December 16, 1983

Docket No. 50-259

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Mr. Hugh G. Parris
Manager of Power
Tennessee Valley Authority
500A Chestnut Street, Tower II
Chattanooga, Tennessee 37401

Dear Mr. Parris:

The Commission has issued the enclosed Amendment No. 93 to Facility Operating License No. DPR-33 for the Browns Ferry Nuclear Plant, Unit 1. This amendment changes the Technical Specifications in partial response to your application of July 13, 1983 (TVA BFNP TS 190), as supplemented by your submittals of October 20, 1983 and November 17, 1983.

The amendment revises the Technical Specifications to reflect the modification which added analog transmitter trip units in place of the mechanical-type switches originally used in the reactor protection system (RPS). A copy of the Safety Evaluation is enclosed.

This amendment does not include changes to the Technical Specifications associated with the core reload and other plant modifications which were also included in your July 13, 1983 submittal; these will be addressed in separate amendments.

Sincerely,

Original signed by/

Richard J. Clark, Project Manager
Operating Reactors Branch #2
Division of Licensing

Enclosures:
1. Amendment No. 93 to License No. DPR-33
2. Safety Evaluation

cc w/enclosures:
See next page

*Please see previous concurrence page.

DL:ORB#2	DL:ORB#2	DL:ORB#2	OELD	DL:AD-OR
SNorris:ajs*	RClark*	DVassallo*	RRawson*	GLainas
12/05/83	12/05/83 12/15/83	12/05/83 12-15-83	12/09/83	12/15/83

Mr. Hugh G. Parris
Tennessee Valley Authority
Browns Ferry Nuclear Plant, Units 1, 2 and 3

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

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-259

BROWNS FERRY NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 93
License No. DPR-33

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

   A. The application for amendment by Tennessee Valley Authority (the licensee) dated July 13, 1983, as supplemented by letters dated October 20, 1983 and November 17, 1983, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations 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; and

   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.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C(2) of Facility License No. DPR-33 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical specifications contained in Appendices A and B, as revised through Amendment No. 93, 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

Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: December 16, 1983

ATTACHMENT TO LICENSE AMENDMENT NO. 93

FACILITY OPERATING LICENSE NO. DPR-33

DOCKET NO. 50-259

Revise Appendix A as follows:

1. Remove the following pages and replace with identically numbered pages:

38

39

41

85

2. The marginal lines on the above pages indicate the revised area.

3. Add the following new page:

110a

TABLE 4.1.A (Continued)

	Group (2)	Functional Test	Minimum Frequency (3)
Main Steam Line Isolation Valve Closure	A	Trip Channel and Alarm	Once/Month (1)
Turbine Control Valve Fast Closure or turbine trip	A	Trip Channel and Alarm	Once/Month (1)
Turbine First Stage Pressure Permissive (PT-1-81A and B, PT-1-91A and B)	B	Trip Channel and Alarm (7)	Every 3 Months
Turbine Stop Valve Closure	A	Trip Channel and Alarm	Once/Month (1)

NOTES FOR TABLE 4.1.A

1. Initially the minimum frequency for the indicated tests shall be once per month.

2. A description of the three groups is included in the Bases of this specification.

3. Functional tests are not required when the systems are not required to be operable or are operating (i.e., already tripped). If tests are missed, they shall be performed prior to returning the systems to an operable status.

4. This instrumentation is exempted from the instrument channel test definition. This instrument channel functional test will consist of injecting a simulated electrical signal into the measurement channels.

5. The water level in the reactor vessel will be perturbed and the corresponding level indicator changes will be monitored. This perturbation test will be performed every month after completion of the monthly functional test program.

6. The functional test of the flow bias network is performed in accordance with Table 4.2.C.

7. Functional test consists of the injection of a simulated signal into the electronic trip circuitry in place of the sensor signal to verify operability of the trip end alarm functions.

NOTES FOR TABLE 4.1.B

1. A description of three groups is included in the bases of this specification.

2. Calibrations are not required when the systems are not required to be operable or are tripped. If calibrations are missed, they shall be performed prior to returning the system to an operable status.

