



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

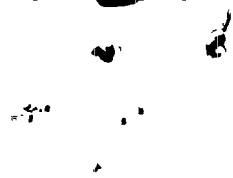
Amendment No. 195
License No. DPR-33

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

- A. The application for amendment by Tennessee Valley Authority (the licensee) dated July 23, 1992, as supplemented March 16 and April 6, 1993, 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.

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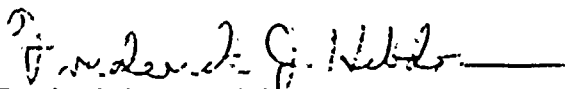
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-33 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 195, 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 its date of issuance and shall be implemented within 30 days from the date of issuance.

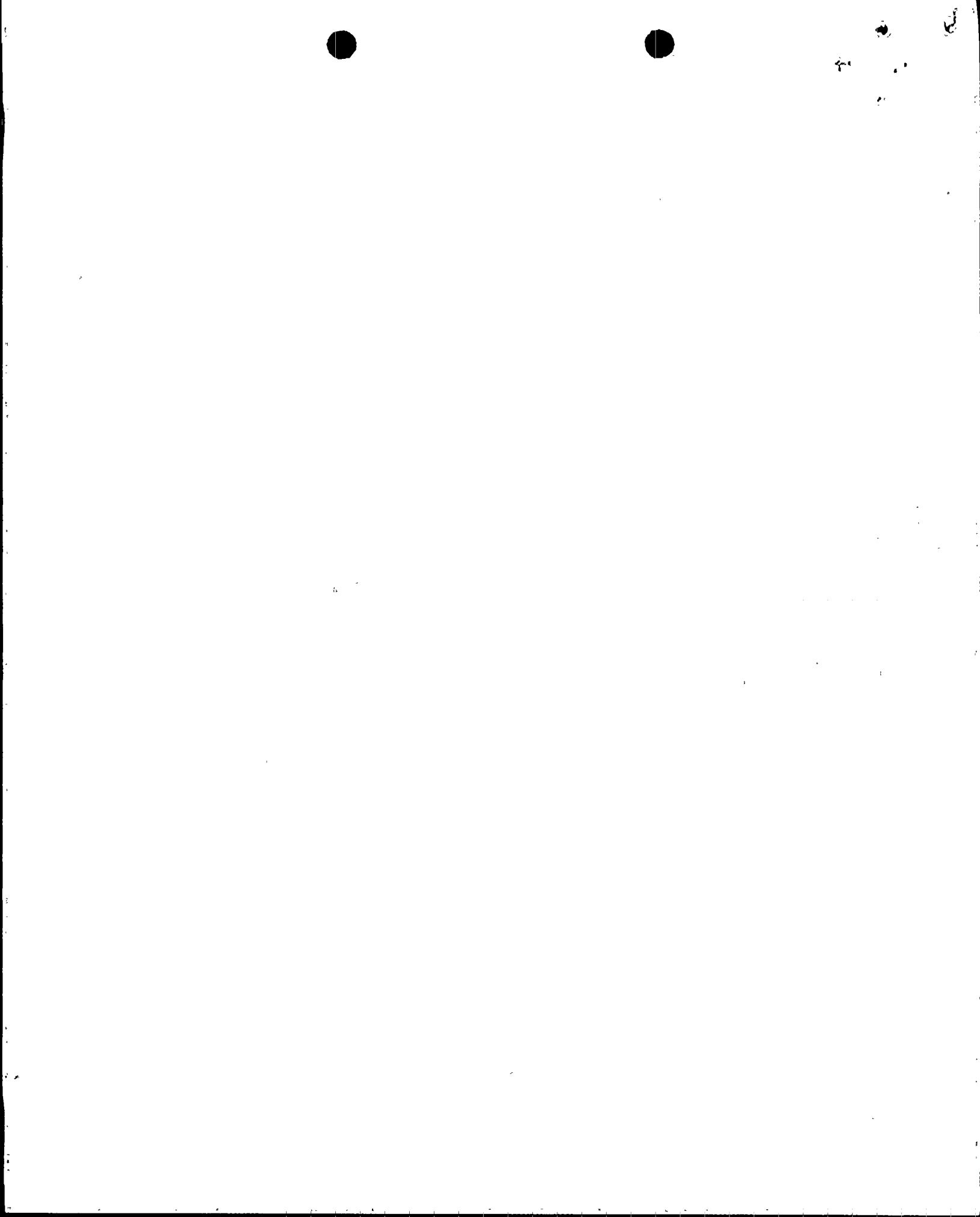
FOR THE NUCLEAR REGULATORY COMMISSION



Frederick J. Hebden, Director
Project Directorate II-4
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 13, 1993



ATTACHMENT TO LICENSE AMENDMENT NO. 195

FACILITY OPERATING LICENSE NO. DPR-33

DOCKET NO. 50-259

Revise the Appendix A Technical Specifications by removing the pages identified below and inserting the enclosed pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change. Overleaf* and spillover** pages are provided to maintain document completeness.

REMOVE

1.0-9
1.0-10
3.2/4.2-7
3.2/4.2-8
3.2/4.2-9
3.2/4.2-10
3.2/4.2-12
3.2/4.2-13
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3.2/4.2-40
3.2/4.2-41
3.2/4.2-59
3.2/4.2-60
3.2/4.2-61
3.2/4.2-61a
3.2/4.2-67
3.2/4.2-68
3.2/4.2-69
3.2/4.2-70
3.2/4.2-73
3.2/4.2-73a

INSERT

1.0-9
1.0-10*
3.2/4.2-7*
3.2/4.2-8
3.2/4.2-9
3.2/4.2-10*
3.2/4.2-12*
3.2/4.2-13
3.2/4.2-13a
3.2/4.2-13b
3.2/4.2-40*
3.2/4.2-41
3.2/4.2-59*
3.2/4.2-60
3.2/4.2-61
3.2/4.2-61a*
3.2/4.2-67*
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3.2/4.2-70*
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3.2/4.2-73a*



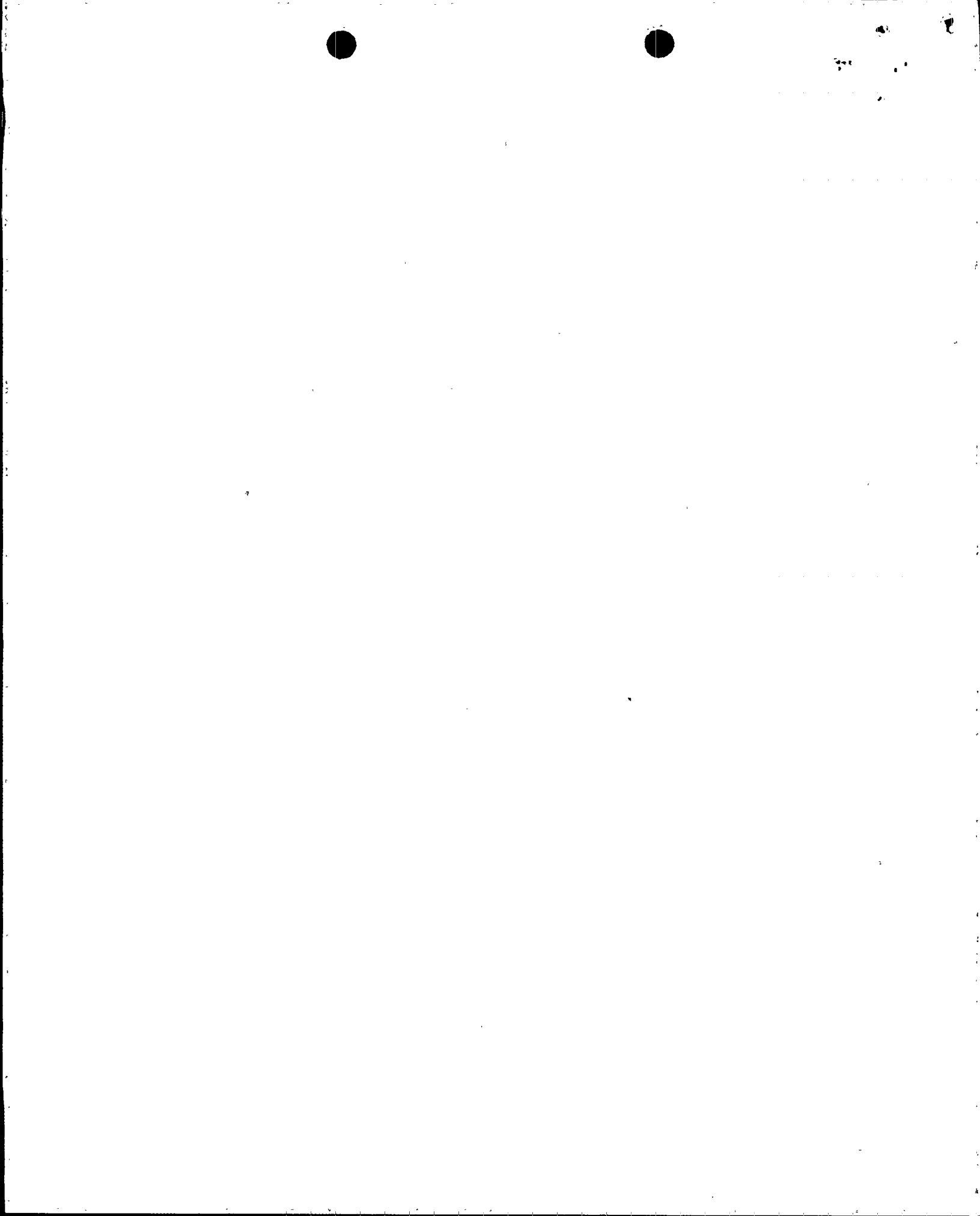
1.0 DEFINITIONS (Cont'd)

10. Logic - A logic is an arrangement of relays, contacts, and other components that produces a decision output.
 - (a) Initiating - A logic that receives signals from channels and produces decision outputs to the actuation logic.
 - (b) Actuation - A logic that receives signals (either from initiation logic or channels) and produces decision outputs to accomplish a protective action.

