone on July 22, 1985, concerning the licensed operator examination problems. An enforcement conference was scheduled and subsequently conducted on July 25, 1985.

### 3. Licensee Action on Previous Enforcement Matters

(Closed) Deviation 160/77-04-10

In Inspection Report 50-160/77-04, the licensee was cited for failure to review its emergency plan semi-annually per licensee's Safety Analysis Report (SAR). Reviews are evidenced by periodic update of the plan, and the licensee is currently in compliance, as they are implementing a new NRR approved emergency plan. This appears to be adequate to resolve the above concern. The licensee conveyed some confusion as to the significance of the NRC approval. The inspector reiterated that the licensee was still accountable for all SAR commitments concerning the emergency plan.

(Closed) Severity Level V violation 160-84-01-01

The licensee was cited for failure to have an adequate procedure (two examples). The violation involved non-incorporation of required temporary changes into the permanent approved procedure. Both cases were corrected per licensee's response dated April 26, 1984. Furthermore, all procedures were reviewed by the licensee's Nuclear Safeguards Committee for incorporation of "pen-and-ink" changes. This was deemed adequate to resolve the above concern.

(Closed) Severity Level V violation 160/84-01-02

The licensee was cited for failure to hold quarterly meetings of the Nuclear Safeguards Committee and failure to distribute minutes properly as required by Technical Specification (TS) 6.2.c. The licensee initiated action to establish meeting dates and to provide for proper distribution of the minutes. This response dated April 26, 1984, was deemed to be adequate to resolve the items of noncompliance.

#### 4. Unresolved Items

Unresolved items were not identified during this inspection.

#### 5. Procedure Review

The following procedures were reviewed during the course of the inspection:

1000	New Fuel Element Inspection
1500	Irradiated Fuel Discharge to Storage Pool
1501	Lower Top Shield Plug Removal From Spent Fuel
1502	Fuel Handling in the Core
3101	Definition of Experiment Categories
3102	Quality Assurance for Experiments
3103	Operation of Experimental Facilities
3104	Pneumatic Tube Transport System
2006	Weekly Reactor Shutdown Checklist
7203	ECCS - Monthly Surveillance
7220	Building Isolation Test
7222	ECCS - Semiannual and Annual Surveillance
7225	Primary Coolant System - Mechanical
	Hot Cell Checklist
	Health Physics Procedures
7241	LI-D1 Check
7202	Control Rod Drop Time
4000	Containment Building Pressure Test

4901 Preventive/Corrective Maintenance on Safety-Related Equipment

In addition, the following procedures received thorough walkdowns:

a. Procedure 7220, Building Isolation Test

The inspector verified this procedure to be technically adequate and to meet the requirements of the licensee's Technical Specification. The test is performed using calibration sources in order to check the entire channel in one test.

b. Procedure 7203, Emergency Core Cooling System (ECCS) - Monthly Surveillance

The inspector noted that during the low reactor level test, the operator would drain down the reactor locally until he heard the reactor isolation valves closed. This is contrary to the procedure which requires the operator to drain the reactor until the low D<sub>2</sub>O level control room alarm is received. Although the intent of the procedure is still met, this is failure to utilize the procedure and is in violation of T.S. 6.4.b.7. Technical Specifications require that procedures be followed and prescribe proper methods for procedure change when needed. This is the first of three examples of Violation 160/85-02-01.

c. Procedure 7202, Control Rod Drop Time

The inspector noted that the licensee had updated this procedure to include set-up and running the Hewlett Packard Universal Counter as a corrective action to violation 84-01-01. This was deemed adequate; but because of equipment failure, the licensee used an oscilloscope as the timing device in performance of this procedure in May and June of 1985. Again, methods slightly different from that specified in the procedure were used, but no temporary change was made to the procedure. This is a violation of T.S. 6.4.b.7 and is the second example of Violation 160/85-02-01.

d. During the course of the inspection, additional procedures were given complete walkdowns. These walkdowns were in order to determine technical adequacy, operator familiarization and proper utilization of the procedures. The following procedures were reviewed without identifying error:

- 7222, ECCS - Light Water Addition Test
- 7225, Primary Coolant System - Mechanical
- 3104, Pneumatic Tube Transport System
- 1502, Fuel Handling in the Core\*
- 4901, Preventive/Corrective Maintenance on Safety-Related Equipment

\*Further documentation of this walk-through is documented in paragraph 12 of this report.



The inspector observed that all procedures audited had been reviewed by the Nuclear Safeguards Committee. It was further noted that all maintenance reviewed, that was not covered by approved procedure, was done under properly approved maintenance job plans per procedure 4901. Finally, the inspector verified that all work audited was done under a 4900, "System Work Sheet," as required administratively.