3. The current source provides an instrument channel alignment. Calibration using a radiation source shall be made each refueling outage.

4. Required frequency is initial startup following each refueling outage.

5. Physical inspection and actuation of these position switches will be performed once per operating cycle.

6. On controlled startups, overlap between the IRM's and APRM's will be verified.

7. The Flow Bias Signal Calibration will consist of calibrating the sensors, flow converters, and signal offset networks during each operating cycle. The instrumentation is an analog type with redundant flow signals that can be compared. The flow comparator trip and upscale will be functionally tested according to Table 4.2.C to ensure the proper operating during the operating cycle. Refer to 4.1 Bases for further explanation of calibration frequency.

8. A complete tip system traverse calibrates the LPRM signals to the process computer. The individual LPRM meter readings will be adjusted as a minimum at the beginning of each operating cycle before reaching 100% power.

9. Calibration consists of the adjustment of the primary sensor and associated components so that they correspond within acceptable range and accuracy to known values of the parameter which the channel monitors, including adjustment of the electronic trip circuitry, so that its output relay changes state at or more conservatively than the analog equivalent of the trip level setting.

TABLE 4.2.A

SURVEILLANCE REQUIREMENTS FOR PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Function	Functional Test	Calibration Frequency	Instrument Check
Instrument Channel - Reactor Low Water Level (LIS-3-203A-D, SW 2-3)	(1)	(5)	once/day
Instrument Channel - Reactor High Pressure	(1)	once/3 months	none
Instrument Channel - Reactor Low Water Level (LIS-3-56A-D, SW #1)	(1)	once/3 month	once/day
Instrument Channel - High Drywell Pressure (PS-64-56A-D)	(1)	(5)	N/A
Instrument Channel - High Radiation Main Steam Line Tunnel	(1)	(5)	once/day
Instrument Channel - Low Pressure Main Steam Line (PT-1-72,-76,-82,-86)	(1) (27)	Once/operating cycle (28)	none
Instrument Channel - High Flow Main Steam Line (dPT-1-13A-D,-25A-D,-36A-D,-50A-D)	(1) (27)	Once/operating cycle (28)	once/day
Instrument Channel - Main Steam Line Tunnel High Temperature	(1)	once/operating cycle	none
Instrument Channel - Reactor Building Ventilation High Radiation - Reactor Zone	(1) (18) (22)	once/3 months	once/day (8)

NOTES FOR TABLES 4.2.A THROUGH 4.2.H (Continued)

27. Functional test consists of the injection of a simulated signal into the electronic trip circuitry in place of the sensor signal to verify operability of the trip and alarm functions.

28. Calibration consists of the adjustment of the primary sensor and associated components so that they correspond within acceptable range and accuracy to known values of the parameter which the channel monitors, including adjustment of the electronic trip circuitry, so that its output relay changes state at or more conservatively than the analog equivalent of the trip level setting.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 93 TO FACILITY LICENSE NO. DPR-33

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-259

1.0 Introduction

By letter dated July 13, 1983 (TVA BFNP TS 190), as supplemented by letters dated October 20, 1983 and November 17, 1983, the Tennessee Valley Authority (the licensee or TVA) requested changes to the Technical Specifications (Appendix A) appended to Facility Operating License No. DPR-33 for the Browns Ferry Nuclear Plant, Unit 1. The proposed amendment and revised Technical Specifications would (1) incorporate the limiting conditions for operation of the facility in the sixth fuel cycle following the fifth refueling of the reactor and (2) reflect modifications performed during the outage. This amendment addresses the changes to the Technical Specifications associated with the modification which added analog transmitter trip units (ATTU) in place of the mechanical-type switches originally used in the reactor protection system (RPS). The core reload and the various modifications completed during the current refueling outage are addressed in separate amendments.