11. Channel Calibration - Shall be the adjustment, as necessary, of the channel output such that it responds with necessary range and accuracy to known values of the parameters which the channel monitors. The channel calibration shall encompass the entire channel including alarm and/or trip functions and shall include the channel functional test. The channel calibration may be performed by any series of sequential, overlapping or total channel steps such that the entire channel is calibrated. Non-calibratable components shall be excluded from this requirement, but will be included in channel functional test and source check.

12. Channel Functional Test - Shall be:
 - a. Analog/Digital Channels - the injection of a simulated signal into the channel as close to the sensor as practicable to verify OPERABILITY including alarm and/or trip functions.
 - b. Bistable Channels - the injection of a simulated signal into the sensor to verify OPERABILITY including alarm and/or trip functions.

13. Source Check - Shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source or multiple of sources.



1.0 DEFINITIONS (Cont'd)

- W. Functional Tests - A functional test is the manual operation or initiation of a system, subsystem, or components to verify that it functions within design tolerances (e.g., the manual start of a core spray pump to verify that it runs and that it pumps the required volume of water).
- X. Shutdown - The reactor is in a shutdown condition when the reactor mode switch is in the shutdown mode position and no core alterations are being performed.
- Y. Engineered Safeguard - An engineered safeguard is a safety system the actions of which are essential to a safety action required in response to accidents.
- Z. Reportable Event - A reportable event shall be any of those conditions specified in Section 50.73 to 10 CFR Part 50.
- AA. Solidification - Shall be the conversion of radioactive wastes into a form that meets shipping and burial ground requirements.
- BB. Offsite Dose Calculation Manual (ODCM) - Shall be a manual describing the environmental monitoring program and the methodology and parameters used in the calculation of release rate limits and offsite doses due to radioactive gaseous and liquid effluents. The ODCM will also provide the plant with guidance for establishing alarm/trip setpoints to ensure technical specifications sections 3.8.A.1 and 3.8.B.1 are not exceeded.
- CC. Purge or purging - The controlled process of discharging air or gas from the primary containment to maintain temperature, pressure, humidity, concentration, or other operating condition in such a manner that replacement air or gas is required to purify the containment.
- DD. Process Control Program - Shall contain the sampling, analysis, and formulation determination by which SOLIDIFICATION of radioactive wastes from liquid systems is assured.
- EE. Radiological Effluent Manual (REM) - Shall be a manual containing the site and environmental sampling and analysis programs for measurements of radiation and radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposure to individuals from station operation. It shall also specify operating guidelines for radioactive waste treatment systems and report content.
- FF. Venting - The controlled process of discharging air or gas from the primary containment to maintain temperature, pressure, humidity, concentration, or other operating condition in such a manner that replacement air or gas is not provided or required. Vent, used in system names, does not imply a venting process.



TABLE 3.2.A
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No. Instrument Channels Operable Per Trip Sys(1)(11)	Function	Trip Level Setting	Action (1)	Remarks
2	Instrument Channel - Reactor Low Water Level(6)	$\geq 538''$ above vessel zero	A or (B and E)	<ol style="list-style-type: none"> 1. Below trip setting does the following: <ol style="list-style-type: none"> a. Initiates Reactor Building Isolation b. Initiates Primary Containment Isolation (Groups 2, 3, and 6) c. Initiates SGTS
1	Instrument Channel - Reactor High Pressure (PS-68-93 and 94)	100 ± 15 psig	D	<ol style="list-style-type: none"> 1. Above trip setting isolates the shutdown cooling suction valves of the RHR system.
2	Instrument Channel - Reactor Low Water Level (LIS-3-56A-D, SW #1)	$\geq 378''$ above vessel zero	A	<ol style="list-style-type: none"> 1. Below trip setting initiates Main Steam Line Isolation
2	Instrument Channel - High Drywell Pressure (6) (PS-64-56A-D)	≤ 2.5 psig	A or (B and E)	<ol style="list-style-type: none"> 1. Above trip setting does the following: <ol style="list-style-type: none"> a. Initiates Reactor Building Isolation b. Initiates Primary Containment Isolation c. Initiates SGTS

3.2/4.2-7

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TABLE 3.2.A (Continued)
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No. Instrument Channels Operable Per Trip Sys(1)(11)	Function	Trip Level Setting	Action (1)	Remarks
2	Instrument Channel - High Radiation Main Steam Line Tunnel (6)	3 times normal rated full power background (13)	B	1. Above trip setting initiates Main Steam Line Isolation
2	Instrument Channel - Low Pressure Main Steam Line	\geq 825 psig (4)	B	1. Below trip setting initiates Main Steam Line Isolation
2(3)	Instrument Channel - High Flow Main Steam Line	\leq 140% of rated steam flow	B	1. Above trip setting initiates Main Steam Line Isolation
2(12)	Instrument Channel - Main Steam Line Tunnel High Temperature	\leq 200°F	B	1. Above trip setting initiates Main Steam Line Isolation.
2(14)	Instrument Channel - Reactor Water Cleanup System Floor Drain High Temperature	160 - 180°F	C	1. Above trip setting initiates Isolation of Reactor Water Cleanup Line from Reactor and Reactor Water Return Line.
2	Instrument Channel - Reactor Water Cleanup System Space High Temperature	160 - 180°F	C	1. Same as above
1(15)	Instrument Channel - Reactor Building Ventilation High Radiation - Reactor Zone	\leq 100 mr/hr or downscale	G	1. 1 upscale channel or 2 downscale channels will a. Initiate SGTS b. Isolate reactor zone and refueling floor. c. Close atmosphere control system.

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3.2/4.2-8

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TABLE 3.2.A (Continued)
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No. Instrument Channels Operable per Trip Sys(1)(11)	Function	Trip Level Setting	Action (1)	Remarks
1(15)	Instrument Channel - Reactor Building Ventilation High Radiation - Refueling Zone	≤ 100 mr/hr or downscale	F	1. 1 upscale channel or 2 downscale channels will a. Initiate SGTS b. Isolate refueling floor c. Close atmosphere control system.
2(7) (8)	Instrument Channel SGTS Flow - Train A R. H. Heaters	≥ 2000 cfm and ≤ 4000 cfm	H and (A or F)	Below 2000 cfm airflow R.H. heaters shall be shut off.
2(7) (8)	Instrument Channel SGTS Flow - Train B R. H. Heaters	≥ 2000 cfm and ≤ 4000 cfm	H and (A or F)	Below 2000 cfm airflow R.H. heaters shall be shut off.
2(7) (8)	Instrument Channel SGTS Flow - Train C R. H. Heaters	≥ 2000 cfm and ≤ 4000 cfm	H and (A or F)	Below 2000 cfm airflow R.H. heaters shall be shut off.
1	Reactor Building Isolation Timer (refueling floor)	$0 \leq t \leq 2$ secs.	H or F	1. Below trip setting prevents spurious trips and system perturbations from initiating isolation.
1	Reactor Building Isolation Timer (reactor zone)	$0 \leq t \leq 2$ secs.	G or A or H	1. Below trip setting prevents spurious trips and system perturbations from initiating isolation.
2(10)	Group 1 (Initiating) Logic	N/A	A	1. Group 1: The valves in Group 1 are actuated by any of the following conditions: a. Reactor Vessel Low Low Water Level b. Main Steamline High Radiation c. Main Steamline High Flow d. Main Steamline Space High Temperature e. Main Steamline Low Pressure

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TABLE 3.2.A (Continued)
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No. Instrument Channels Operable per Trip Sys(1)(1)	Function	Trip Level Setting	Action (1)	Remarks
1	Group 1 (Actuation) Logic	N/A	B	1. Group 1: The valves in Group 1 are actuated by any of the following conditions: a. Reactor Vessel Low Low Water Level b. Main Steamline High Radiation c. Main Steamline High Flow d. Main Steamline Space High Temperature e. Main Steamline Low Pressure
2	Group 2 (Initiating) Logic	N/A	A or (B and E)	1. Group 2: The valves in Group 2 are actuated by any of the following conditions: a. Reactor Vessel Low Water Level b. High Drywell Pressure
1	Group 2 (RHR Isolation-Actuation) Logic	N/A	D	
1	Group 8 (TIP-Actuation) Logic	N/A	J	
1	Group 2 (Drywell Sump Drains-Actuation) Logic	N/A	K	
1	Group 2 (Reactor Building & Refueling Floor, and Drywell Vent and Purge-Actuation) Logic	N/A	F and G	1. Part of Group 6 Logic
2	Group 3 (Initiating) Logic	N/A	C	1. Group 3: The valves in Group 3 are actuated by any of the following conditions: a. Reactor Vessel Low Water Level b. Reactor Water Cleanup System High Temperature c. Reactor Water Cleanup System High Drain Temperature

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3.2/4.2-10

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6
8

NOTES FOR TABLE 3.2.A

1. Whenever the respective functions are required to be OPERABLE there shall be two OPERABLE or tripped trip systems for each function. If the first column cannot be met for one of the trip systems, that trip system or logic for that function shall be tripped (or the appropriate action listed below shall be taken). If the column cannot be met for all trip systems, the appropriate action listed below shall be taken.
 - A. Initiate an orderly shutdown and have the reactor in Cold Shutdown in 24 hours.
 - B. Initiate an orderly load reduction and have Main Steam Lines isolated within eight hours.
 - C. Isolate Reactor Water Cleanup System.
 - D. Administratively control the affected system isolation valves in the closed position within one hour and then declare the affected system inoperable.
 - E. Initiate primary containment isolation within 24 hours.
 - F. The handling of spent fuel will be prohibited and all operations over spent fuels and open reactor wells shall be prohibited.
 - G. Isolate the reactor building and start the standby gas treatment system.
 - H. Immediately perform a logic system functional test on the logic in the other trip systems and daily thereafter not to exceed 7 days.
 - I. Deleted
 - J. Withdraw TIP.
 - K. Manually isolate the affected lines. Refer to Section 4.2.E for the requirements of an inoperable system.
 - L. If one SGTS train is inoperable take actions H or A and F. If two SGTS trains are inoperable take actions A and F.
2. Deleted
3. There are four sensors per steam line of which at least one sensor per trip system must be OPERABLE.

