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

Report No.: 50-259,-260,-296/89-04

Licensee: Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket No.: 50-259,-260,and -296 License No.: DPR-33, DPR-52, and DPR-68

Facility Name: Browns Ferry Units 1, 2, and 3

Inspection at Browns Ferry Site near Decatur, Alabama

Inspection Conducted: January 4-12, 1989

Inspector: _____ 1-27-89
D. R. Carpenter, NRC Site Manager Date Signed

Accompanied by: P. Burnett, Reactor Inspector
P. Castleman, Plant Systems Engineer
E. Christnot, Resident Inspector
K. Ivey, Resident Inspector
A. Johnson, Project Engineer
A. Long, Project Engineer

Approved by: _____ 1/30/89
W. S. Little, Section Chief, Date Signed
Inspection Programs,
TVA Projects Division

SUMMARY

Scope: This special, reactive inspection was conducted to determine the conditions that led to the loading of 74 fuel bundles into the Browns Ferry Unit 2 core without indication of core neutron flux levels as identified by NRC inspectors.

Results: Three apparent violations were identified:

260/89-04-01: Potential Failure to Comply with 10 CFR 50.59 by Proceeding with Unmonitored Core Loading of Unit 2. This Constitutes a Potential Unreviewed Safety Question and Compromises Fundamental Safety Principles (paragraph 4.a)

259,260,296/89-04-02: Failure to Implement the Requirements of Procedure SDSP-27.1 to Perform Adequate Unreviewed Safety Question Determinations, as Evidenced by Numerous Inadequacies in the 10 CFR 50.59 Reviews of Fuel Loading Procedures (paragraph 4.b)

259,260,296/89-04-03: Failure to Provide Adequate Cross Disciplinary Review of Procedures Impacting Plant Safety (paragraph 6)

Three unresolved items were identified. One concerned the adequacy of the licensee determination that the unmonitored core loading was not reportable per 10 CFR 50.72 or 50.73 (paragraph 10), another concerned the procedure review process (paragraph 6), and the third concerned the review of Technical Specification (TS) requirements for core monitoring (paragraph 5).

All of the identified violations and unresolved items must be satisfactorily resolved prior to Unit 2 restart.

The inspection noted significant weaknesses in the areas of fuel loading operations, 10 CFR 50.59 safety reviews, review and approval of procedures, and TSs. The inspection also indicated that the licensee accepted without question the provision of TSs which did not preclude unmonitored core alterations and may have taken nonconservative and improper advantage of existing TS wording in performing unmonitored core alterations. As a consequence, this gives indication of a general licensee attitude which appeared to emphasize compliance rather than safety in order to accommodate the easiest option of performing the fuel loading operation.

When the problem was initially identified, the licensee's assessment and actions were considered to be nonconservative, incomplete, and inadequate. Once the licensee acknowledged the full significance of the issues of unmonitored core loading, however, the corrective actions taken were appropriately conservative, thorough, and acceptable.

REPORT DETAILS

1. Persons Contacted

Licensee Employees:

O. Kingsley, Jr., Senior Vice President, Nuclear Power
C. Fox, Vice President and Nuclear Technical Director
J. Bynum, Vice President, Nuclear Power Production
C. Mason, Acting Site Director
*G. Campbell, Plant Manager
H. Bounds, Project Engineer
*J. Hutton, Operations Superintendent
*D. Mims, Technical Services Supervisor
G. Turner, Site Quality Assurance Manager
P. Carier, Site Licensing Manager
*J. Savage, Licensing Supervisor
A. Sorrell, Site Radiological Control Superintendent

Other licensee employees or contractors contacted included licensed reactor operators, auxiliary operators, craftsmen, technicians, and quality assurance, design, and engineering personnel.

NRC Attendees

*D. Carpenter
*E. Christnot
*K. Ivey
*P. Castleman

*Attended exit interview

On January 9 and 10, 1989, while NRC managers were on site for a plant tour and schedule review, TVA management made presentations to the staff on the root cause of the unmonitored core loading, corrective actions (short term and long term), and plans for resumption of fuel loading activities. Attachment A to this report summarizes TVA's presentations. The following persons were in attendance:

Licensee attendees:

O. Kingsley, Jr., Senior Vice President, Nuclear Power
J. Bynum, Vice President, Nuclear Power Production
C. Fox, Jr., Vice President and Nuclear Technical Director
J. Kirkebo, Vice President, Nuclear Engineering
N. Kazanas, Vice President, Nuclear Quality Assurance
R. Gridley, Director, Nuclear Safety and Licensing
J. Robertson, Manager, Nuclear Fuel
C. Mason, Acting Site Director, Browns Ferry Nuclear Plant

G. Campbell, Plant Manager
G. Turner, Site Quality Assurance Manager
P. Carier, Site Licensing Manager
J. Savage, Licensing Supervisor
T. Overlid, Nuclear Manager's Review Group

Licensee contractor attendees:

W. Cobean, TVA Consultant
P. Marriott, General Electric
D. Janecek, General Electric

NRC attendees:

P. Burnett, Reactor Inspector
D. Carpenter, Site Manager
P. Castleman, Plant Systems/TVA Projects
E. Christnot, Resident Inspector
K. Ivey, Resident Inspector
A. Johnson, Project Engineer
B. Liaw, Director, TVA Projects Division
W. Little, Section Chief, Inspection Programs, TVA Projects Division
A. Long, Project Engineer
E. Marinos, Branch Chief, Reactor Operations Branch
F. McCoy, Assistant Director, TVA Inspection Programs

Acronyms used throughout this report are listed in the last paragraph.

2. Sequence of Events

After an extended shutdown of over four years in duration, Unit 2 fuel loading commenced at 9:50 a.m., on January 3, 1989.

The reactor core included four Source Range Monitors (SRMs), one in each quadrant, to provide neutron monitoring during fuel loading. TS 3.10 states that a minimum count rate of 3 cps is required for SRM operability unless other specified conditions are met. Because the SRMs were reading less than 3 cps, the licensee performed fuel loading in accordance with TS 3.10.B.1.b.2. This allowed count rates less than 3 cps provided SRM response checks were successfully performed every 8 hours using a neutron source, both fresh and irradiated fuel were being loaded, and the core was loaded in a spiral sequence. The TS does not specify what minimum count rate is acceptable.

As the assemblies were loaded, the count rate on SRM C fluctuated between 0.2 cps and 0.65 cps, SRM B indicated between zero cps and 0.17 cps, and SRMs A and D showed no detectable count rates. During the source checks, the SRMs responded with count rates on the order of 3 cps. The observed responses with and without the sources indicated that the SRMs were operable and capable of detecting neutrons, but at least three SRMs were not continuously responding to core neutrons from the fuel configuration

established during the core reload process. The response of the fourth SRM, channel C, was also questionable.

Both prior to and immediately following the initiation of the fuel loading process, NRC inspectors questioned the licensee regarding whether the positive reactivity additions from the fuel assembly movements were being adequately monitored to ensure core safety, since the SRMs were not responding to neutrons from the fuel. The licensee contended that per TS 3.10.B.1.b.2, SRM response to core neutrons during core loading was not required.

On January 5, 1989, after approximately 45 fuel assemblies had been loaded into the core without achieving any observable response on more than one SRM, an NRC inspector again raised the issue of adequate core monitoring. The licensee continued to maintain that it was unnecessary to require SRM response to core neutrons because it was not required by TS, and obtained concurrence on this position from the GE representative on site. Licensee reactor engineers indicated to the NRC inspectors that, due to the length of the extended shutdown, the radioactivity level of the fuel was so low that the loading of approximately 200 bundles was anticipated before the count rates on all SRMs would exceed 3 cps.

The licensee was requested to provide the NRC inspectors with a safety analysis supporting the unmonitored core loading, including: (1) analytical verification that the unresponding SRMs would promptly and adequately reflect any significant adverse flux trend; and (2) the calculations of the minimum number of assemblies required for criticality. Simultaneously, the NRC inspector's concern was escalated within NRC senior management and appropriate NRC Regional and Headquarters technical sections.

On January 5, 1989, at approximately 5:00 p.m., fuel loading was halted by the licensee pending review and resolution of the NRC concerns, with 74 of the total 764 fuel assemblies loaded. Recorded SRM count rate readings at the termination of fuel loading showed SRM C at 0.8 cps and the other three detectors reading essentially zero.