2.0 Discussion

The licensee, in its submittals as listed under reference of this report, has proposed certain modifications to the reactor protection system. These modifications, originally developed by the General Electric Company (GE) for boiling water reactors (BWR) involve installing a new design for safety systems instrumentation in the RPS (i.e., reactor trip system, RTS and engineered safety features, ESF). The new design, referred to as the analog transmitter trip unit system (ATTUS), is being supplied as original equipment in later built BWRs (e.g., BWR 6) and the design is adaptable to operating BWRs as a design-improvement modification. The ATTUS is a replacement for mechanical sensor switches at the parameter sensor level and does not involve the logic levels of the RTS or ESF. GE developed ATTUS to offset operating disadvantages of the direct pressure and differential pressure actuated switches of the original safety system instrumentation.

The new ATTUS is comprised of an analog transmitter and trip unit/calibration system (Model 710DU). GE provided the design and evaluation of ATTUS to the NRC staff in topical reports NEDO-21617, "Analog Transmitter/Trip Unit System for Engineered Safeguard Sensor Trip Inputs," dated April 1977 and in Revision 1 to this document (NEDO-21617-1) dated

January 1978. The staff has reviewed previously the use of this type of equipment and found that, provided certain interface requirements were satisfied, this equipment is acceptable. Our letter of approval, dated June 27, 1978, is a part of General Electric Topical Report NEDO-21617-A dated December 1978.

TVA's letter of October 20, 1983 stated that the instrumentation which is installed and will be installed as part of the analog trip system at Browns Ferry is the same or better than the instrumentation which is described in NEDO-21617. TVA also provided information which "demonstrates applicability of this topical report to the system proposed for Browns Ferry." As discussed above, the staff in its approval of ATTUS noted that for those licensees who are modifying the safety system instrumentation, certain plant specific information must be provided to insure that necessary interface requirements are satisfied and that the topical report is applicable. The particular information required of the licensee is the environmental qualification and the divisional separation of the hardware installed for the plant modification.

3.0 Description and Evaluation

The ATTUS, as stated above, is a replacement for the mechanical-type sensor switches at the sensor level and not the logic level. The ATTUS and the trip relays provide the input intelligence for the plant process parameters to the system logics for the reactor trip system, the primary containment isolation system (PCIS) and the core standby cooling system (CSCS). The proposed instrument modifications are intended to:

1) reduce primary sensor element drift;

2) reduce the frequency of setpoint drift occurrences;

3) provide indication for each primary sensor which will verify operability of the sensor;

4) reduce the time RTS logic must be in half scram condition to functionally test or calibrate a safety trip;

5) reduce the functional test and calibration frequency for the primary sensor and facilitate calibration of the primary sensor when the reactor is shutdown for refueling;

6) reduce the likelihood of instrument valving errors; and

7) reduce the potential for instrument testing related scrams.

Since the dual channel design (with two trip systems) of the RTS is not being altered, the safe and reliable operation of the trip system is not compromised. The automatic and manual initiation and protective action of essential systems remain unchanged. The parameter sensors being replaced with ATTUS along with the safety systems they actuate are listed below:

PARAMETER	SYSTEM INVOLVED	EQUIPMENT INSTALLED TRANSMITTER	EQUIPMENT INSTALLED TRIP UNIT
1. Reactor low water level	RTS	Rosemount 1153	Rosemount 710DU
2. Reactor high pressure	RTS	1153	710DU
3. Reactor low low water level	PCI, Recirc. pump trip	1153	710DU
4. Main steam line low pressure	PCI	1153	710DU
5. Main steam line high flow	PCI	1153	710DU
6. Primary containment high pressure	RTS, PCI	1153	710DU
7. Turbine first stage pressure permissive	RTS, Recirc. pump trip	1153	710DU
8. Reactor high pressure	Recirc. pump trip	1153	710DU

The trip units are located in four cabinets in the auxiliary instrument room (AIR). These trip units are divided into four channels, A1 and A2 and B1 and B2. Any combination of sensor inputs that meets the expression (A1 + A2) X (B1 + B2) will initiate RPS protective action. All of the logic combinations are accomplished at the system level and are not modified by the installation of the transmitter trip units. Each channel of trip units is housed in its own panel in the AIR (panels 9-83, 9-84, 9-85, and 9-86). The licensee stated that since each channel is located in its own cabinet, and the external wiring is separated, the separation of the RPS channels are maintained and the requirements of General Design Criteria (GDC) 21, 22, 24 and Regulatory Guide 1.75, entitled "Physical Independence of Electric Systems," (as it applies to Browns Ferry) are met.