NOTES FOR TABLE 3.2.A (Cont'd)

4. Only required in RUN MODE (interlocked with Mode Switch).
5. Deleted
6. Channel shared by RPS and Primary Containment & Reactor Vessel Isolation Control System. A channel failure may be a channel failure in each system.
7. A train is considered a trip system.
8. Two out of three SGTS trains required. A failure of more than one will require actions A and F.
9. Deleted
10. Deleted
11. A channel may be placed in an inoperable status for up to four hours for required surveillance without placing the trip system in the tripped condition provided at least one OPERABLE channel in the same trip system is monitoring that parameter. For the Reactor Building Ventilation system, one channel may be inoperable for up to 4 hours for functional testing or for up to 24 hours for calibration and maintenance, as long as the downscale trip of the inoperable channel is placed in the tripped condition.
12. A channel contains four sensors, all of which must be OPERABLE for the channel to be OPERABLE.

Power operations permitted for up to 30 days with 15 of the 16 temperature switches OPERABLE.

In the event that normal ventilation is unavailable in the main steam line tunnel, the high temperature channels may be bypassed for a period of not to exceed four hours. During periods when normal ventilation is not available, such as during the performance of secondary containment leak rate tests, the control room indicators of the affected space temperatures shall be monitored for indications of small steam leaks. In the event of rapid increases in temperature (indicative of steam line break), the operator shall promptly close the main steam line isolation valves.

13. The nominal setpoints for alarm and reactor trip (1.5 and 3.0 times background, respectively) are established based on the normal background at full power. The allowable setpoints for alarm and reactor trip are 1.2-1.8 and 2.4-3.6 times background, respectively.

NOTES FOR TABLE 3.2.A (Cont'd)

14. Requires two independent channels from each physical location; there are two locations.
15. There is a RBVRM trip function for the refueling zone and a RBVRM trip function for the reactor zone. Each trip function is composed of two divisional trip systems. Each trip system has one channel for each zone. Each channel contains two sensors, both of which must be OPERABLE for the channel to be OPERABLE. A channel downscale/inoperable trip occurs when either of the sensors are indicating less than the low radiation setpoint or are inoperable. A channel upscale trip occurs when both of the sensors are indicating higher than the high radiation setpoint. Only one channel upscale trip is required for trip function initiation. Two channel downscale trips in a zone are required for trip function initiation.

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TABLE 4.2.A
SURVEILLANCE REQUIREMENTS FOR PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

<u>Function</u>	<u>Functional Test</u>	<u>Calibration Frequency</u>	<u>Instrument Check</u>
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	once/3 months (29)	(5)	once/day
Instrument Channel - Low Pressure Main Steam Line (PT-1-72, -76, -82, -86)	once/3 months (27) (29)	once/operating cycle (28)	None
Instrument Channel - High Flow Main Steam Line (dPT-1-13A-D, -25A-D, -36A-D, -50A-D)	once/3 months (27) (29)	once/operating cycle (28)	once/day

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TABLE 4.2.A (Cont'd)
 SURVEILLANCE REQUIREMENTS FOR PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

<u>Function</u>	<u>Functional Test</u>	<u>Calibration Frequency</u>	<u>Instrument Check</u>
Instrument Channel - Main Steam Line Tunnel High Temperature	once/3 months (27)	once/operating cycle	None
Instrument Channel - Reactor Building Ventilation High Radiation - Reactor Zone	(1) (30)	once/18 months	once/day (8)
Instrument Channel - Reactor Building Ventilation High Radiation - Refueling Zone	(1) (30)	once/18 Months	once/day (8)
Instrument Channel - SGTS Train A Heaters	(4)	(9)	N/A
Instrument Channel - SGTS Train B Heaters	(4)	(9)	N/A
Instrument Channel - SGTS Train C Heaters	(4)	(9)	N/A
Reactor Building Isolation Timer (refueling floor)	(4)	once/operating cycle	N/A
Reactor Building Isolation Timer (reactor zone)	(4)	once/operating cycle	N/A

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 Unit 1

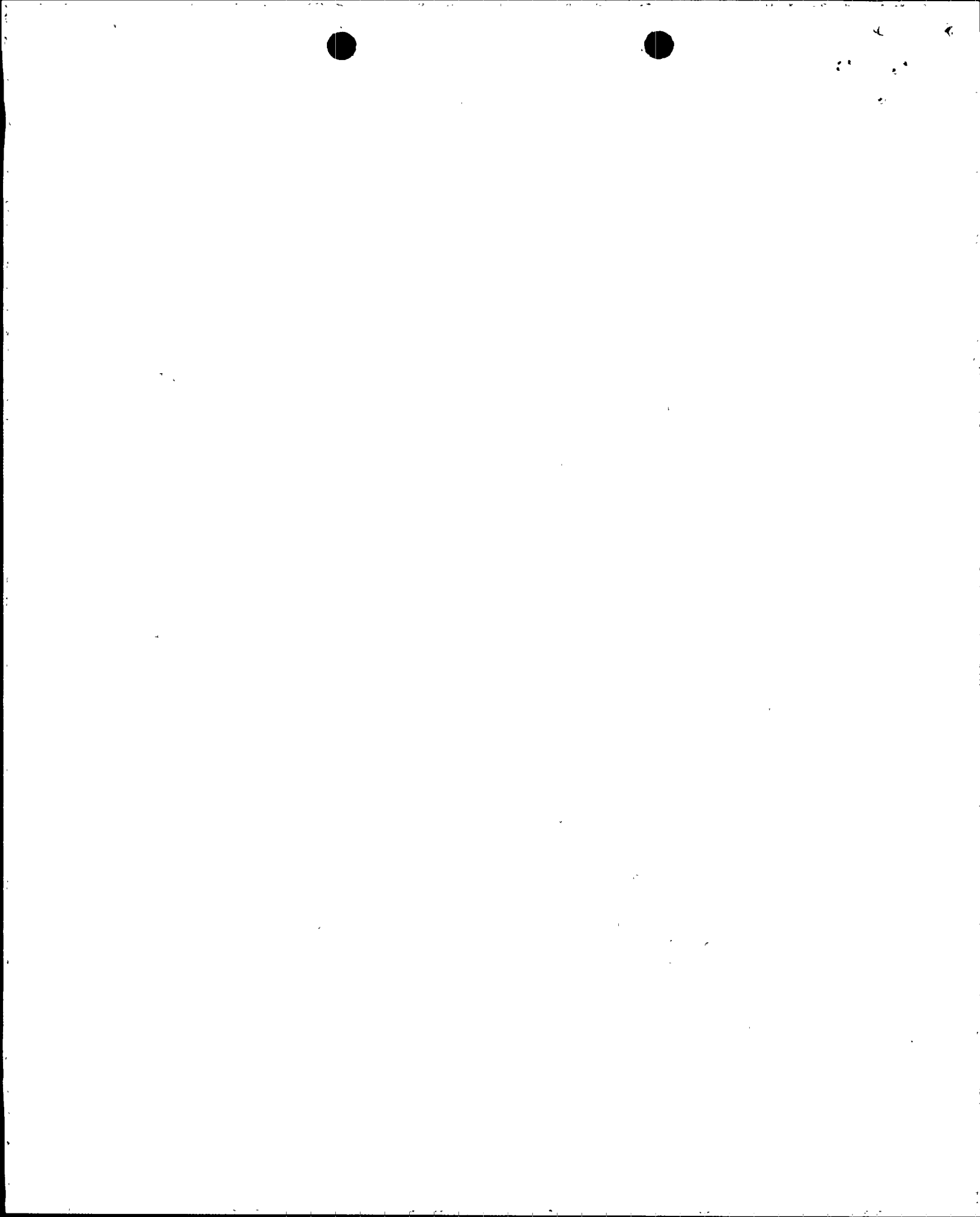
3.2/4.2-41

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NOTES FOR TABLES 4.2.A THROUGH 4.2.L except 4.2. D AND 4.2.K

1. Functional tests shall be performed once per month.
2. Functional tests shall be performed before each startup with a required frequency not to exceed once per week.
3. This instrumentation is excepted from the functional test definition. The functional test will consist of injecting a simulated electrical signal into the measurement channel.
4. Tested during logic system functional tests.
5. Refer to Table 4.1.B.
6. The logic system functional tests shall include a calibration once per operating cycle of time delay relays and timers necessary for proper functioning of the trip systems.
7. The functional test will consist of verifying continuity across the inhibit with a volt-ohmmeter.
8. Instrument checks shall be performed in accordance with the definition of instrument check (see Section 1.0, Definitions). An instrument check is not applicable to a particular setpoint, such as Upscale, but is a qualitative check that the instrument is behaving and/or indicating in an acceptable manner for the particular plant condition. Instrument check is included in this table for convenience and to indicate that an instrument check will be performed on the instrument. Instrument checks are not required when these instruments are not required to be OPERABLE or are tripped.
9. Calibration frequency shall be once/year.
10. Deleted
11. Portion of the logic is functionally tested during outage only.
12. The detector will be inserted during each operating cycle and the proper amount of travel into the core verified.
13. Functional test will consist of applying simulated inputs (see note 3). Local alarm lights representing upscale and downscale trips will be verified, but no rod block will be produced at this time. The inoperative trip will be initiated to produce a rod block (SRM and IRM inoperative also bypassed with the mode switch in RUN). The functions that cannot be verified to produce a rod block directly will be verified during the operating cycle.