On January 8, 1989, at approximately 1:15 a.m., the licensee moved SRM D to the location of IRM F near the center of the core and reestablished core monitoring. An indication of 35 to 40 cps was attained and the count rate remained stable at that level.

3. Safety Significance of the Event

Inadvertent criticality is prevented during core alterations by the margin of safety provided in the core design, through refueling interlocks, and by continuous core neutron flux monitoring.

Neutron monitoring is essential to ensure the prompt detection of and operator response to an inadvertent criticality. The safety impact of loading fuel without the SRMs on scale is that if a criticality

condition did occur, it would continue undetected until flux levels increased enough to bring the SRM readings on scale. In such an event, the lack of core neutron monitoring could delay actions to mitigate the consequences of an inadvertent criticality accident.

Detector "response" to neutrons must be distinguished from a detector being "operable" per TS requirements. The SRMs were verified to be operable by the periodic source checks performed during the fuel loading; however, detector operability does not assure the monitoring of core neutrons. For monitoring to occur, an operable detector must be in a geometry which assures exposure to sufficient core flux for the detector to be on scale and responding directly to changes in the magnitude of the neutron flux.

Licensee reactor engineers indicated to the NRC inspectors that as few as eight fuel bundles could have achieved criticality if two control rods were withdrawn. The licensee loaded several multiples of this potential critical mass without core neutron monitoring. Based on additional licensee calculations, criticality could have occurred during the core loading sequence if four worst case loading errors had occurred combined with the withdrawal of the highest worth control rod.

In this specific case, no control rods were withdrawn and no loading sequence errors occurred. Consequently, as discussed in paragraph 9, the reactor was in fact adequately shutdown. However, the licensee did load 74 fuel bundles into the core without continuous neutron flux monitoring. This is contrary to the fundamental concept of not adding positive reactivity or making core alterations without the ability to determine the effect of that reactivity addition or alteration on the core.

4. Unreviewed Safety Question Determinations

10 CFR 50.59 requires that the holder of a license authorizing operation of a production or utilization facility must receive prior Commission approval to make changes in the procedures as described in the safety analysis report if the proposed changes involve an unreviewed safety question (USQ). Two conditions of 10 CFR 50.59 for which a proposed change shall be deemed to involve an unreviewed safety question are: (1) if the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or (2) if the margin of safety as defined in the basis for any TS is reduced. The holder of a license authorizing operation of a utilization facility who desires to make a change in the procedures described in the safety analysis report which involve an unreviewed safety question must submit an application for a license amendment.

Site Director Standard Practice (SDSP) 27.1, "Evaluations of Changes, Tests, and Experiments-Unreviewed Safety Question Determination," which implements the requirements of 10 CFR 50.59, requires that new procedures or proposed changes to existing procedures be given a screening review to

determine whether the proposed change could impact nuclear safety. This screening review process applies the criteria in 10 CFR 50.59 to determine if proposed changes require a safety evaluation or TS Change. If it is determined that there could be an impact on nuclear safety, a safety evaluation of the proposed procedure change is required. The safety evaluation determines whether a proposed change involves a USQ or change to a TS and therefore would require prior NRC approval.

a. Core Loading Procedures

In August 1988, 2-GOI-100-3, "Refueling Operations," was approved in preparation for loading fuel in Unit 2. This procedure prescribed a fuel loading sequence which did not provide for continuous source range monitoring. Specifically, the procedure did not delineate a minimum acceptable count rate or assure that the SRMs were responding to core neutrons. The 10 CFR 50.59 screening review of the procedure, conducted per SDSP 27.1, indicated that the procedure could not impact nuclear safety. Therefore, no safety evaluation was performed to determine whether the proposed change involved a USQ or required a TS change. The inspectors consider that a procedure which allows unmonitored positive reactivity additions does impact nuclear safety, and consequently should have been supported by a proper safety evaluation as required by 10 CFR 50.59.

The written justification on the screening review, which supported the classification of 2-GOI-100-3 as having no potential safety impact, stated that the proposed steps were within the guidelines of the TS and FSAR. The TSs were amended in 1979 to allow fuel loading with SRM count rates less than 3 cps under certain conditions. The inspectors considered that the licensee's safety evaluation supporting this amendment was inadequate as discussed in paragraph 5. FSAR Section 7.5.4.1, which documents the design basis of the SRMs, states that neutron detectors shall be provided which result in a count rate of no less than 3 cps with all control rods fully inserted. The FSAR was not updated when the TSs were changed, so the change in TS 3.10 was clearly in direct contradiction with the FSAR requirement.

When 2-GOI-100-3 was written in 1988, the trained initiator and qualified reviewer performing the procedure review failed to identify the contradiction between the FSAR and TS. Additionally, review of the applicable portions of the FSAR and TS, as required by the SDSP 27.1 screening review apparently did not include a review of the TS Bases and SER, which require core monitoring. Due to the inadequate screening review, a safety evaluation was not performed and a potential unreviewed safety question was not identified.

The inspectors consider that had an appropriate 10 CFR 50.59 safety evaluation of 2-GOI-100-3 been performed when the procedure was written, the necessity for adequate core neutron monitoring should

have been identified and the contradiction between the FSAR and TS should have been resolved.

In addition, an adequate 10 CFR 50.59 evaluation of 2-GOI-100-3 should have questioned the applicability of TS 3.10.B.1.b.2, which allows fuel loading with SRM count rate levels less than 3 cps provided that both fresh and irradiated fuel are loaded. Irradiated fuel should provide adequate minimum flux levels for core monitoring, to meet the intent of TS 3.10.B.1.b.2. In this case, the irradiated fuel should have been considered equivalent to fresh fuel due to the decay of the neutron levels in the irradiated fuel during the extended shutdown.

Performance of an unmonitored core loading is considered to be a potential Unreviewed Safety Question in that it may increase the consequences and/or probability of an accident previously evaluated in the SAR and may reduce the margin of safety as defined in the basis for TS 3.10.B.1.b.2 (see paragraph 5 of this report).

The fact that the licensee began an unmonitored core loading without performing a proper evaluation and obtaining prior NRC approval as required by 10 CFR 50.59 was identified as apparent violation 260/89-04-01.

b. Programmatic Assessment

NRC inspectors reviewed the adequacy of the licensee's program for unreviewed safety question determinations.

The NRC reviewed 13 screening reviews (performed between June and December 1988) associated with refueling procedures and their revisions. Several errors were noted. In some cases, these errors were not in accordance with SDSP-27.1, while in other cases, the errors appeared to violate the intent of both SDSP-27.1 and 10 CFR 50.59 to ensure that proposed changes do not adversely impact nuclear safety.

The following deficiencies in implementation of SDSP-27.1 were noted:

1) Section 6.2.3 and Attachment B of SDSP-27.1 require that each "Yes," "No," or "N/A" response to the three questions on the screening review form be given "sufficient justification... to support that conclusion." In aggregate, among the 13 SRs assessed, there were a total of 39 justifications required. Of these:

   Two were left blank.

   Six merely stated that the proposed changes did not affect nuclear safety, but did not provide any supporting analysis or other explanation. The inspectors consider that these changes could have affected nuclear safety.

Eleven were incomplete and/or included what the inspector considered to be illogical assessments of the issues being screened. Many of the justifications failed to answer the question of whether the issues could impact nuclear safety. Several justifications stated that the changes had no safety impact because they were administrative in nature, but this assumption was not supported. A number of discrepancies were observed between the information provided on different screening forms for the same procedures.

Fourteen were identified as N/A as allowed by SDSP-27.1.

Six were considered to be satisfactory.

From the above categorization of justifications, additional analysis and justification should have been performed for approximately half of the questions reviewed. For those proposed changes which could not be categorically shown to have no impact on safety, a safety evaluation (SE) should have been performed. The inspector considers that for the screening reviews (SRs) assessed, 12 SEs should have been performed in accordance with the provisions of SDSP-27.1.

2) One activity which is included in the screening review process is the requirement for screeners to list FSAR and TS sections researched in conjunction with their reviews. There are five locations on each screening review form to list the applicable research documentation, resulting in a total of 65 research citations required for the sample of 13 SRs. Of those 65:

Two were left blank

Four listed "ALL" as having been reviewed (both TS & FSAR)

Six stated that no TS and/or FSAR section applied.