## 6. Surveillance Testing

Surveillance requirements in the licensee's technical specifications were reviewed to determine that procedures existed for accomplishing the specification. The licensee's program for scheduling and tracking of surveillance testing was reviewed and deemed to be adequate. Next, selected surveillance tests were reviewed by the inspector. These included:

- Control Rod Drop Time of Shim-Safety Rods
- Drive Time of Regulating Rod
- ECCS - Tests and Timing
- ECCS - Lightwater Addition Capability
- Containment Building Pressure Test
- D<sub>2</sub>O Level Channel Checks and Calibration

This review involved examination of records, proper tracking, completeness and technical adequacy of procedures to meet the surveillance requirements.

During the course of this review, the inspector noted that procedure number 7241, LI-D1 Check, had been scheduled and performed on an annual basis since 1978. Licensee's T.S. 4.2.a referencing Table 4.1, item 6, requires the D<sub>2</sub>O level channels to be calibrated semi-annually. The failure to semi-annually perform the LI-D1 calibration is in noncompliance with T.S. 4.2.a and will be addressed as violation 160/85-02-02.

Table 4.1, item 6, also requires that a channel check of the D<sub>2</sub>O level channels be performed on a weekly basis. As part of this requirement, procedure 2006, Weekly Reactor Shutdown Checklist, requires testing of the reactor scram and ECCS initiation concurrent with low reactor level ( $\leq 12$  inches below overflow T.S. 4.2.a, Table 4.1).

The procedure checks all associated signals at low reactor level; however, the actual reactor level at which these occur is never absolutely verified or recorded. The license states that the level is checked; however, the procedure, as is, does not require level verification and is inadequate to perform the surveillance requirement of T.S. 4.2.a. Inadequate procedures for performance of a surveillance requirement is in violation of T.S. 6.4.b.7. This item will be tracked as a third example of violation 160/85-02-01.

## 7. Logs and Records

### a. Annual Report - GTRR

The annual report for the GTRR was reviewed and found to meet the requirements of T.S. 6.7.a.

### b. Records

T.S. 6.5.a and 6.5.b require that certain records be retained for five years and other records be maintained for the life of the facility. The inspector selected several records in each of these categories and requested the licensee to retrieve the records. The licensee demonstrated the records were on file and readily retrievable.

### c. Console Log

The reactor console log was reviewed for the period January 1984 to June 1985. The inspector found operating log entries to be complete, adequate and traceable to additional event documentation. Discussion of six selected events found that safety significant events had been reviewed and were sent to the Nuclear Safeguards Committee for further review as necessary. The inspector observed that the console logs had been audited by the Nuclear Safeguards Committee for 1984.

The licensee committed at the exit of NRC inspection 84-01 and in later correspondence dated April 26, 1984, to initial log entries made during periods of reactor shutdown. This factor of traceability was added to the logs beginning April 26, 1984, but began to taper off approximately six months later. Examples of this are entries for the dates November 26 and December 24, 1985, and January 8, 11, 14, 16, 17, and 22, 1985. The licensee was reminded of its commitment and agreed to correct the error. This item will be tracked as Inspector Followup Item IFI 160/85-02-03.

### d. System Workbook Log

The licensee's System Workbook is used to schedule and track all periodic work done on the plant including preventive maintenance, surveillance testing, and system inspections. The inspector reviewed the log for the preceding quarter and found it to be up-to-date and complete.

### e. Plant Drawings

Technical Specification 6.5.b.6 requires the licensee to maintain updated, corrected, and as-built facility drawings. During the plant tours, the inspector found numerous errors in the facility flow diagrams including a test connection in-plant that is not on the drawings, a valve on the drawing and not in the plant, and piping system connections in the plant that are inconsistent with the drawings. All drawing errors found by the inspector were identified to

the licensee. These errors are multiple examples of violations of T.S. 6.5.b.6. This item will be referred to as violation 160/85-02-04.

#### 8. Organization

The inspector verified that the organization for the Georgia Tech. Reactor meets the requirements of T.S. 6.1.a. It was further verified that the Reactor Supervisor and the Reactor Engineer meet the minimum qualification requirements of T.S. 6.1.c. Finally, a spot check of the console log verified that the licensee met the minimum crew complement requirements of T.S. 6.1.d when the reactor was operational. No violations or deviations were identified in this area.

#### 9. Requalification Training

The inspector determined that all licensed personnel had taken the 1984 requalification exam required by the licensee's approved program dated August 5, 1984. Furthermore, all personnel received an overall passing grade. A single reactor operator (RO) received less than 80 percent in the area of Radiation Control and Safety. The licensee did not initiate appropriate retraining. The program requires, "Tutoring and individual study and/or preplanned lectures." The retraining should also include an appropriate schedule including examinations covering the areas of deficiency. When identified to the licensee by the inspector, the licensee immediately initiated corrective action. The above item is in violation of 10 CFR 50.54.i-1 which requires operator requalification training and will be tracked as violation 160/85-02-05.