NOTES FOR TABLES 4.2.A THROUGH 4.2.L except 4.2.D AND 4.2.K (Cont'd)

14. (Deleted)
15. The flow bias comparator will be tested by putting one flow unit in "Test" (producing 1/2 scram) and adjusting the test input to obtain comparator rod block. The flow bias upscale will be verified by observing a local upscale trip light during operation and verified that it will produce a rod block during the operating cycle.
16. Performed during operating cycle. Portions of the logic is checked more frequently during functional tests of the functions that produce a rod block.
17. This calibration consists of removing the function from service and performing an electronic calibration of the channel.
18. Functional test is limited to the condition where secondary containment integrity is not required as specified in Sections 3.7.C.2 and 3.7.C.3.
19. Functional test is limited to the time where the SGTS is required to meet the requirements of Section 4.7.C.1.a.
20. Calibration of the comparator requires the inputs from both recirculation loops to be interrupted, thereby removing the flow bias signal to the APRM and RBM and scrambling the reactor. This calibration can only be performed during an outage.
21. Logic test is limited to the time where actual operation of the equipment is permissible.
22. (Deleted)
23. (Deleted)
24. This instrument check consists of comparing the thermocouple readings for all valves for consistence and for nominal expected values (not required during refueling outages).
25. During each refueling outage, all acoustic monitoring channels shall be calibrated. This calibration includes verification of accelerometer response due to mechanical excitation in the vicinity of the sensor.

NOTES FOR TABLES 4.2.A THROUGH 4.2.L except 4.2.D AND 4.2.K (Cont'd)

26. This instrument check consists of comparing the background signal levels for all valves for consistency and for nominal expected values (not required during refueling outages).
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.
29. The functional test frequency decreased to once/3 months to reduce challenges to relief valves per NUREG-0737, Item II.K.3.16.
30. Functional testing for the Reactor Building Ventilation Radiation Monitoring System (RBVRMS) shall consist of verifying the High Voltage Power Supply (HVPS) voltage at the Sensor and Convertors (detectors) is within its design limits. A channel functional test as defined in Section 1.0, "Definitions" shall be performed once per 18 months as part of the RBVRM channel calibration.

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Unit 1

3.2/4.2-61a

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3.2 BASES (Cont'd)

steam line isolation valve closure, fission product release is limited so that 10 CFR 100 guidelines are not exceeded for this accident. Reference Section 14.6.2 FSAR. An alarm with a nominal setpoint of 1.5 x normal full-power background is provided also.

Pressure instrumentation is provided to close the main steam isolation valves in RUN Mode when the main steam line pressure drops below 825 psig.

The HPCI high flow and temperature instrumentation are provided to detect a break in the HPCI steam piping. Tripping of this instrumentation results in actuation of HPCI isolation valves. Tripping logic for the high flow is a 1-out-of-2 logic, and all sensors are required to be operable.

High temperature in the vicinity of the HPCI equipment is sensed by four sets of four bimetallic temperature switches. The 16 temperature switches are arranged in two trip systems with eight temperature switches in each trip system.

The HPCI trip settings of 90 psi for high flow and 200°F for high temperature are such that core uncover is prevented and fission product release is within limits.

The RCIC high flow and temperature instrumentation are arranged the same as that for the HPCI. The trip setting of 450" H₂O for high flow and 200°F for temperature are based on the same criteria as the HPCI.

High temperature at the Reactor Cleanup System floor drain could indicate a break in the cleanup system. When high temperature occurs, the cleanup system is isolated.

The instrumentation which initiates CSCS action is arranged in a dual bus system. As for other vital instrumentation arranged in this fashion, the specification preserves the effectiveness of the system even during periods when maintenance or testing is being performed. An exception to this is when logic functional testing is being performed.

The control rod block functions are provided to prevent excessive control rod withdrawal so that MCPR does not decrease to 1.07. The trip logic for this function is 1-out-of-n: e.g., any trip on one of six APRMs, eight IRMs, or four SRMs will result in a rod block.

The minimum instrument channel requirements assure sufficient instrumentation to assure the single failure criteria is met. The minimum instrument channel requirements for the RBM may be reduced by one for maintenance, testing, or calibration. This does not significantly increase the risk of an inadvertent control rod withdrawal, as the other channel is available, and the RBM is a backup system to the written sequence for withdrawal of control rods.



3.2 BASES (Cont'd)

The APRM rod block function is flow biased and prevents a significant reduction in MCPR, especially during operation at reduced flow. The APRM provides gross core protection; i.e., limits the gross core power increase from withdrawal of control rods in the normal withdrawal sequence. The trips are set so that MCPR is maintained greater than 1.07.

The RBM rod block function provides local protection of the core; i.e., the prevention of critical power in a local region of the core, for a single rod withdrawal error from a limiting control rod pattern.

If the IRM channels are in the worst condition of allowed bypass, the sealing arrangement is such that for unbypassed IRM channels, a rod block signal is generated before the detected neutrons flux has increased by more than a factor of 10.

A downscale indication is an indication the instrument has failed or the instrument is not sensitive enough. In either case the instrument will not respond to changes in control rod motion and thus, control rod motion is prevented.

The refueling interlocks also operate one logic channel, and are required for safety only when the mode switch is in the refueling position.

For effective emergency core cooling for small pipe breaks, the HPCI system must function since reactor pressure does not decrease rapid enough to allow either core spray or LPCI to operate in time. The automatic pressure relief function is provided as a backup to the HPCI in the event the HPCI does not operate. The arrangement of the tripping contacts is such as to provide this function when necessary and minimize spurious operation. The trip settings given in the specification are adequate to assure the above criteria are met. The specification preserves the effectiveness of the system during periods of maintenance, testing, or calibration, and also minimizes the risk of inadvertent operation; i.e., only one instrument channel out of service.

Two post treatment off-gas radiation monitors are provided and, when their trip point is reached, cause an isolation of the off-gas line. Isolation is initiated when both instruments reach their high trip point or one has an upscale trip and the other a downscale trip or both have a downscale trip.

Both instruments are required for trip but the instruments are set so that the instantaneous stack release rate limit given in Specification 3.8 is not exceeded.

Two radiation monitors are provided for each unit which initiate Primary Containment Isolation (Group 6 isolation valves) Reactor Building Isolation and operation of the Standby Gas Treatment System. These instrument channels monitor the radiation in the reactor zone ventilation exhaust ducts and in the refueling zone.

3.2 BASES (Cont'd)

Trip setting of 100 mr/hr for the monitors in the refueling zone are based upon initiating normal ventilation isolation and SGTS operation so that none of the activity released during the refueling accident leaves the Reactor Building via the normal ventilation path but rather all the activity is processed by the SGTS.

The allowed inoperable time of 4 hours for functional testing or 24 hours for calibration and maintenance (with the downscale trip of the inoperable channel in the tripped condition) of the Reactor Building Ventilation system is based upon a Probabilistic Risk Assessment (PRA). The assessment considered the failures, relay failures and the probability of an accident occurring for which the RBVRMs are required to operate.

Flow integrators and sump fill rate and pump out rate timers are used to determine leakage in the drywell. A system whereby the time interval to fill a known volume will be utilized to provide a backup. An air sampling system is also provided to detect leakage inside the primary containment (See Table 3.2.E).

For each parameter monitored, as listed in Table 3.2.F, there are two channels of instrumentation except as noted. By comparing readings between the two channels, a near continuous surveillance of instrument performance is available. Any deviation in readings will initiate an early recalibration, thereby maintaining the quality of the instrument readings.

Instrumentation is provided for isolating the control room and initiating a pressurizing system that processes outside air before supplying it to the control room. An accident signal that isolates primary containment will also automatically isolate the control room and initiate the emergency pressurization system. In addition, there are radiation monitors in the normal ventilation system that will isolate the control room and initiate the emergency pressurization system. Activity required to cause automatic actuation is about one mRem/hr.

Because of the constant surveillance and control exercised by TVA over the Tennessee Valley, flood levels of large magnitudes can be predicted in advance of their actual occurrence. In all cases, full advantage will be taken of advance warning to take appropriate action whenever reservoir levels above normal pool are predicted. Therefore, during flood conditions, the plant will be permitted to operate until water begins to run across the top of the pumping station at elevation 565. Seismically qualified, redundant level switches each powered from a separate division of power are provided at the pumping station to give main control room indication of this condition. At that time an orderly shutdown of the plant will be initiated, although surges even to a depth of several feet over the pumping station deck will not cause the loss of the main condenser circulating water pumps.

3.2 BASES (Cont'd)

The operability of the meteorological instrumentation ensures that sufficient meteorological data is available for estimating potential radiation dose to the public as a result of routine or accidental release of radioactive materials to the atmosphere. This capability is required to evaluate the need for initiating protective measures to protect the health and safety of the public.

The operability of the seismic instrumentation ensures that sufficient capability is available to promptly determine the seismic response of those features important to safety. This capability is required to permit comparison of the measured response to that used in the design basis for Browns Ferry Nuclear Plant and to determine whether the plant can continue to be operated safely. The instrumentation provided is consistent with specific portions of the recommendations of Regulatory Guide 1.12 "Instrumentation for Earthquakes."