It is not clear from the inspectors review of the SRs that the FSAR was properly researched and reviewed as required.

3) On the SRs reviewed by the NRC inspector, there were five instances where the wrong box ("NO" instead of "N/A") was checked as defined in SDSP-27.1. These errors were all made in response to question 1 of the screening review form: "Does the proposed change involve a change in the facility (or plant operating characteristics) from that described in the FSAR and which could impact nuclear safety?" In accordance with the guidelines of Attachment B of SDSP-27.1, in each of these instances the "N/A" box should have been checked as the changes did not involve changes to either the facility or plant operating characteristics.

The deficiencies described above indicated that SR preparers neither strictly nor consistently adhered to the requirements of SDSP-27.1. The resulting determinations that no safety evaluations were necessary appeared to incorrectly bypass the mechanism established by SDSP-27.1 to ensure that proposed changes receive the appropriate review regarding safety impact. In summary, it is considered that the licensee's threshold for performance of safety evaluations based on the screening review process is too high. This may result in a superficial evaluation of nuclear safety consequences. Additionally, it is also considered that the numerous deficiencies noted in the SRs indicate a weakness in the diligence with which the screening reviews are performed. These concerns are considered to have contributed to a failure to perform a safety evaluation to determine if a USQ exists as cited in Violation 260/89-04-01.

10 CFR 50, Appendix B, Criterion V requires that activities affecting quality shall be accomplished in accordance with documented procedures. The failure to implement the requirements of 10 CFR 50 Appendix B, Criterion V and procedure SDSP-27.1 for 10 CFR 50.59 unreviewed safety question determinations, as indicated by the numerous deficiencies identified by the NRC inspectors in the screening reviews of the fuel loading procedures, was identified as Violation 259,260,296/89-04-02.

All of the SRs assessed were approved by personnel who were officially designated as "Approvers." Each of these personnel had successfully completed an eight-hour training course in the USQD process and were current in their required annual requalification training. Also, review of the USQD training material determined that the required information from SDSP-27.1, 10 CFR 50.59, and other NRC and industry guidance is presented during training courses for SR Preparers and Approvers.

Per SDSP-27.1, the Approvers are charged with the responsibility to review the responses to the SR questions and the associated justifications for technical adequacy, and to indicate their approval of the SRs. It appears that the standard of technical adequacy enforced by the first level of supervisory review has not been sufficient.

5. Technical Specification and Bases Adequacy

The inspectors reviewed the technical adequacy of the specific TS sections used by the licensee as a basis for conducting unmonitored fuel loading.

Technical Specification 3.10.B.1 required that during core alterations, other than a complete core removal, two SRMs shall be operable in or

adjacent to any quadrant where fuel or control rods are being moved. For an SRM to be considered operable, the following shall be satisfied:

> TS 3.10.B.1.b.1: The SRMs shall have a minimum of 3 cps with all rods fully inserted in the core, if one or more fuel assemblies are in the core, or
>
> TS 3.10.B.1.b.2: During a full core reload where both irradiated and fresh fuel is being loaded, SRMs (FLCs) may have a count rate of less than 3 cps provided that the SRMs are response checked at least once every 8 hours with a neutron source until greater than 3 cps can be maintained, and provided also that the core is loaded in a spiral sequence only, or
>
> TS 3.10.B.1.b.3: During a full core reload where both irradiated and fresh fuel are being loaded, four irradiated fuel assemblies will be placed adjacent to each SRM to establish a count rate of greater than 3 cps, provided each SRM is functionally tested prior to adjacent fuel loading, a neutron response is observed as the adjacent fuel is loaded, and the core is loaded in a spiral sequence only after the SRM adjacent fuel loading.

The provisions of TS Sections 3.10.B.1.b.2 and 3.10.B.1.b.3 could result in fuel loading sequences without continuous monitoring of reactivity changes because of the geometry of the SRM locations. As fuel is loaded in a spiral pattern from the center of the core, the flux is not initially neutronically coupled with the SRM locations due to attenuation between the fuel and the detectors. In this situation, the SRMs are not monitoring core neutrons. Although the provision of TS 3.10.B.1.b.3 should maintain a 3 cps minimum count rate, this only provides continuous demonstration of SRM operability and does not ensure monitoring of core neutrons. The licensee had not performed a safety analysis to justify that the SRMs would promptly respond to a criticality event if continuous monitoring was not maintained.

Both the TS Basis and the NRC 1979 SER indicated the necessity for continuous core monitoring. The TS Basis for Section 3.10 states that the SRMs are provided for monitoring and for guidance of the operator during refueling operations. The TS Basis further states that 3 cps on the SRMs is required to ensure that the flux is being monitored. The SER states that one function of the minimum count rate requirements in the TS is to provide assurance that the SRM detectors are close enough to the array of fuel assemblies to monitor core neutron flux levels.

Both TS 3.10.B.1.b.2 and TS 3.10.B.1.b.3 are only applicable when the fuel being loaded contains irradiated assemblies. The SER indicates that the relaxation of the 3 cps minimum count rate applies only when irradiated fuel is being loaded because the neutrons from spontaneous fission and fission product decay, and photoneutrons provide a minimum neutron flux to demonstrate SRM response. Section 3.1 of the SER states that the presence of exposed fuel will ensure the required minimum flux levels required for

monitoring. The SER further states that the loading of a core containing only fresh fuel must use lumped neutron sources and FLCs to meet the normal 3 cps minimum count rate. The inspectors consider that the intent of the TS 3.10.B.1.b.2 and TS 3.10.B.1.b.3 requirements for irradiated fuel relates to an assumed minimum flux level from the presence of photo-neutrons even though a minimum flux level is not specified. Although the previously exposed fuel assemblies being loaded in Unit 2 were "irradiated", the radiation levels had decayed during the extended shut-down such that the assemblies should have been considered equivalent to new fuel with respect to neutron levels. The inspector concluded that loading of fuel, under the existing conditions, would appear to preclude the use of TS 3.10.B.1.b.2 and TS 3.10.B.1.b.3.

Based on the assumption of loading irradiated fuel of sufficient activity level to meet minimum flux requirements for monitoring, the TS Basis states that a large number of fuel assemblies will not be required to maintain 3 cps. The licensee's plan to load 200 assemblies before achieving the specified minimum count rate appears to contradict this Basis.

Originally, the TSs required fuel loadings to be monitored with SRMs or FLCs reading greater than 3 cps. FLCs were to be used during fuel loading until 3 cps could be achieved on the SRMs.

In 1975, the TS were changed to allow for a full core unload with SRM or FLC count rates of less than 3 cps. Also, the requirement to have an operable neutron monitor in the quadrant in which fuel was being moved and in the adjacent quadrant was inadvertently changed to require an operable monitor in the quadrant of fuel movement or the adjacent quadrant. Thus an operable monitor was no longer required in the quadrant in which fuel was actually being loaded.

In 1979, TSs were changed to allow a full core reload with less than 3 cps if the core is loaded in a spiral sequence. This loading method did not provide continuous core monitoring. TVA based their safety evaluation on the fact that the NRC had approved a similar change for Nine Mile Point Unit 1. Records indicated that the BFNP submission simply referenced the NMP Unit 1 SER without describing any differences between the two reactors and the required procedures and process in carrying out the fuel loading and core monitoring.

The inspectors considered the licensee safety analysis supporting the 1979 TS amendment to be inadequate in that it did not provide any minimum count rate. If relief from the 3 cps minimum was justifiable, a new minimum should have been established which would be based on SRM signal to noise ratio parameters. Written relief from the requirement for 3 cps was obtained, but no new minimum count rate requirement was established. This did not relieve the licensee of the responsibility for providing adequate procedures including specifying a minimum acceptable

count rate. Although a count rate of zero literally complies with the TS requirements, it is considered unacceptable from a conservative safety perspective.

In 1984, TS were changed to allow loading irradiated fuel around each SRM to obtain a 3 cps minimum count rate with a spiral loading pattern. Again, this loading method did not provide adequate core monitoring.

All three of the TS revisions singularly and collectively are considered to be non-conservative and appear at variance with fundamental core physics requirements to monitor core neutron population as positive reactivity is added or as core alterations are made.