#### 10. Experiments

The inspector reviewed approximately ten percent of the licensee's experiments listed from January 1, 1984, to June 30, 1985. This review included adequacy of procedures, use of procedures, review and audit, and completeness of documentation. Most of the experiments conducted are relatively routine and present little hazard to the reactor, the reactor personnel, or to the public. Two experiments reviewed were noted as being significant. One involved a hot "rabbit" being inadvertently sent to the wrong location causing a criticality alarm and subsequent manual scram of the reactor. The second event involved a pinhole leak in a phosphorus lined can. Both problems were handled according to procedures and both received adequate Nuclear Safeguards Committee review. No violations or deviations were identified in this area.

#### 11. Review and Audit Functions

The Nuclear Safeguards Committee (NSC) minutes for the GTRR were reviewed for the period January 1, 1984, through June 30, 1985. Seven meetings were conducted during the period. The inspector verified that the composition of the Committee, collective experience of the members, quorum requirements, and subjects reviewed met the requirements of T.S. 6.2. The inspector noted that the NSC was conservative in its approach, and reviewed more than required by T.S.

One area of noncompliance was identified. T.S. 6.2.c requires the Committee to meet quarterly. Previous interpretation by both the NRC and the licensee determines this to mean 13 weeks  $\pm$  25 percent. After the February 4, 1985 meeting, the next meeting was not until June 13, 1985. Exceeding the maximum interval between meetings is a violation of T.S. 6.2.c and will be addressed as violation 160/85-02-06.

The inspector observed that the NSC had conducted audits of the operations of the plant during the spring of 1985. These reviews involved procedures, experiments, and day-to-day operations. The committee had identified one area of concern to the inspector. Non-console log documentation of startups existed without documentation of a shutdown. Conversely shutdown checklists were found without matching startups. This audit is a major agenda item for the next NSC meeting. The licensee committed to having these discrepancies reviewed.

The inspector reviewed documentation of the only modification done at the plant during the previous year. This modification which replaced a nuclear detector with a new design was determined to be done in accordance with applicable procedures and T.S. Furthermore, the inspector noted that a 10 CFR 50.59 review was done and the modification deemed not to be an unreviewed safety question.

## 12. Refueling

No major refueling has been performed by the licensee since the last inspection. However, during the dates from January 9, 1984, to January 11, 1984, a core shuffle was performed to insure the fuel in the Irradiated Fuel Storage Holds is self-protecting ( $>100$  rad/hr. at 1 meter). The procedures and documentations were reviewed for adequacy, completeness, and adherence to Technical Specifications. The inspector verified that the procedures met the requirements and were followed during the evolution.

The inspector noted that in Procedure 1502, "Fuel Handling in the Core," the precautions require that if the count rate on the nuclear instrumentation doubles during an evolution that fuel handling should cease until the situation can be evaluated. However, no step in the core shuffle procedure reminds or requires the operator to look at his instrumentation. The licensee agreed that this was a potential deficiency and that they would look into the matter.

No violations or deviations were identified in this area.

## 13. Open Items

(Closed) UNR 160/78-03-05.

The licensee committed to bringing plant drawings up-to-date by including modifications made since the last update. These items are currently in the plant drawings and documentation of a complete drawing review exists.



(Closed) IFI 160/84-01-03.

Concern over the disposition of AGN-201 Reactor was raised with this item. The licensee has NRC approved decommissioning plans. The inspector reviewed the status of the reactor, including a paperwork review, plant tour and interviews with the plant staff. The reactor has been defueled and the water in the vessel tested with satisfactory results. Completion of decommissioning should come about by the end of the year. Based on this review and the results of this inspection in the affected functional area, the item was determined to require no additional specific followup and is closed.

#### 14. Independent Inspection Effort

The inspector reviewed several operational events, including a paperwork review and operator interviews. The most noteworthy is described here. On December 14, 1984, during a cooldown after a 4500 KW run, the reactor operator received a low D<sub>2</sub>O level alarm. The operator immediately determined by control room indication and by the vessel level column that the reactor level was holding. Following Procedure 5000, "Objective and Code for Emergency Procedures", the operator verified the air compressor was functional and thus verifying the validity of the LI-D1 control room level indicator. After determining that there was no water leakage in the process room, the operator went to reset on the ECCS signal. When the ECCS spray valves would not close, the operator manually closed the block valves. The circulatory pumps were restarted to continue the cooldown and the level was monitored closely for possible re-initiation of ECCS.