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments will be calculated in accordance with guidance provided in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. This instrumentation also includes provisions for monitoring the concentration of potentially explosive gas mixtures in the offgas holdup system. The operability and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with guidance provided in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20 Appendix B, Table II, Column 2. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

ATWS/RPT, Anticipated Transients without Scram/Recirculation Pump Trip system provides a means of limiting the consequences of the unlikely occurrence of a failure to scram during an ATWS event. The response of the plant to this postulated event (ATWS/RPT) follows the BWR Owners Group Report by General Electric NEDE-31096-P-A and the accompanying NRC Staff Safety Evaluation Report.

ATWS/RPT utilizes the engineered safety feature (ESF) master/slave analog trip units (ATU) which consists of four level and four pressure channels total. The initiating logic consists of two independent trip systems each consisting of two reactor dome high pressure channels and two reactor vessel low level channels. A coincident trip of either two low levels or two high pressures in the same trip system causes initiation of ATWS/RPT. This signal from either trip system opens one of two EOC



The conclusions to be drawn are these:

1. A 1-out-of-n system may be treated the same as a single channel in terms of choosing a test interval; and
2. more than one channel should not be bypassed for testing at any one time.

The radiation monitors in the reactor and refueling zones which initiate building isolation and standby gas treatment operation are arranged such that two sensors high (above the high level setpoint) in a single channel or one sensor downscale (below low level setpoint) or inoperable in two channels in the same zone will initiate a trip function. The functional testing frequencies for both the channel functional test and the high voltage power supply functional test are based on a Probabilistic Risk Assessment and system drift characteristics of the Reactor Building Ventilation Radiation Monitors. The calibration frequency is based upon the drift characteristics of the radiation monitors.

The off-gas post treatment monitors are connected in a 2-out-of-2 logic arrangement. Based on experience with instruments of similar design, a testing interval of once every three months has been found adequate.

The automatic pressure relief instrumentation can be considered to be a 1-out-of-2 logic system and the discussion above applies also.

The criteria for ensuring the reliability and accuracy of the radioactive gaseous effluent instrumentation is listed in Table 4.2.K.

The criteria for ensuring the reliability and accuracy of the radioactive liquid effluent instrumentation is listed in Table 4.2.D.

The RCIC and HPCI system logic tests required by Table 4.2.B contain provisions to demonstrate that these systems will automatically restart on a RPV low water level signal received subsequent to a RPV high water level trip.

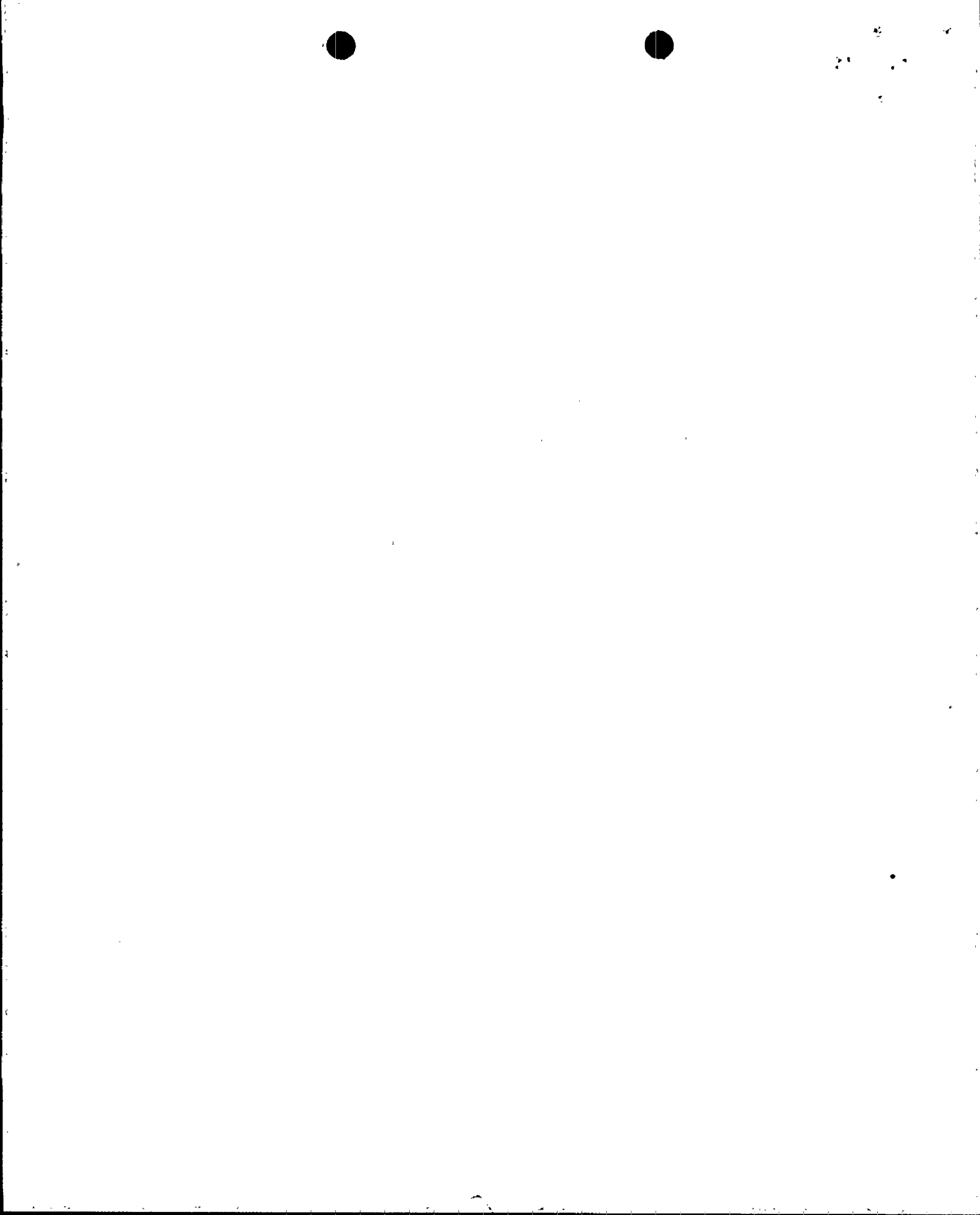


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BFN
Unit 1

3.2/4.2-73a

By letter 07/31/92





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

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-260

BROWNS FERRY NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 210
License No. DPR-52

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

- A. The application for amendment by Tennessee Valley Authority (the licensee) dated July 23, 1992, as supplemented March 16 and April 6, 1993, 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.

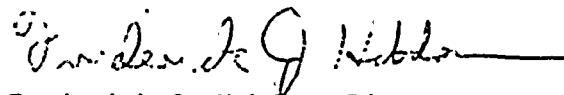
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-52 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 210, 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 its date of issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Frederick J. Hebdon, Director
Project Directorate II-4
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 13, 1993



ATTACHMENT TO LICENSE AMENDMENT NO. 210

FACILITY OPERATING LICENSE NO. DPR-52

DOCKET NO. 50-260

Revise the Appendix A Technical Specifications by removing the pages identified below and inserting the enclosed pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change. Overleaf* and spillover** pages are provided to maintain document completeness.

REMOVE

1.0-9
1.0-10
3.2/4.2-7
3.2/4.2-8
3.2/4.2-9
3.2/4.2-10
3.2/4.2-12
3.2/4.2-13
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3.2/4.2-40
3.2/4.2-41
3.2/4.2-59
3.2/4.2-60
3.2/4.2-61
3.2/4.2-61a
3.2/4.2-69
3.2/4.2-70
3.2/4.2-71
3.2/4.2-72
3.2/4.2-73
3.2/4.2-73a

INSERT

1.0-9
1.0-10*
3.2/4.2-7*
3.2/4.2-8
3.2/4.2-9
3.2/4.2-10*
3.2/4.2-12*
3.2/4.2-13
3.2/4.2-13a
3.2/4.2-13b
3.2/4.2-40*
3.2/4.2-41
3.2/4.2-59*
3.2/4.2-60
3.2/4.2-61
3.2/4.2-61a*
3.2/4.2-69
3.2/4.2-70**
3.2/4.2-71**
3.2/4.2-72**
3.2/4.2-73**
3.2/4.2-73a

10. Logic - A logic is an arrangement of relays, contacts, and other components that produces a decision output.
 - (a) Initiating - A logic that receives signals from channels and produces decision outputs to the actuation logic.
 - (b) Actuation - A logic that receives signals (either from initiation logic or channels) and produces decision outputs to accomplish a protective action.

11. Channel Calibration - Shall be the adjustment, as necessary, of the channel output such that it responds with necessary range and accuracy to known values of the parameters which the channel monitors. The channel calibration shall encompass the entire channel including alarm and/or trip functions and shall include the channel functional test. The channel calibration may be performed by any series of sequential, overlapping or total channel steps such that the entire channel is calibrated. Non-calibratable components shall be excluded from this requirement, but will be included in channel functional test and source check.

12. Channel Functional Test - Shall be:
 - a. Analog/Digital Channels - the injection of a simulated signal into the channel as close to the sensor as practicable to verify OPERABILITY including alarm and/or trip functions.
 - b. Bistable Channels - the injection of a simulated signal into the sensor to verify OPERABILITY including alarm and/or trip functions.