On January 6, 1989, following the termination of fuel loading, the licensee's Plant Manager informed the NRC inspectors that the licensee safety analysis supporting the 1979 TS amendment which allowed core loading without a minimum SRM count rate level of 3 cps was inadequate. The Plant Manager also acknowledged that inadequate safety evaluations were provided to the NRC for the TS submittal in 1984, and that management should have provided an in-depth review of the adequacy of the evaluations for both the 1979 and 1984 submittals.

The inspectors questioned the validity of TSs which allow unmonitored core alterations. This is identified as Unresolved Item 259,260,296/89-04-04 pending completion of licensee action to generically review TSs for this type of concern and further NRC review.

6. Fuel Load Procedure Review, Approval, and Adequacy

The NRC inspectors reviewed the following procedures which controlled the fuel loading process:

- 2-GOI-100-3, "Refueling Operations"
- TI-147, "Fuel Loading After a Complete Core Unload"
- 2-SI-4.10.8, "Demonstration of Source Range Operability"
- TI-14, "Special Nuclear Material Control"

The following conclusions were reached and discussed with the licensee:

a. A minimum acceptable count rate was not mentioned, directly or by reference, in the procedure.

b. The concept of detector response as opposed to detector operability was not adequately addressed in the fuel loading procedures (see paragraph 3).

c. Licensee insensitivity to the requirement for and benefit of continuous monitoring was reflected in TI-147, "Fuel Loading After A Complete Core Unload", step 4.2.8, which stated that fuel movement

should be halted if two or more SRM readings double after loading a single fuel assembly provided that three out of four SRMs were reading greater than 3.0 cps without the Response Check Neutron Source, prior to loading that bundle. The NRC inspectors did not consider this a meaningful precaution when the SRMs were not continuously responding to core neutrons. A large portion of the core, many critical masses, could have been loaded before the 3 cps count rate was achieved.

d. A primary purpose of the spiral loading pattern being used by the licensee was to ensure that no control cell size (four fuel assemblies) flux traps were created in the loading sequence. A flux trap is a region of high flux created in an unfilled fuel assembly location which is surrounded by fuel. A fuel assembly inserted into a flux trap could have especially high reactivity worth. Although cell-size flux traps did not occur in the loading sequence, the NRC inspectors determined that fuel assembly size flux traps did occur. This is due to the need to use control rod blade guides during the loading sequence. In the first 36 steps of the loading sequence there were two instances of fuel assemblies being added to a position that was completely surrounded by fuel. The NRC inspectors reviewed the loading error analysis and concluded that a fuel-assembly size flux trap was within the bounding analysis. The insertion of a single fuel assembly into a flux trap region of high worth should not result in criticality. Therefore the assembly size flux traps allowed by the loading sequence did not present a safety hazard.

e. NRC inspectors observing the SRM count rate meters during fuel loading noted that count rates on the order of 100 cps occurred whenever a fire alarm or medical emergency code call occurred. Although neutron monitoring capability was lost during these alarms, the procedures contained no precaution to stop fuel movement when this situation occurred.

f. An NRC inspector assessed the operability of the SRMs by observing the response of the count rate meters in the control room when the SRMs were checked, with eight hour frequency, using a fixed neutron source in an adjacent core position. The response was surprisingly slow, but stable once complete. The inspector also checked the response of two channels with a stop watch. The apparent response time constants were 34 seconds and 25 seconds for channels A and B, respectively. The time constant is the time to reach 63% of the final reading. Review of FSAR 7.5.4.2.4 indicated that this performance is expected at low count rates but will improve at higher count rates. The fuel handling procedures did not include a requirement to confirm that SRM indications have stabilized prior to releasing the fuel handling grapple. The need for such a provision was identified to the licensee by the NRC inspectors.

Of the fuel load procedures reviewed, only TI-14, "Special Nuclear Material Control", which provided the specific fuel movement steps, had been reviewed by the PORC. The other procedures, all of which contained steps and precautions essential to the safety of the loading process and

described cross disciplinary activities, received only Section Supervisor and RSPC review.

The inspectors reviewed the TS requirements applicable to procedure review and approval. TS 6.8.1.1 itemizes those plant activities for which written procedures shall be established, implemented and maintained, and includes the applicable procedures recommended in Appendix A of Regulatory Guide 1.33. Appendix A includes plant operating procedures for refueling and core alterations. TS 6.8.1.2 requires that each administrative procedure recommended in Regulatory Guide 1.33 shall be reviewed by the PORC, and all other procedures required by Regulatory Guide 1.33 shall be reviewed in accordance with TS Section 6.5.3. Section 6.5.3 requires independent review and cross-disciplinary review when necessary. These TS provisions were implemented by the licensee through SDSP 7.4, "Onsite Technical Review and Approval For Procedures," which defines when cross disciplinary review is necessary, and PMI-7.1, "Plant Operations Review Committee." These procedures require PORC review for the administrative procedures of Regulatory Guide 1.33, and require a qualified independent review for other safety-related procedures. Step 4.4 of SDSP 7.4 states that cross-disciplinary reviews shall be performed whenever any of the following conditions apply:

- Steps in a procedure may affect equipment under another group's direct control
- Whenever another group will be required to perform physical actions not included in previously approved instructions
- In cases where parts of the procedure are outside the reviewer's expertise.

The above requirements indicate that the fuel loading procedures should have received cross disciplinary review. Of particular significance was the fact that 2-GOI-100-3 did not receive the appropriate cross-disciplinary reviews by RadCon, Operations, Industrial Safety, PORC Oversight, Training, Vendor Manual Coordinator, Site Licensing, Instrumentation Section, Mechanical Section, and other relevant disciplines.

The NRC inspectors identified that none of the procedures for fuel loading were classified during the review and approval process as safety-related, despite the obvious safety implications. The inspector noted that Regulatory Guide 1.33 specifically designates procedures for refueling and core alterations as safety-related.

The NRC inspectors considered the lack of adequate review to be a significant contributing factor to the occurrence of the unmonitored fuel loading. Fuel loading was of particular safety significance considering that Unit 2 had been shut down for over four years due to poor performance, the majority of operators were either newly qualified or had not recently operated, and the condition of the fuel after the extended

shutdown differed from a typical refueling. Procedures to conduct core loading should have been given the highest level of review.

Failure to provide cross disciplinary review as required by TS 6.5.3 and administrative procedure SDSP 7.4, was identified as apparent Violation 259,260,296/89-04-03.

The NRC inspectors further noted that an issue involving inadequate review and approval of procedures had recently been raised in NRC Inspection Report 259,260,296/88-36, but the licensee's corrective actions focused only on addressing the specific procedure questioned by the NRC. A review of TS 6.5.1 concerning PORC activities revealed an ambiguously worded specification that provided only for PORC review of administrative procedures and emergency operating procedures and did not appear to address either PORC overview of potential unreviewed safety questions associated with procedures or PORC overview of the implementation of the independent qualified reviewer process. The adequacy of the procedure review process including the responsibilities of the PORC for procedure review is identified as Unresolved Item 259,260,296/89-04-05.

7. Previous NRC Findings on SRM Monitoring During Refueling

The inspectors reviewed previous NRC inspection findings in the area of core monitoring during fuel movement to assess whether the licensee had previous opportunity to identify and evaluate the adequacy of core monitoring.

NRC Inspection Reports 259,260,296/85-43 and 85-44 documented NRC concerns regarding TS requirements for SRM count rates during Unit 1 core unloading. The specific issue involved an apparent conflict between TS 3.10.B.1, which required a minimum 3 cps count rate for SRM operability except during certain specific reloading conditions, and TS 3.10.B.2, which allowed the SRM count rate to drop below 3 cps during a complete core removal. Although the concern was identified during an inspection of core unloading, a key concept is that core monitoring is required as long as fuel is in the core. Additionally, the concern brought the ambiguity of the TS to the attention of the licensee. The licensee committed to a reevaluation of the operability requirements in TS 3.10 for the SRMs, and made an interim procedure change to leave fuel around the SRMs to maintain a minimum count rate indication. This previous inspection finding was identified as IFI 259/85-44-02.

The same concern surfaced again during Unit 3 fuel unloading, as documented in NRC Inspection Report 259,260,296/87-09. The inspection report again raised the issue of adequate monitoring and reiterated the licensee's commitment to evaluate the adequacy of TS 3.10. At that time the inspectors questioned the adequacy of management oversight because this was the second incidence of the same concern.