The inspector verified that the operator's actions were correct and procedural. He also verified that proper documentation and review of the event was performed. No violations or deviations were identified in this area.

#### 15. Licensed Operator Examinations

On July 10 and 11, 1985, two reactor operator candidates for the GTRR were examined by a Region II licensed operator examiner. The eligibility of the applicants to take the exam was based on NRC Form 398s, Personnel Qualification Statement - Licensee, submitted on June 5 and July 10, 1985. On the NRC Form 398, the Director, Nuclear Research Center, certified that the applicants had "learned to operate the controls in a competent and safe manner." Grading of the written portion of the examination revealed that the candidates' knowledge of reactor operations was significantly below the minimum acceptable level required to operate the facility satisfactorily. The acceptance criteria for the written exam is a 70 percent in all seven areas. Not only did neither candidate attain a 70 percent in any one area, but the overall scores for each applicant were both approximately 40 percent. Although an applicant failing an NRC exam does, of itself, not necessarily reflect negatively on the certification provided by the licensee, the complete apparent lack of reasonable operations control

knowledge exhibited by these two candidates places doubt as to the validity of the certification.

This failure to ensure that the two applicants adequately learned to operate the reactor controls as certified on the NRC Form 398 is identified as a deviation from an NRC commitment, given in the form of the NRC 398 certification (160/85-02-07). A subsequent enforcement conference was conducted concerning this matter and is discussed in paragraph 16.

#### 16. Enforcement Conference

##### a. Introduction

An enforcement conference was held with Georgia Institute of Technology on July 25, 1985, at 1:00 p.m. in the Region II Office of Inspection and Enforcement. The purpose of the meeting was to discuss the qualification requirements for personnel nominated by the licensee to take the NRC operator licensee examination for the Georgia Tech Research Reactor (GTRR) docket 50-160.

##### b. Attendees

###### NRC

Roger D. Walker, Director, Division of Reactor Projects (DRP)  
Region II  
Albert F. Gibson, Acting Director, Division of Reactor Safety (DRS)  
Region II  
David M. Verrelli, Chief, Project Branch No. 1, DRP  
George R. Jenkins, Director, Enforcement and Investigation  
Coordination Staff (EICS)  
Paul E. Fredrickson, Chief Project Section 1C, DRP  
Bruce Wilson, Chief, Operator Licensing Section, DRS  
Leo P. Modenos, Enforcement Specialist, EICS  
Austin K. Hardin, Project Inspector, DRP

###### Georgia Institute of Technology

Dr. Ratib A. Karam, Director, Nuclear Research Center  
L. Dean McDowell, Reactor Supervisor

##### c. Meeting Summary

The Division Director, Reactor Projects, introduced the participants and stated the purpose of the meeting. The Acting Director, Division of Reactor Safety, discussed the NRC's position relative to the licensee's responsibility in designating a candidate for NRC licensed operator examination and requested the licensee to discuss the process through which Georgia Institute of Technology selected their Reactor Operator (RO) and Senior Reactor Operator (SRO) candidates and how

they determined the candidates are adequately trained and have a reasonable potential for successfully passing an NRC license examination.

Dr. Karam stated they did not have formal classroom training to directly qualify personnel as operators for the GTRR. They teach one course, three hours/week for one quarter, relative to general reactor theory and reactor operation plus each candidate works with a qualified operator and learns by observation. Dr. Karam stated he believed the two candidates designated were capable of passing the examination since they had trained the individuals consistent with previous reactor operator applicants and the candidates had led them to believe they were prepared for the exam. Dr. Karam stated that the candidates did express doubt about their ability to pass the exam shortly before the exam was given, but he felt that the uneasiness could be accounted for by the students' nervousness and not by lack of ability. The NRC raised questions concerning the licensee's interpretation of the NRC Form 398 certification and the licensee's responsibility to ensure that its candidates are prepared to take the NRC exam. Dr. Karam stated that although the research center had provided some training for the applicants, their readiness for the exam was based on the individuals' own determination. The NRC then addressed the specific responsibility as addressed on the NRC Form 398 for the licensee to not only train the applicant on the reactor but also to develop some mechanism to satisfy the certifier that the applicant can, in fact, "operate the controls in a competent and safe manner."

A general discussion ensued as to the actions which Georgia Tech should take. The three major improvements addressed were the need for a more structured training program, more rigorous criteria for selection of candidates, and better assessment of the candidates' capability and knowledge following training.

The licensee agreed with the above items related to improving operator candidate preparation.

The NRC stated that the discussion and exchange of views was most helpful and that the licensee's comments would be considered in further evaluation.