13. Source Check - Shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source or multiple of sources.

1.0 DEFINITIONS (Cont'd)

- W. Functional Tests - A functional test is the manual operation or initiation of a system, subsystem, or component to verify that it functions within design tolerances (e.g., the manual start of a core spray pump to verify that it runs and that it pumps the required volume of water).
- X. Shutdown - The reactor is in a shutdown condition when the reactor mode switch is in the shutdown mode position and no core alterations are being performed.
- Y. Engineered Safeguard - An engineered safeguard is a safety system the actions of which are essential to a safety action required in response to accidents.
- Z. Reportable Event - A reportable event shall be any of those conditions specified in Section 50.73 to 10 CFR Part 50.
- AA. Solidification - Shall be the conversion of radioactive wastes into a form that meets shipping and burial ground requirements.
- BB. Offsite Dose Calculation Manual (ODCM) - Shall be a manual describing the environmental monitoring program and the methodology and parameters used in the calculation of release rate limits and offsite doses due to radioactive gaseous and liquid effluents. The ODCM will also provide the plant with guidance for establishing alarm/trip setpoints to ensure technical specifications sections 3.8.A.1 and 3.8.B.1 are not exceeded.
- CC. Purge or purging - The controlled process of discharging air or gas from the primary containment to maintain temperature, pressure, humidity, concentration, or other operating condition in such a manner that replacement air or gas is required to purify the containment.
- DD. Process Control Program - Shall contain the sampling, analysis, and formulation determination by which SOLIDIFICATION of radioactive wastes from liquid systems is assured.
- EE. Radiological Effluent Manual (REM) - Shall be a manual containing the site and environmental sampling and analysis programs for measurements of radiation and radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposure to individuals from station operation. It shall also specify operating guidelines for radioactive waste treatment systems and report content.
- FF. Venting - The controlled process of discharging air or gas from the primary containment to maintain temperature, pressure, humidity, concentration, or other operating condition in such a manner that replacement air or gas is not provided or required. Vent, used in system names, does not imply a venting process.



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TABLE 3.2.A
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No.
Instrument
Channels Operable
Per Trip Sys(1)(11)

	Function	Trip Level Setting	Action (1)	Remarks
2	Instrument Channel - Reactor Low Water Level(6) (LIS-3-203 A-D)	$\geq 538''$ above vessel zero	A or (B and E)	1. Below trip setting does the following: a. Initiates Reactor Building Isolation b. Initiates Primary Containment Isolation c. Initiates SGTS
1	Instrument Channel - Reactor High Pressure (PS-68-93 and -94)	100 ± 15 psig	D	1. Above trip setting isolates the shutdown cooling suction valves of the RHR system.
2	Instrument Channel - Reactor Low Water Level (LIS-3-56A-D)	$\geq 398''$ above vessel zero	A	1. Below trip setting initiates Main Steam Line Isolation
2	Instrument Channel - High Drywell Pressure (6) (PIS-64-56A-D)	≤ 2.5 psig	A or (B and E)	1. Above trip setting does the following: a. Initiates Reactor Building Isolation b. Initiates Primary Containment Isolation c. Initiates SGTS

BFN
Unit 2

3.2/4.2-7

AMENDMENT NO. 183

TABLE 3.2.A (Continued)
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No. Instrument Channels Operable Per Trip Sys(1)(11)	Function	Trip Level Setting	Action (1)	Remarks
2	Instrument Channel - High Radiation Main Steam Line Tunnel (6)	3 times normal rated full power background (13)	B	1. Above trip setting initiates Main Steam Line Isolation
2	Instrument Channel - Low Pressure Main Steam Line (PIS-1-72, 76, 82, 86)	\geq 825 psig (4)	B	1. Below trip setting initiates Main Steam Line Isolation
2(3)	Instrument Channel - High Flow Main Steam Line (PdIS-1-13A-D, 25A-D, 36A-D, 50A-D)	\leq 140% of rated steam flow	B	1. Above trip setting initiates Main Steam Line Isolation
2(12)	Instrument Channel - Main Steam Line Tunnel High Temperature	\leq 200°F	B	1. Above trip setting initiates Main Steam Line Isolation.
1(14)	Instrument Channel - Reactor Building Ventilation High Radiation - Reactor Zone	\leq 100 mr/hr or downscale	G	1. 1 upscale channel or 2 downscale channels will a. Initiate SGTS b. Isolate reactor zone and refueling floor. c. Close atmosphere control system.

BFN
Unit 2

3.2/4.2-8

Amendment 210



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TABLE 3.2.A (Continued)
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Unit	BFN	Minimum No. Instrument Channels Operable per Trip Sys(1)(11)	Function	Trip Level Setting	Action (1)	Remarks
2		1(14)	Instrument Channel - Reactor Building Ventilation High Radiation - Refueling Zone	≤ 100 mr/hr or downscale	F	1. 1 upscale channel or 2 downscale channels will a. Initiate SGTS b. Isolate refueling floor c. Close atmosphere control system.
		2(7) (8)	Instrument Channel SGTS Flow - Train A R. H. Heaters	≥ 2000 cfm and ≤ 4000 cfm	H and (A or F)	Below 2000 cfm airflow R.H. heaters shall be shut off.
		2(7) (8)	Instrument Channel SGTS Flow - Train B R. H. Heaters	≥ 2000 cfm and ≤ 4000 cfm	H and (A or F)	Below 2000 cfm airflow R.H. heaters shall be shut off.
		2(7) (8)	Instrument Channel SGTS Flow - Train C R. H. Heaters	≥ 2000 cfm and ≤ 4000 cfm	H and (A or F)	Below 2000 cfm airflow R.H. heaters shall be shut off.
		1	Reactor Building Isolation Timer (refueling floor)	$0 \leq t \leq 2$ secs.	H or F	1. Below trip setting prevents spurious trips and system perturbations from initiating isolation.
		1	Reactor Building Isolation Timer (reactor zone)	$0 \leq t \leq 2$ secs.	G or A or H	1. Below trip setting prevents spurious trips and system perturbations from initiating isolation.
		2(10)	Group 1 (Initiating) Logic	N/A	A	1. Group 1: The valves in Group 1 are actuated by any of the following conditions: a. Reactor Vessel Low Low Water Level b. Main Steamline High Radiation c. Main Steamline High Flow d. Main Steamline Space High Temperature e. Main Steamline Low Pressure

3.2/4.2-9
Amendment 210

TABLE 3.2.A (Continued)
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No.
Instrument
Channels Operable
per Trip Sys(1)(11)

	Function	Trip Level Setting	Action (1)	Remarks
1	Group 1 (Actuation) Logic	N/A	B	1. Group 1: The valves in Group 1 are actuated by any of the following conditions: a. Reactor Vessel Low Water Level b. Main Steamline High Radiation c. Main Steamline High Flow d. Main Steamline Space High Temperature e. Main Steamline Low Pressure
2	Group 2 (Initiating) Logic	N/A	A or (B and E)	1. Group 2: The valves in Group 2 are actuated by any of the following conditions: a. Reactor Vessel Low Water Level b. High Drywell Pressure
1	Group 2 (RHR Isolation-Actuation) Logic	N/A	D	
1	Group 8 (TIP-Actuation) Logic	N/A	J	
1	Group 2 (Drywell Sump Drains-Actuation) Logic	N/A	K	
1	Group 2 (Reactor Building & Refueling Floor, and Drywell Vent and Purge-Actuation) Logic	N/A	F and G	1. Part of Group 6 Logic
2	Group 3 (Initiating) Logic	N/A	C	1. Group 3: The valves in Group 3 are actuated by any of the following conditions: a. Reactor Vessel Low Water Level b. Reactor Water Cleanup (RWCU) System High Temperature in the main steam valve vault c. RWCU System High Temperature in the RWCU pump room 2A d. RWCU System High Temperature in the RWCU pump room 2B e. RWCU System High Temperature in the RWCU heat exchanger room f. RWCU System High Temperature in the space near the pipe trench containing RWCU piping

BFN
Unit 2

3.2/4.2-10

AMENDMENT NO. 204

NOTES FOR TABLE 3.2.A

1. Whenever the respective functions are required to be OPERABLE there shall be two OPERABLE or tripped trip systems for each function. If the first column cannot be met for one of the trip systems, that trip system or logic for that function shall be tripped (or the appropriate action listed below shall be taken). If the column cannot be met for all trip systems, the appropriate action listed below shall be taken.
 - A. Initiate an orderly shutdown and have the reactor in Cold Shutdown in 24 hours.
 - B. Initiate an orderly load reduction and have Main Steam Lines isolated within eight hours.
 - C. Isolate Reactor Water Cleanup System.
 - D. Administratively control the affected system isolation valves in the closed position within one hour and then declare the affected system inoperable.
 - E. Initiate primary containment isolation within 24 hours.
 - F. The handling of spent fuel will be prohibited and all operations over spent fuels and open reactor wells shall be prohibited.
 - G. Isolate the reactor building and start the standby gas treatment system.
 - H. Immediately perform a logic system functional test on the logic in the other trip systems and daily thereafter not to exceed 7 days.
 - I. Deleted
 - J. Withdraw TIP.
 - K. Manually isolate the affected lines. Refer to Section 4.2.E for the requirements of an inoperable system.
 - L. If one SGTS train is inoperable take actions H or A and F. If two SGTS trains are inoperable take actions A and F.
2. Deleted
3. There are four sensors per steam line of which at least one sensor per trip system must be OPERABLE.

NOTES FOR TABLE 3.2.A (Cont'd)

4. Only required in RUN MODE (interlocked with Mode Switch).
5. Deleted
6. Channel shared by RPS and Primary Containment & Reactor Vessel Isolation Control System. A channel failure may be a channel failure in each system.
7. A train is considered a trip system.
8. Two out of three SGTS trains required. A failure of more than one will require actions A and F.
9. Deleted
10. Deleted
11. A channel may be placed in an inoperable status for up to four hours for required surveillance without placing the trip system in the tripped condition provided at least one OPERABLE channel in the same trip system is monitoring that parameter. For the Reactor Building Ventilation system, one channel may be inoperable for up to 4 hours for functional testing or for up to 24 hours for calibration and maintenance, as long as the downscale trip of the inoperable channel is placed in the tripped condition.
12. A channel contains four sensors, all of which must be OPERABLE for the channel to be OPERABLE.

Power operations permitted for up to 30 days with 15 of the 16 temperature switches OPERABLE.