Since the items addressed concerns with defueling, they were inappropriately classified as not affecting fuel load or startup. Therefore, the adequacy of TS 3.10 with respect to SRM operability requirements had not been formally evaluated by the licensee.

8. Other Opportunities To Identify Unmonitored Fuel Loading

As previously discussed, the licensee should have identified the safety issue of unmonitored core loading through the performance of adequate 10 CFR 50.59 reviews, through the procedure review and approval process required by TS, through reference to the TS Bases and/or SER, or through adequate response to previous NRC inspection findings. In addition, other specific opportunities for the licensee to identify and correct the problem had also existed.

a. Previous communications between the licensee and GE should have led to earlier identification of the problem. In 1987, as part of the design process, the licensee began discussions with GE on neutron source requirements for fuel loading. Licensee engineers were concerned that TS 3.3.B.4, which requires greater than 3 cps on the SRMs prior to pulling rods to go critical, could not be met because of the effects of the long shutdown on the fuel. In May 1987, GE recommended the use of startup sources and FLCs for fuel loading. Based on reference to the TS, the licensee did not believe that FLCs would be required and declined the recommendation of GE. GE further recommended a change to TS to allow a reduction in the required cps and spiral loading around an SRM. The licensee also rejected this proposal as unnecessary based on the wording of the existing TS.

b. On December 16, 1988, GE issued Nuclear Services Information Letter (SIL) No. 478, "SRM Minimum Count Rate", which stated that owners of BWRs which have not operated for an extended period find that the SRM signal is less than following briefer outages. The SIL raised the concept of adequate core monitoring. In particular, the SIL addressed the need for establishing a minimum count rate limit. The SIL also stated that SRM monitoring of neutrons requires a minimum count rate of 0.7 with a signal to noise ratio of 20 to 1. During the fuel load at BFNP even SRM C did not maintain a count rate level of 0.7. The inspectors also observed that the licensee did not appear to have a formal process to ensure that GE SILs are adequately addressed in a timely manner.

c. Prior to fuel loading, the licensee conducted training for nuclear engineers, GE field engineers, QA personnel, and operations personnel who would be involved in the loading activities. The training focused primarily on the actions to be taken and did not cover the technical bases for these actions. The licensee reported that GE field engineers did informally question the lack of core monitoring, but were convinced by TVA personnel that the planned methodology was acceptable because of the wording of the approved TS.

Adequate engineering design review should also have identified the problem of unmonitored core loading. The licensee's Nuclear Fuels Department performed the core design and safety analyses, and developed the full core loading pattern used as a basis for the detailed loading sequence. Nuclear Fuels reviewed the fuel assembly transfer forms for technical adequacy and concurred that they were acceptable to safely load fuel. The

safety analyses performed for the core were directed toward confirming that the core for Cycle 6 would operate within the thermal limits of TS and the bounds of the analyzed accidents in the FSAR. The safety of the refueling operation was not addressed by the licensee's Nuclear Fuels Department in any of the design documents reviewed by the NRC inspectors.

The inspectors considered it significant that the licensee made a conscious decision to apply TS 3.10.B.1.b.2 to load fuel with less than 3 cps based on loading irradiated fuel. Licensee engineers made statements to the inspectors on several occasions which demonstrated full awareness that the irradiated fuel being loaded was the equivalent of fresh fuel with respect to neutron levels. In fact, licensee engineers indicated that a decision was made not to apply TS 3.10.B.1.b.3, and load four irradiated assemblies around each SRM to achieve a 3 cps SRM count rate, because the licensee did not believe that the neutron levels of the irradiated assemblies was sufficient to comply with the TS. The inspector considered that the licensee took nonconservative and improper advantage of the TS wording.

In each of the various opportunities to have identified and corrected this basic safety concern, the licensee seemed to accept without question the provisions of the TSs which allowed unmonitored core alterations. As a consequence, this gives indication of a general attitude which appears to emphasize compliance rather than safety.

9. Licensee Immediate Corrective Actions

Upon termination of fuel loading on January 5, 1989, the licensee took the following immediate corrective actions to assure adequate shutdown margin would be maintained:

a. Licensee nuclear engineers analyzed the shutdown margin of the 74 fuel assembly configuration, conservatively approximated in the calculations by a symmetric pattern of 76 assemblies. The calculated SDM with 76 assemblies correctly loaded and all control rods fully inserted was 7.59 % delta k/k, which represented a very substantial safety margin. The calculated SDM with 76 assemblies correctly loaded and a single stuck rod withdrawn was 2.65 % delta k/k, which remained substantially more conservative than the SDM of 0.38 % delta k/k required by TS. The SDM remained safely above the TS limit even with three worst-case loading errors assumed and one stuck rod withdrawn. The calculations predicted criticality would occur only with the assumption of four worst case loading errors plus a stuck rod. The NRC inspectors concluded that adequate core safety margin had been analytically demonstrated.

b. A core verification was performed to confirm that the core was loaded as designed and analyzed. No discrepancies were identified. An NRC inspector reviewed the licensee's process for administratively assuring that the core was loaded in accordance with the design. The following documents were reviewed in the assessment:

- TVA Memorandum, Verification of Browns Ferry Nuclear Plant Unit 2 (BFN2), Cycle 6 Core Loading Fuel Assembly Transfer Forms (FATFs) BFN-2-21, November 28, 1988.

- TVA Memorandum, Unit 2 Cycle 6 Final Core Loading Pattern, November 17, 1988.

- BCD-395 (Revision 2/ July 21, 1988), Fuel Cycle Report, Volume I, Fuel Cycle Design, for Browns Ferry Nuclear Plant Unit 2, Cycle 6.

- SAS-366 (Revision 0/ July 1988), Fuel Cycle Report, Volume II, for Browns Ferry Nuclear Plant Unit 2, Cycle 6, Transient and Accident Analysis (Reconstituted Core).

- TVA-RLR-002 (Revision 2/ July 1988), Reload Licensing Report, Browns Ferry Nuclear Plant Unit 2, Cycle 6.

- TI-14 (Revision 8), Special Nuclear Material Control, Appendix B, Fuel Assembly Transfer Form.

The inspector concluded that there was a continuous trail of documentation of the licensee's activities from the outset of core design to the designation of each fuel assembly by unique serial number to be installed into each unique core location. The inspector concluded that the core was loaded in the configuration that was designed and analyzed.

c. Control rod movement was inhibited by removing power to the directional control valves.

d. SRM D, which was reading zero cps in its original installed core position, was moved to IRM F location near the center of the core to provide flux monitoring and trip capability. A stable count rate of 35-40 cps was obtained.

e. Source range monitor operability checks continued to be performed at least every eight hours per 2-SI-4.10.B, "Demonstration of Source Range Monitor System Operability During Core Alterations."

The NRC inspectors reviewed these immediate corrective actions and considered them adequate to maintain core safety for the as-terminated core configuration.

Subsequent to the termination of fuel loading, the licensee initially persisted in maintaining that one responding SRM would be sufficient to support continued fuel loading, and was supported by GE in this contention. The NRC inspectors considered that this proposal was contrary to TS requirements, as well as safe engineering practices. Only after additional consideration and extensive interaction with the NRC and GE, was the decision made by the licensee to use FLCs to provide redundant

core monitoring in each quadrant in which fuel was being moved, as required by TS.

Prior to resuming fuel loading, the following additional corrective actions were taken by the licensee:

- Redundancy in neutron monitoring was established through the use of two FLCs in place of SRM's A and B.

- Core loading and support procedures were appropriately revised and reviewed by the PORC. A review of the revised procedures by NRC inspectors reflected that fuel loading procedural concerns had been adequately resolved. Observations by NRC inspectors of the PORC meetings indicated that the meetings were satisfactorily conducted.

- Training of refueling personnel was conducted, including a critique of the event and training on the procedure revisions. The NRC inspectors attended a number of these training sessions, and concluded that the licensee provided a good critique and lessons learned session with all personnel involved with fuel handling and provided a good overview of revisions to the procedures.

Once the licensee acknowledged the safety significance of the issue of unmonitored core loading, the immediate corrective actions taken were acceptable.