With respect to the degree to which the new instrumentation meets Regulatory Guide 1.75, the staff recognized that it is not possible for the licensee to make all retrofit modifications meet the requirements of present regulatory guides that are not applicable to their plant designs. However, the staff has concluded that when a retrofit modification can be completed and present regulatory requirements are met, a significant improvement in safety margin can be obtained. The licensee stated that the wiring for the ATTUS conforms to the requirements of Regulatory Guide 1.75, except for the internal panel wiring of the annunciator circuitry. The design of the equipment mounted in the cabinets prevents maintaining complete physical separation between the annunciator wiring and the class 1E wiring. This does not pose a problem because the annunciator circuitry is a low energy circuit. The annunciators interrogate contacts in the ATTUS with a 140-v dc signal that is currently limited to a maximum of 1 mA by the annunciator input resistance. Thus, except for this one area - which is not significant - the design conforms to Regulatory Guide 1.75 and Sections 4.6 and 4.22 of IEEE-279, Identification of Divisionalized Equipment.

The separation criteria of the original plant is unchanged. Separation is provided by locating equipment on separate racks and panels and by running cable in separated cable tray or conduit. The power supply used for an instrument channel is dependent on that channel's divisional assignment. Each panel of transmitter trip units provides trip signals to only one channel of the RPS. Based on the above, we concluded that the separation criteria is met and, in this area, satisfies the constraints of our prior approval (of the GE topical report) and is therefore acceptable.

With respect to single failure criterion, no new single failure events have been created; therefore, no single failure will result in any action not previously evaluated in the Final Safety Analysis Report (FSAR). The licensee stated that there are no new single failures relating to power loss for the RPS. The consequence of the loss of the MG-set power source is the same as it was before the transmitter trip unit installation, and the loss of a single trip unit cabinet power supply does not disable the trip units because it is backed with a redundant power supply. Based on the above, the design meets the single failure criterion and is therefore acceptable in this regard.

The staff was concerned that an undervoltage condition could exist that would incapacitate the trip functions of all the effected ATTUS. The Rosemount instruction manual (447-1 Revision A) contains a warning regarding operating at a low ATTU power supply voltage because if certain conditions exist (e.g., lead length, wire diameter, temperature), a lower supply voltage at the transmitter may cause it to operate improperly and a desired trip may not occur. To alleviate this concern, we requested that the licensee provide design details regarding protection against undervoltage conditions (e.g., electrical protection assemblies).

In our letter of October 31, 1983, the staff requested clarifying information and drawings to assure that the units were adequately shielded against electromagnetic interferences, that the power supply design protected against possible failure modes (e.g., open circuits, hot shorts, loss of a fuse, etc.), that the length of cable runs did not exceed design criteria and that there was adequate separation of cables in the cabinets. The staff also requested more discussion on the licensee's set point methodology. The requested clarifying information and drawings were provided by TVA's letter of November 17, 1983. The supplemental information verified details regarding the design of the analog trip units and did not in any way change or modify the design that was described in the staff's initial notice in the Federal Register (48 FR 49947).

The licensee stated that protection of the Class 1E RPS buses against possible sustained over/under voltage or underfrequency conditions from the non-Class 1E power sources is provided by redundant Class 1E electrical protection assemblies (EPA) that are installed between each RPS bus and each power source. Each EPA consists of a circuit breaker with a trip coil driven by logic circuitry that senses line voltage and frequency and trip the circuit breaker open on conditions of overvoltage, undervoltage or underfrequency. The licensee further stated that the EPA trip setpoints (overvoltage, undervoltage and underfrequency) have been selected so as not to exceed the operating capabilities of the ATTUS. Based on the supplemental information provided by TVA and the submittals of October 20, 1983 and November 17, 1983, the licensee has designed the system to insure that the minimum power supply voltage is well above the 13.5 volts necessary at the transmitter terminals to operate properly. We conclude that the power supply design is acceptable.