In the event that normal ventilation is unavailable in the main steam line tunnel, the high temperature channels may be bypassed for a period of not to exceed four hours. During periods when normal ventilation is not available, such as during the performance of secondary containment leak rate tests, the control room indicators of the affected space temperatures shall be monitored for indications of small steam leaks. In the event of rapid increases in temperature (indicative of steam line break), the operator shall promptly close the main steam line isolation valves.
13. The nominal setpoints for alarm and reactor trip (1.5 and 3.0 times background, respectively) are established based on the normal background at full power. The allowable setpoints for alarm and reactor trip are 1.2-1.8 and 2.4-3.6 times background, respectively.



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NOTES FOR TABLE 3.2.A (Cont'd)

14. There is a RBVRM trip function for the refueling zone and a RBVRM trip function for the reactor zone. Each trip function is composed of two divisional trip systems. Each trip system has one channel for each zone. Each channel contains two sensors, both of which must be OPERABLE for the channel to be OPERABLE. A channel downscale/inoperable trip occurs when either of the sensors are indicating less than the low radiation setpoint or are inoperable. A channel upscale trip occurs when both of the sensors are indicating higher than the high radiation setpoint. Only one channel upscale trip is required for trip function initiation. Two channel downscale trips in a zone are required for trip function initiation.

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TABLE 4.2.A
SURVEILLANCE REQUIREMENTS FOR PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Unit	Function	Functional Test	Calibration Frequency	Instrument Check
Unit 2 BRN 3.2/4.2-40	Instrument Channel - Reactor Low Water Level (LIS-3-203A-D)	(1) (27)	Once/18 Months (28)	Once/day
	Instrument Channel - Reactor High Pressure (PS-68-93 & 94)	(31)	Once/18 months	None
	Instrument Channel - Reactor Low Water Level (LIS-3-56A-D)	(1) (27)	Once/18 months (28)	Once/day
	Instrument Channel - High Drywell Pressure (PIS-64-56A-D)	(1) (27)	Once/18 Months (28)	N/A
	Instrument Channel - High Radiation Main Steam Line Tunnel	29	(5)	Once/day
	Instrument Channel - Low Pressure Main Steam Line (PIS-1-72, 76, 82, 86)	(29) (27)	Once/18 Months (28)	None
	Instrument Channel - High Flow Main Steam Line (PdIS-1-13A-D, 25A-D, 36A-D, 50A-D)	(29) (27)	Once/18 Months (28)	Once/day



TABLE 4.2.A (Cont'd)
SURVEILLANCE REQUIREMENTS FOR PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

<u>Function</u>	<u>Functional Test</u>	<u>Calibration Frequency</u>	<u>Instrument Check</u>
Instrument Channel - Main Steam Line Tunnel High Temperature	once/3 months (27)	once/operating cycle	None
Instrument Channel - Reactor Building Ventilation High Radiation - Reactor Zone	(1) (32)	once/18 months	once/day (8)
Instrument Channel - Reactor Building Ventilation High Radiation - Refueling Zone	(1) (32)	once/18 Months	once/day (8)
Instrument Channel - SGTS Train A Heaters	(4)	(9)	N/A
Instrument Channel - SGTS Train B Heaters	(4)	(9)	N/A
Instrument Channel - SGTS Train C Heaters	(4)	(9)	N/A
Reactor Building Isolation Timer (refueling floor)	(4)	once/operating cycle	N/A
Reactor Building Isolation Timer (reactor zone)	(4)	once/operating cycle	N/A

NOTES FOR TABLES 4.2.A THROUGH 4.2.L except 4.2.D AND 4.2.K

1. Functional tests shall be performed once per month.
2. Functional tests shall be performed before each startup with a required frequency not to exceed once per week.
3. This instrumentation is excepted from the functional test definition. The functional test will consist of injecting a simulated electrical signal into the measurement channel.
4. Tested during logic system functional tests.
5. Refer to Table 4.1.B.
6. The logic system functional tests shall include a calibration once per operating cycle of time delay relays and timers necessary for proper functioning of the trip systems.
7. The functional test will consist of verifying continuity across the inhibit with a volt-ohmmeter.
8. Instrument checks shall be performed in accordance with the definition of instrument check (see Section 1.0, Definitions). An instrument check is not applicable to a particular setpoint, such as Upscale, but is a qualitative check that the instrument is behaving and/or indicating in an acceptable manner for the particular plant condition. Instrument check is included in this table for convenience and to indicate that an instrument check will be performed on the instrument. Instrument checks are not required when these instruments are not required to be OPERABLE or are tripped.
9. Calibration frequency shall be once/year.
10. Deleted
11. Portion of the logic is functionally tested during outage only.
12. The detector will be inserted during each operating cycle and the proper amount of travel into the core verified.
13. Functional test will consist of applying simulated inputs (see note 3). Local alarm lights representing upscale and downscale trips will be verified, but no rod block will be produced at this time. The inoperative trip will be initiated to produce a rod block (SRM and IRM inoperative also bypassed with the mode switch in RUN). The functions that cannot be verified to produce a rod block directly will be verified during the operating cycle.



14. (Deleted)
15. The flow bias comparator will be tested by putting one flow unit in "Test" (producing 1/2 scram) and adjusting the test input to obtain comparator rod block. The flow bias upscale will be verified by observing a local upscale trip light during operation and verified that it will produce a rod block during the operating cycle.
16. Performed during operating cycle. Portions of the logic is checked more frequently during functional tests of the functions that produce a rod block.
17. This calibration consists of removing the function from service and performing an electronic calibration of the channel.
18. Functional test is limited to the condition where secondary containment integrity is not required as specified in Sections 3.7.C.2 and 3.7.C.3.
19. Functional test is limited to the time where the SGTS is required to meet the requirements of Section 4.7.C.1.a.
20. Calibration of the comparator requires the inputs from both recirculation loops to be interrupted, thereby removing the flow bias signal to the APRM and RBM and scrambling the reactor. This calibration can only be performed during an outage.
21. Logic test is limited to the time where actual operation of the equipment is permissible.
22. (Deleted)
23. (Deleted)
24. This instrument check consists of comparing the thermocouple readings for all valves for consistence and for nominal expected values (not required during refueling outages).
25. During each refueling outage, all acoustic monitoring channels shall be calibrated. This calibration includes verification of accelerometer response due to mechanical excitation in the vicinity of the sensor.

NOTES FOR TABLES 4.2.A THROUGH 4.2.L except 4.2.D AND 4.2.K (Cont'd)

26. This instrument check consists of comparing the background signal levels for all valves for consistency and for nominal expected values (not required during refueling outages).
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.
29. The functional test frequency decreased to once/3 months to reduce challenges to relief valves per NUREG-0737, Item II.K.3.16.
30. Calibration shall consist of an electronic calibration of the channel, not including the detector, for range decades above 10 R/hr and a one-point source check of the detector below 10 R/hr with an installed or portable gamma source.
31. Functional Tests shall be performed once/3months.
32. Functional testing for the Reactor Building Ventilation Radiation Monitoring System (RBVRMS) shall consist of verifying the High Voltage Power Supply (HVPS) voltage at the Sensor and Convertors (detectors) is within its design limits. A channel functional test as defined in Section 1.0, "Definitions" shall be performed once per 18 months as part of the RBVRM channel calibration.

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adequate to assure the above criteria are met. The specification preserves the effectiveness of the system during periods of maintenance, testing, or calibration, and also minimizes the risk of inadvertent operation; i.e., only one instrument channel out of service.

Two post treatment off-gas radiation monitors are provided and, when their trip point is reached, cause an isolation of the off-gas line. Isolation is initiated when both instruments reach their high trip point or one has an upscale trip and the other a downscale trip or both have a downscale trip.

Both instruments are required for trip but the instruments are set so that the instantaneous stack release rate limit given in Specification 3.8 is not exceeded.

Two radiation monitors are provided for each unit which initiate Primary Containment Isolation (Group 6 isolation valves) Reactor Building Isolation and operation of the Standby Gas Treatment System. These instrument channels monitor the radiation in the reactor zone ventilation exhaust ducts and in the refueling zone.

Trip setting of 100 mr/hr for the monitors in the refueling zone are based upon initiating normal ventilation isolation and SGTS operation so that none of the activity released during the refueling accident leaves the Reactor Building via the normal ventilation path but rather all the activity is processed by the SGTS.

The allowed inoperable time of 4 hours for functional testing or 24 hours for calibration and maintenance (with the downscale trip of the inoperable channel in the tripped condition) of the Reactor Building Ventilation system is based upon a Probabilistic Risk Assessment (PRA). The assessment considered the failures, relay failures and the probability of an accident occurring for which the RBVRMs are required to operate.

Flow integrators and sump fill rate and pump out rate timers are used to determine leakage in the drywell. A system whereby the time interval to fill a known volume will be utilized to provide a backup. An air sampling system is also provided to detect leakage inside the primary containment (See Table 3.2.E).

For each parameter monitored, as listed in Table 3.2.F, there are two channels of instrumentation except as noted. By comparing readings between the two channels, a near continuous surveillance of instrument performance is available. Any deviation in readings will initiate an early recalibration, thereby maintaining the quality of the instrument readings.

Instrumentation is provided for isolating the control room and initiating a pressurizing system that processes outside air before supplying it to the control room. An accident signal that isolates primary containment will also automatically isolate the control room and initiate the emergency pressurization system. In addition, there are radiation monitors in the normal ventilation system that will isolate the control room and initiate the emergency pressurization system. Activity required to cause automatic actuation is about one mRem/hr.