10. Reportability

Licensee Reportable Event Determination 89-2-004, issued on January 6, 1989, classified the termination of fuel loading due to lack of monitoring as non-reportable per 10 CFR 50.72, 50.73, or plant implementing procedures. The basis for this assessment was that all applicable TS requirements were satisfied throughout fuel loading, and that the plant had been analyzed for the fuel loading method as described in TS 3.10.B.1.b.2. The NRC inspectors consider this event to be reportable under 10 CFR 50.73 and that there may also be basis for reportability under 10 CFR 50.72. The adequacy of the reportability determination for this event was identified as Unresolved Item 260/89-04-06 pending review of the licensee's basis of not reporting it under 10 CFR 50.72 and pending licensee disposition pursuant to 10 CFR 50.73.

11. Exit Interview (30703)

The inspection scope and findings were summarized on January 13, 1989, with those persons indicated in paragraph 1 above. The inspectors described the areas inspected and discussed the inspection findings listed below. Proprietary material was reviewed by the inspectors but was not retained. Dissenting comments were not received from the licensee.

Inspection Findings:

Apparent Violation 260/89-04-01: Failure to Obtain NRC Approval Prior to Proceeding with Unmonitored Core Loading of Unit 2, which Constituted a Potential Unreviewed Safety Question and Compromised Fundamental Safety Principles (paragraph 4.a)

Apparent Violation 259,260,296/89-04-02: Programmatic Failure to Implement the Requirements of 10 CFR 50.59 and Procedure SDSP-27.1 Unreviewed Safety Question Determinations, as Evidenced by Numerous Inadequacies in the 10 CFR 50.59 Reviews of Fuel Loading Procedures (paragraph 4.b)

Apparent Violation 259,260,296/89-04-03: Failure to Provide Cross Disciplinary Review of Procedures Impacting Plant Safety (paragraph 6)

Unresolved Item 259,260,296/89-04-04: Review of TS Requirements (paragraph 5)

Unresolved Item 259,260,296/89-04-05: Procedure Review Process Adequacy (paragraph 6)

Unresolved Item 259,260,296/89-04-06: Adequacy of the Licensee Determination that Loading Fuel without Core Monitoring was not reportable per 10 CFR 50.72 or 50.73 (paragraph 10).

12. List of Acronyms

BFNP	Browns Ferry Nuclear Power Plant
BWR	Boiling Water Reactor
CFR	Code of Federal Regulations
CPS	Counts Per Second
EA	Enforcement Action
FATF	Fuel Assembly Transfer Form
FLC	Fuel Loading Chamber
FSAR	Final Safety Analysis Report
GE	General Electric
GOI	General Operating Instruction
IFI	Inspector Followup Item
IRM	Intermediate Range Monitor
NMP	Nine Mile Point
NRC	Nuclear Regulatory Commission
NRR	(NRC Office of) Nuclear Reactor Regulation
PMI	Plant Manager Instruction
PORC	Plant Operations Review Committee
QA	Quality Assurance
RCNS	Response Check Neutron Source
RSPC	Responsible Section Procedure Coordinator
SAR	Safety Analysis Report
SDM	Shutdown Margin
SDSP	Site Director Standard Practice

SE	Safety Evaluation
SER	Safety Evaluation Report
SI	Surveillance Instruction
SIL	(General Electric) Service Information Letter
SR	Screening Review
SRM	Source Range Monitor
TI	Technical Instruction
TS	Technical Specifications
TVA	Tennessee Valley Authority
USQ	Unreviewed Safety Question
USQD	Unreviewed Safety Question Determination

ATTACHMENT A

SLIDES FROM TVA PRESENTATION

TVA/NRC MANAGEMENT MEETING - JANUARY 9, 1989

AGENDA

	TOPIC	SPEAKER
I.	INTRODUCTION	O. KINGSLEY, JR
II.	BFN RELOAD ASSESSMENT	
	• HISTORY - TECH SPECS & LOADING SEQUENCE	J. BYNUM
	• ROOT CAUSE	
	• GE SUPPORT	P. MARRIOTT
	• CORE REACTIVITY	J.BYNUM
III.	RESUMING FUEL LOAD	
	• RELOAD PLAN AND CORE MONITORING	G. CAMPBELL
	• RELOAD SEQUENCE / GE TECH OVERVIEW	P. MARRIOTT
IV.	ADDITIONAL TVA INITIATIVES	
	• SHORT TERM TECH SPEC ASSESSMENT	CAMPBELL/OVERLID
	• PLANNED TECH SPEC ASSESSMENT	N. KAZANAS
	• SECTION 6 TECH SPEC	P. CARIER
	• EXPERIENCE REVIEW	C. FOX
	• VENDOR INTERFACE	C. MASON
V.	SUMMARY	O. KINGSLEY, JR

FL-AGEND.CHT

TVA/NRC MANAGEMENT MEETING
JANUARY 9, 1989

INTRODUCTORY REMARKS
BY O. D. KINGSLEY, JR.

FL-INTRO.CHT

TVA/NRC MANAGEMENT MEETING
JANUARY 9, 1989

BFN RELOAD ASSESSMENT
BY J. R. BYNUM

FL-ASMT.CHT

TECH SPEC HISTORY

- 1973 - TWO SRM's OR FLC's
  ONE IN QUADRANT BEING LOADED
  AND ONE IN ADJACENT QUADRANT
- 1975 - TWO SRM's OR FLC's ONE IN
  QUADRANT BEING LOADED OR ONE
  IN ADJACENT QUADRANT, LESS
  THAN 3 CPS ALLOWED DURING FULL
  CORE UNLOAD
- 1979 - TWO SRM's OR FLC's, LESS THAN
  3 CPS ALLOWED IF FULL CORE RELOAD
  AND CORE LOADED IN SPIRAL
  SEQUENCE ONLY
- 1984 - TWO SRM's OR FLC's, FOUR ASSEMBLIES
  MAY BE LOADED ADJACENT TO SRMS TO
  ESTABLISH A GREATER THAN 3 CPS AND
  FUEL LOADED IN SPIRAL SEQUENCE
  AFTER ADJACENT FUEL LOADING

CORE LOADING SEQUENCE HISTORY

1973-1984

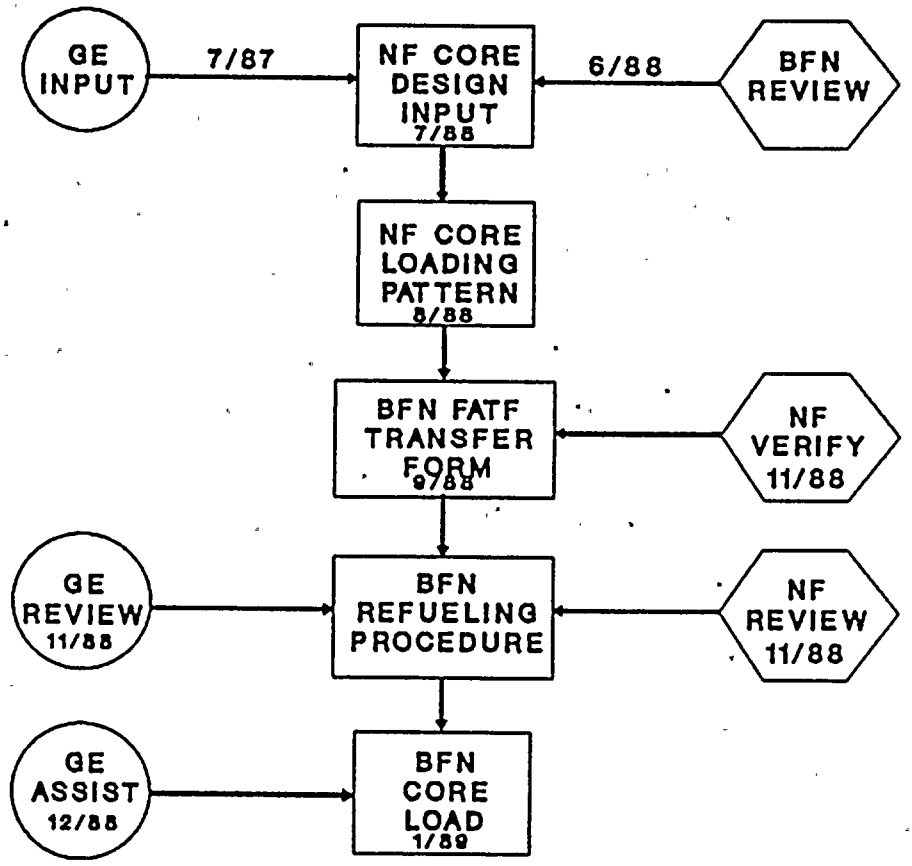
- LOADED USING SRM's AND FUEL LOADING CHAMBERS
- MAINTAINED GREATER THAN 3 CPS

AUGUST 1984

- U3 CYCLE 6 - USED PRESENT METHOD

FL-CLH.CHT

RELOAD SEQUENCE DEVELOPMENT



FL-GE2.CHT

GE SUPPORT FOR BFN REFUELING

- NORMAL SITE ENGINEERING FUNCTIONS
- LOCAL POWER RANGE MONITOR REPLACEMENT SUPPORT
- FUEL LOADING ASSISTANCE
  - ASSISTED WITH PLANNING
  - INSPECTED REFUELING BRIDGE CRANE
  - CRITIQUED TRAINING
  - ASSESSED READINESS
  - SUPPORTED EXECUTION