The operability of the trip unit and auxiliary relays is verified by periodic functional testing using special test equipment supplied as part of the analog trip system.

Operability of the transmitters is verified by periodic comparison of the redundant indicators on the master trip units which monitor the same parameter. Gross transmitter failure is detected by special monitoring circuits in the analog trip units and is annuciated in the main control room. Main control room annunciation is provided to indicate when a trip unit is out of service or is being functionally checked.

While in the test mode, the trip units alarm in the MCR on panel 9-5 when they are bypassed. They also alarm on the following conditions:

a) trip unit in test;

b) input signal to trip unit and out-of-range (gross failure);

c) trip out-of-file (card out); and

d) one of two power supplies failed.

There are no direct connections between safety-related and nonsafety-related circuits in the ATTUS installed at Browns Ferry Unit 1; therefore isolation devices are not necessary. Isolation between 1E power and non-1E power is provided by mechanical interface relays mounted on the analog trip channel cabinets. This interface occurs only between the plant annunciator system and the analog trip circuits for gross failure and card-out alarms. Specifically, the annunciator interface relays have Class 1E power at the relay coils supplied by the analog trip unit power supplies, but non-Class 1E power is supplied to the relay contacts from the annunciator system power supplies. The staff found this acceptable.

The staff has reviewed the acceptability of the proposed technical specifications revision which address the addition of ATTUS and has concluded that the proposed techncial specification revisions permit the operation of the facility in a manner that is consistent with the licensing basis and accident analysis and therefore, the proposed technical specification revisions on pages 37, 38, 39, 40, 41, 85 and 86 of Tables 4.1.A, 4.1.B and 4.2.B of the Browns Ferry Technical Specifications which accompanied the licensee's submittal are acceptable.

4.0 Summary

The staff has previously reviewed the use of this type of equipment and found that, provided certain interface requirements were satisfied, this equipment is acceptable (letter of approval, dated June 27, 1978, is a part of General Electric Topical Report NEDO-21617-A dated December 1978). Based upon our review of the documentation submitted by the licensee, we conclude that the modifications proposed satisfy the constraints of our prior approval, and, also satisfy the requirements of the applicable General Design Criteria and Regulatory Guides. In addition, based on the data submitted, we conclude that:

1. The reliability, accuracy, and response time of the replacement instrumentation are better than that of the existing instrumentation.

2. Separation Criteria - the separation criteria of the original plant is unchanged. The separation criteria used for the ATTUS modification meets the licensee's interpretation of Regulatory Guide 1.75. Separation is provided by locating equipment on separate racks and panels and by running cable in separated cable tray or conduit. The power supply used for an instrument channel is dependent on that channel's divisional assignment.

3. Single Failure Criterion - no new single failure events have been created, therefore, no single failure will result in any action not previously evaluated in the FSAR.

4. Qualification - all new equipment has been tested or analyzed to assure that the design environmental conditions and the design basis seismic requirements are met.

5. Testability - means are provided to test the trip units periodically by injecting a signal and observing the trip output. Operability of the analog loop is verified by periodic instrument checks.

6. Technical Specifications - proposed revisions permit the operation of the facility in a manner that is consistent with the licensing basis and accident analysis.

Therefore, we conclude that the modifications of the RPS as discussed above are acceptable. It is further concluded that the applicable Technical Specification pages identified above are acceptable.

5.0 Environmental Considerations

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact, and pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement, or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

6.0 Conclusion

We have 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 to the health and safety of the public.

Principal Reviewers: J. Mauck and M. Virgilio

Dated: December 16, 1983

References

1. Letter dated July 13, 1983 from L. M. Mills to Harold R. Denton.

2. Letter dated October 20, 1983 from L. M. Mills to Harold R. Denton.

3. Letter dated November 17, 1983 from L. M. Mills to Harold R. Denton.