FL-GE1.CHT

CURRENT CORE CONFIGURATION
REACTIVITY ANALYSIS

	(%ΔK) SHUT DOWN MARGIN ARI	SRO
76 BUNDLES LOADED IN CORRECT CONFIGURATION	7.59	2.65
76 BUNDLES LOADED ASSUMING 3 WORST LOADING ERRORS	6.72	0.83
76 BUNDLES LOADED ASSUMING 4 WORST LOADING ERRORS	6.34	-0.19 •
REQUIRED SHUTDOWN MARGIN		0.38

GE PERFORMED INDEPENDENT CALCULATIONS ON THE 76 BUNDLE CONFIGURATION AND VERIFIED THE TVA RESULTS

• ACHIEVES CRITICALLY

FL-REACT.CHT

TVA/NRC MANAGEMENT MEETING
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RESUMING FUEL LOAD
BY G. G. CAMPBELL
AND P. W. MARRIOTT

FL-RFL.CHT

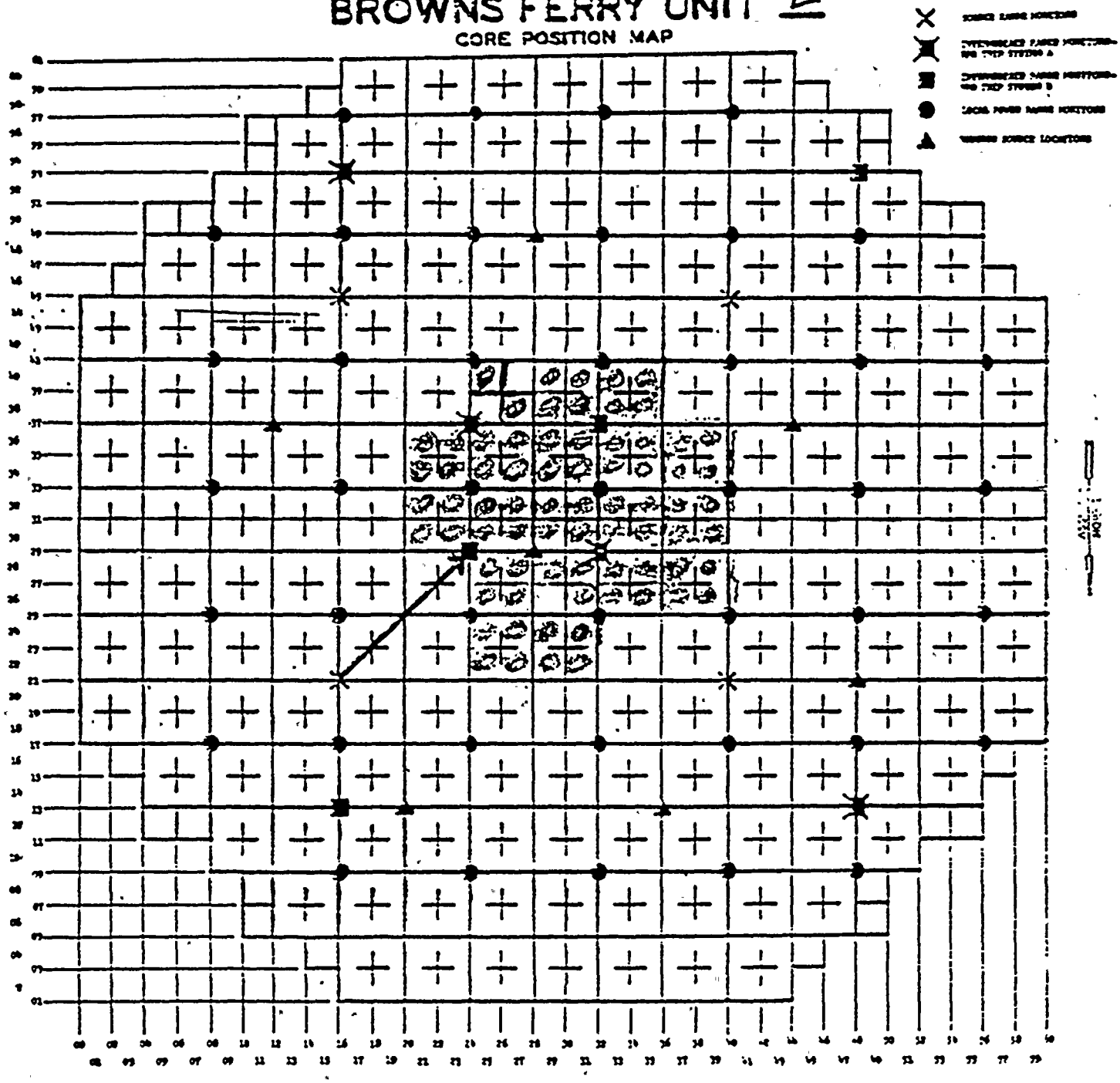
CORE MONITORING

- INSTALLATION OF ADDITIONAL NEUTRON MONITORING INSTRUMENTS
- CONVERTED IRM F TO ADDITIONAL SRM IN REGION 29-24 WITH FUEL MONITORING AND TRIP CAPABILITY
- PROCURED DUNKING CHAMBERS TO BE USED FOR RE-COMMENCEMENT OF FUEL LOAD

DATE 1-9-89
USE

BROWNS FERRY UNIT 2

CORE POSITION MAP



X ⟶ ■ SRM D in IRM F

⊡ Core locations with fuel

RELOAD PLANS

- WILL ACCOMPLISH RELOAD UNDER TECH SPEC 3.10.B.1.b.1
  2 SRM'S OPERABLE AND GREATER THAN 3 CPS

- ONE SRM IN QUADRANT OF FUEL MOVEMENT, AND ONE SRM IN ADJACENT QUADRANT
  NOTE: WILL ACTUALLY USE INSTALLED SRM'S
  PLUS TWO DUNKING CHAMBERS

- GE HAS DEVELOPED RELOAD SEQUENCE TO RE-COMMENCE FUEL LOADING

FL-RLP.CHT

MODIFIED REFUELING PROCEDURE

- SIMILAR TO INITIAL CORE LOADING
- REFUELING PREREQUISITES DEFINED
- ACHIEVES CORE MONITORING IN LOADING REGION PLUS ADJACENT REGION
  - SUBSTITUTE SRM
  - TWO FUEL LOADING CHAMBERS
- NON-COINCIDENT SCRAM
  - SRM/FLC
  - IRM
  - APRM
- MINOR MODIFICATIONS TO ORIGINAL LOADING SEQUENCE
- NO MODIFICATIONS TO CURRENT TECH SPECS REQUIRED

EXCEEDS THE BEST PRACTICES
OF OTHER UTILITIES

FL-MFLP.CHT

RELOAD PLANS SUMMARY

- ADDITIONAL NEUTRON MONITORING INSTALLED
- EXCEEDS THE BEST INDUSTRY PRACTICE FOR LOADING
- GE DEVELOPMENT OF LOADING SEQUENCE
- APPLICABLE PERSONNEL TRAINED ON PROCEDURE REVISIONS AND MONITORING OF SOURCE RANGE INSTRUMENTATION
- GE REACTOR ENGINEER OVERVIEW FOR REMAINING FUEL LOAD ACTIVITIES

FL-RLSUM.CHT

TVA/NRC MANAGEMENT MEETING
JANUARY 9, 1989

ADDITIONAL TVA INITIATIVES

SHORT-TERM TECH SPEC ASSESSMENT
BY G. CAMPBELL & T. OVERLID

PLANNED TECH SPEC ASSESSMENT
BY N. KAZANAS

ADMINISTRATIVE TECH SPECS.
BY P. CARIER

EXPERIENCE REVIEW
BY C. H. FOX

VENDOR INTERFACE
BY C. C. MASON

FL-LL.CHT

SHORT TERM TECH SPEC ASSESSMENT

SCOPE

- CORE ALTERATIONS
- OTHER TECH SPEC REQUIRED TO SUPPORT FUEL LOAD UP TO HEAD TENSIONING

FL-ST.CHT

TECHNICAL SPECIFICATIONS
ASSESSMENT TEAM MEMBERS

NAME	ORGANIZATION	SRO LICENSE/ CERTIFICATION	YEARS NUCLEAR EXPERIENCE
TERRY OVERLID	NMRG	SRO	17
JOE CARIGNAN	NMRG	SRO CERT.	13
LARRY NEWMAN	NMRG	SRO	14 14
MIKE FECHT	NUCLEAR PROCEDURES	SRO	16
STEVE BLAKE	QUALITY ASSURANCE	SRO CERT.	15
J. D. WOLCOTT	NUCLEAR ENGINEERING	SRO CERT.	12
GLENN PRATT	GE OPS ENGINEER	SRO CERT.	10
ALLEN BRUCH	NUCLEAR FUELS		12
MICHAEL GARRETT	NUCLEAR FUELS		11

NUCLEAR MANAGERS REVIEW GROUP

FL-TEAM.CHT

TECH SPEC ASSESSMENT
METHODOLOGY

ASSESSMENT TEAM REVIEWED U2 TECH SPEC APPLICABLE OR POTENTIALLY APPLICABLE TO REFUEL/SHUTDOWN

↓

REVIEWED TECH SPECS AGAINST SPOC LIST BASES, SERS, SILS, BFN TECH SPEC INTERPRETATION MANUAL AND THE BWR 4 STANDARD TECH SPEC FOR CONSISTENCY AND GOOD OPERATING PRACTICES

↓

RESULTS OF ASSESSMENT:

1. NO SIGNIFICANT SAFETY CONCERNS
2. ITEMS REQUIRING CLARIFICATION THROUGH ADMINISTRATIVE CONTROLS
3. FURTHER EVALUATIONS FOR POTENTIAL ENHANCEMENTS

FL-METH.CHT

CLARIFY BY FURTHER ADMINISTRATIVE CONTROLS

- OPERABLE SRM IN THE QUADRANT WHERE CORE ALTERATIONS ARE BEING MADE (3.10.B.1)
- CORE ALTERATIONS SUSPENSION IF RHR AND CORE SPRAY INOPERABLE (3.5.A & 3.5.B)
- REACTOR BUILDING ISOLATION FUNCTIONS TO BE OPERABLE WHEN SECONDARY CONTAINMENT INTEGRITY IS REQUIRED (3.2.A)
- EECW PUMPS NECESSARY WHILE REFUELING (3.5.C.1)
- FUEL LOADING ENHANCEMENTS WILL BE ADMINISTRATIVELY CONTROLLED AND OPERATIONS PERSONS TRAINED
- SCHEDULE TO COMPLETE - JANUARY 10, 1989

PLANNED TECH SPEC ASSESSMENT PROGRAM

PURPOSE: COMPLIANCE WITH PLANT HARDWARE, DESIGN BASIS, AND NRC SAFETY EVALUATIONS

- INDEPENDENT TEAM
- ADMINISTRATIVE PROCESS
- TECH SPEC VS SAFETY ANALYSIS REPORT (SAR)
- TECH SPEC VS HARDWARE
- SETPOINTS / CALCULATIONS
- TECH SPEC INTERPRETATION
- SCHEDULE

FL-TSASM.CHT

ADMINISTRATIVE TECH SPECS

- PLANT PROCEDURES REVISED TO DELINEATE COMPOSITION AND SPECIFY QUORUM REQUIREMENTS

- REVIEW PORC PROCEDURE REVIEW LIST AND DETERMINE NEED FOR REVISION

COMPLETE BY JANUARY 24, 1989

- SUBMIT STANDARDIZED BFN AND SQN SECTION 6 IN NEAR FUTURE

IMPLEMENT PRIOR TO RESTART AT BFN

FL-SEC6.CHT

EXPERIENCE REVIEW

FOLLOW-UP ACTIONS

- PERFORM CRITICAL INDEPENDENT REVIEW OF EXISTING NER PROCESS
  - PROGRAM SCOPE SURVEY VENDORS AND OTHER UTILITY PROGRAMS
  - RESPONSIBILITY AND ACCOUNTABILITY OF NUCLEAR POWER ORGANIZATION
  - SCREENING CRITERIA
  - DISTRIBUTION OF INFORMATION
  - ORGANIZATION
    - o STRUCTURE
    - o QUALIFICATIONS OF REVIEWERS
    - o TRAINING

- ESTABLISH ACTION PLAN TO IMPLEMENT RECOMMENDATIONS

- ESTABLISH NECESSARY PROGRAMMATIC CHANGES AND MONITOR EFFECTIVENESS

EXPERIENCE REVIEW

NUCLEAR EXPERIENCE REVIEW NEEDS STRENGTHENING

IMMEDIATE ACTIONS

- ASSIGN PROJECT MANAGER FOR EACH SIGNIFICANT EXPERIENCE REVIEW
- REQUIRE ACTION PLAN FOR SIGNIFICANT ISSUES
- IMPOSE SCHEDULE FOR INITIATION OF ACTION PLAN
- ESTABLISH A SINGLE POINT OF CONTACT AT SITES AND ENGINEERING
- PREPARE GUIDANCE FOR PROMPT NOTIFICATION TO SENIOR MANAGEMENT

GE/SITE INTERFACE
EXISTING

- SITE SERVICES MANAGER
  INTERFACES - PLANT MANAGER LEVEL

- OPERATIONS ENGINEER
  INTERFACES AT TECHNICAL SERVICES MANAGER LEVEL
  VOTING MEMBER OF JTG

- NUCLEAR SERVICES MANAGER
  INTERFACES AT CORPORATE LEVEL AND SITE

- REFUELING FLOOR SUPPORT
  7 GE ENGINEERS

- OPERATIONS AND MODIFICATIONS
  HARRY HENDON - TECHNICAL CONSULTING

- RESTART ENGINEER/POWER ASCENSION ENGINEERS
  5 GE ENGINEERS

- VENDOR MANUAL PROJECT
  SITE AND SAN JOSE ENGINEERS

- ECN CLOSEOUT AND SYSTEM OPERABILITY
  ECKERT AND 5 GE ENGINEERS

FL-GE7.CHT

GE-SITE INTERFACE
ENHANCEMENTS

SHORT-TERM

- SITE SERVICES MANAGER AT PLANT MANAGER'S STAFF MEETING
- INFORMATION - TRANSMITTALS AND FOLLOWUP
- PERIODIC (WEEKLY) SITE DIRECTOR/SOUTHERN TERRITORY MANAGER MEETING
- ESTABLISH CORPORATE/GE INTERFACE (KINGSLEY STAFF)
- PEOPLE ADDITIONS THROUGH FUEL LOAD/POWER ASCENSION
  - TECH SPEC REVIEW
  - ENGINEERING/FUEL ENGI NEER
  - OPERATIONAL SHIFT TECHNICAL ADVISOR
  - SYSTEM ENGINEER
  - STARTUP ASSISTANT
- OVERSIGHT REVIEW TEAM
  - GE MANAGEMENT, SITE MANAGEMENT, CORPORATE MANAGEMENT

GE-SITE INTERFACE
ENHANCEMENTS

LONG-TERM

- BROWNS FERRY ORGANIZATIONAL/PROCESS ASSESSMENT
- STARTUP READINESS REVIEW
- ENGINEERING EVALUATION OF VENDOR INTERFACE

FL-GE4.CHT

TVA/NRC MANAGEMENT MEETING
JANUARY 9, 1989

SUMMARY REMARKS
BY O. D. KINGSLEY, JR

FL-SUM1.CHT