Because of the constant surveillance and control exercised by TVA over the Tennessee Valley, flood levels of large magnitudes can be predicted in advance of their actual occurrence. In all cases, full advantage will be taken of advance warning to take appropriate action whenever reservoir levels above normal pool are predicted. Therefore, during flood conditions, the plant will be permitted to operate until water begins to run across the top of the pumping station at elevation 565. Seismically qualified, redundant level switches each powered from a separate division of power are provided at the pumping station to give main control room indication of this condition. At that time an orderly shutdown of the plant will be initiated, although surges even to a depth of several feet over the pumping station deck will not cause the loss of the main condenser circulating water pumps.

The OPERABILITY of the meteorological instrumentation ensures that sufficient meteorological data is available for estimating potential radiation dose to the public as a result of routine or accidental release of radioactive materials to the atmosphere. This capability is required to evaluate the need for initiating protective measures to protect the health and safety of the public.

The OPERABILITY of the seismic instrumentation ensures that sufficient capability is available to promptly determine the seismic response of those features important to safety. This capability is required to permit comparison of the measured response to that used in the design basis for Browns Ferry Nuclear Plant and to determine whether the plant can continue to be operated safely. The instrumentation provided is consistent with specific portions of the recommendations of Regulatory Guide 1.12 "Instrumentation for Earthquakes."

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments will be calculated in accordance with guidance provided in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. This instrumentation also includes provisions for monitoring the concentration of potentially explosive gas mixtures in the off-gas holdup system. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

3.2 BASES (Cont'd)

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with guidance provided in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20 Appendix B, Table II, Column 2. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

ATWS/RPT, Anticipated Transients without Scram/Recirculation Pump Trip system provides a means of limiting the consequences of the unlikely occurrence of a failure to scram during an ATWS event. The response of the plant to this postulated event (ATWS/RPT) follows the BWR Owners Group Report by General Electric NEDE-31096-P-A and the accompanying NRC Staff Safety Evaluation Report.

ATWS/RPT utilizes the engineered safety feature (ESF) master/slave analog trip units (ATU) which consists of four level and four pressure channels total. The initiating logic consists of two independent trip systems each consisting of two reactor dome high pressure channels and two reactor vessel low level channels. A coincident trip of either two low levels or two high pressures in the same trip system causes initiation of ATWS/RPT. This signal from either trip system opens one of two EOC (end-of-cycle) breakers in series (the other system opens the other breaker) between the pump motor and the Motor Generator set driving each recirculation pump. Both systems are completely redundant such that only one trip system is necessary to perform the ATWS/RPT function. Power comes from the 250 VDC shutdown boards.

Setpoints for reactor dome high pressure and reactor vessel low level are such that a normal Reactor Protection System scram and accompanying recirculation pump trip would occur before or coincident with the trip by ATWS/RPT.

4.2 BASES

The instrumentation listed in Tables 4.2.A through 4.2.F will be functionally tested and calibrated at regularly scheduled intervals. The same design reliability goal as the Reactor Protection System of 0.99999 generally applies for all applications of (1-out-of-2) X (2) logic. Therefore, on-off sensors are tested once/3 months, and bistable trips associated with analog sensors and amplifiers are tested once/week.

Those instruments which, when tripped, result in a rod block have their contacts arranged in a 1-out-of-n logic, and all are capable of being bypassed. For such a tripping arrangement with bypass capability provided, there is an optimum test interval that should be maintained in order to maximize the reliability of a given channel (7). This takes account of the fact that testing degrades reliability and the optimum interval between tests is approximately given by:

$$i = \sqrt{\frac{2t}{r}}$$

Where: i = the optimum interval between tests.

t = the time the trip contacts are disabled from performing their function while the test is in progress.

r = the expected failure rate of the relays.

To test the trip relays requires that the channel be bypassed, the test made, and the system returned to its initial state. It is assumed this task requires an estimated 30 minutes to complete in a thorough and workmanlike manner and that the relays have a failure rate of 10^{-6} failures per hour. Using this data and the above operation, the optimum test interval is:

$$i = \sqrt{\frac{2(0.5)}{10^{-6}}} = 1 \times 10^3 \\ = 40 \text{ days}$$

For additional margin a test interval of once per month will be used initially.

The sensors and electronic apparatus have not been included here as these are analog devices with readouts in the control room and the sensors and electronic apparatus can be checked by comparison with other like instruments. The checks which are made on a daily basis are adequate to assure OPERABILITY of the sensors and electronic apparatus, and the test interval given above provides for optimum testing of the relay circuits.

The above calculated test interval optimizes each individual channel, considering it to be independent of all others. As an example, assume that there are two channels with an individual technician assigned to each. Each technician tests his channel at the optimum frequency, but the two technicians are not allowed to communicate so that one can advise the other that his channel is under test. Under these conditions, it is possible for both channels to be under test simultaneously. Now, assume that the technicians are required to communicate and that two channels are never tested at the same time.

- (7) UCRL-50451, Improving Availability and Readiness of Field Equipment Through Periodic Inspection, Benjamin Epstein, Albert Shiff, July 16, 1968, page 10, Equation (24), Lawrence Radiation Laboratory.

Forbidding simultaneous testing improves the availability of the system over that which would be achieved by testing each channel independently. These one-out-of-n trip systems will be tested one at a time in order to take advantage of this inherent improvement in availability.

Optimizing each channel independently may not truly optimize the system considering the overall rules of system operation. However, true system optimization is a complex problem. The optimums are broad, not sharp, and optimizing the individual channels is generally adequate for the system.

The formula given above minimizes the unavailability of a single channel which must be bypassed during testing. The minimization of the unavailability is illustrated by Curve No. 1 of Figure 4.2-1 which assumes that a channel has a failure rate of 0.1×10^{-6} /hour and 0.5 hours is required to test it. The unavailability is a minimum at a test interval t , of 3.16×10^3 hours.

If two similar channels are used in a 1-out-of-2 configuration, the test interval for minimum unavailability changes as a function of the rules for testing. The simplest case is to test each one independent of the other. In this case, there is assumed to be a finite probability that both may be bypassed at one time. This case is shown by Curve No. 2. Note that the unavailability is lower as expected for a redundant system and the minimum occurs at the same test interval. Thus, if the two channels are tested independently, the equation above yields the test interval for minimum unavailability.

A more usual case is that the testing is not done independently. If both channels are bypassed and tested at the same time, the result is shown in Curve No. 3. Note that the minimum occurs at about 40,000 hours, much longer than for cases 1 and 2. Also, the minimum is not nearly as low as Case 2 which indicates that this method of testing does not take full advantage of the redundant channel. Bypassing both channels for simultaneous testing should be avoided.

The most likely case would be to stipulate that one channel be bypassed, tested, and restored, and then immediately following, the second channel be bypassed, tested, and restored. This is shown by Curve No. 4. Note that there is no true minimum. The curve does have a definite knee and very little reduction in system unavailability is achieved by testing at a shorter interval than computed by the equation for a single channel.



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The best test procedure of all those examined is to perfectly stagger the tests. That is, if the test interval is four months, test one or the other channel every two months. This is shown in Curve No. 5. The difference between Cases 4 and 5 is negligible. There may be other arguments, however, that more strongly support the perfectly staggered tests, including reductions in human error.

The conclusions to be drawn are these:

1. A 1-out-of-n system may be treated the same as a single channel in terms of choosing a test interval; and
2. more than one channel should not be bypassed for testing at any one time.

The radiation monitors in the reactor and refueling zones which initiate building isolation and standby gas treatment operation are arranged such that two sensors high (above the high level setpoint) in a single channel or one sensor downscale (below low level setpoint) or inoperable in two channels in the same zone will initiate a trip function. The functional testing frequencies for both the channel functional test and the high voltage power supply functional test are based on a Probabilistic Risk Assessment and system drift characteristics of the Reactor Building Ventilation Radiation Monitors. The calibration frequency is based upon the drift characteristics of the radiation monitors.

The off-gas post treatment monitors are connected in a 2-out-of-2 logic arrangement. Based on experience with instruments of similar design, a testing interval of once every three months has been found adequate.

The automatic pressure relief instrumentation can be considered to be a 1-out-of-2 logic system and the discussion above applies also.

The criteria for ensuring the reliability and accuracy of the radioactive gaseous effluent instrumentation is listed in Table 4.2.K.

The criteria for ensuring the reliability and accuracy of the radioactive liquid effluent instrumentation is listed in Table 4.2.D.

The RCIC and HPCI system logic tests required by Table 4.2.B contain provisions to demonstrate that these systems will automatically restart on a RPV low water level signal received subsequent to a RPV high water level trip.



ATTACHMENT TO LICENSE AMENDMENT NO. 167

FACILITY OPERATING LICENSE NO. DPR-68

DOCKET NO. 50-296

Revise the Appendix A Technical Specifications by removing the pages identified below and inserting the enclosed pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change. Overleaf* and spillover** pages are provided to maintain document completeness.

REMOVE

1.0-9
1.0-10
3.2/4.2-7
3.2/4.2-8
3.2/4.2-9
3.2/4.2-10
3.2/4.2-12
3.2/4.2-13
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3.2/4.2-39
3.2/4.2-40
3.2/4.2-58
3.2/4.2-59
3.2/4.2-60
3.2/4.2-60a
3.2/4.2-66
3.2/4.2-67
3.2/4.2-68
3.2/4.2-69
3.2/4.2-72
3.2/4.2-72a

INSERT

1.0-9
1.0-10*
3.2/4.2-7*
3.2/4.2-8
3.2/4.2-9
3.2/4.2-10*
3.2/4.2-12*
3.2/4.2-13
3.2/4.2-13a
3.2/4.2-13b
3.2/4.2-39*
3.2/4.2-40
3.2/4.2-58*
3.2/4.2-59
3.2/4.2-60
3.2/4.2-60a*
3.2/4.2-66*
3.2/4.2-67
3.2/4.2-68
3.2/4.2-69*
3.2/4.2-72
3.2/4.2-72a*



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

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-296

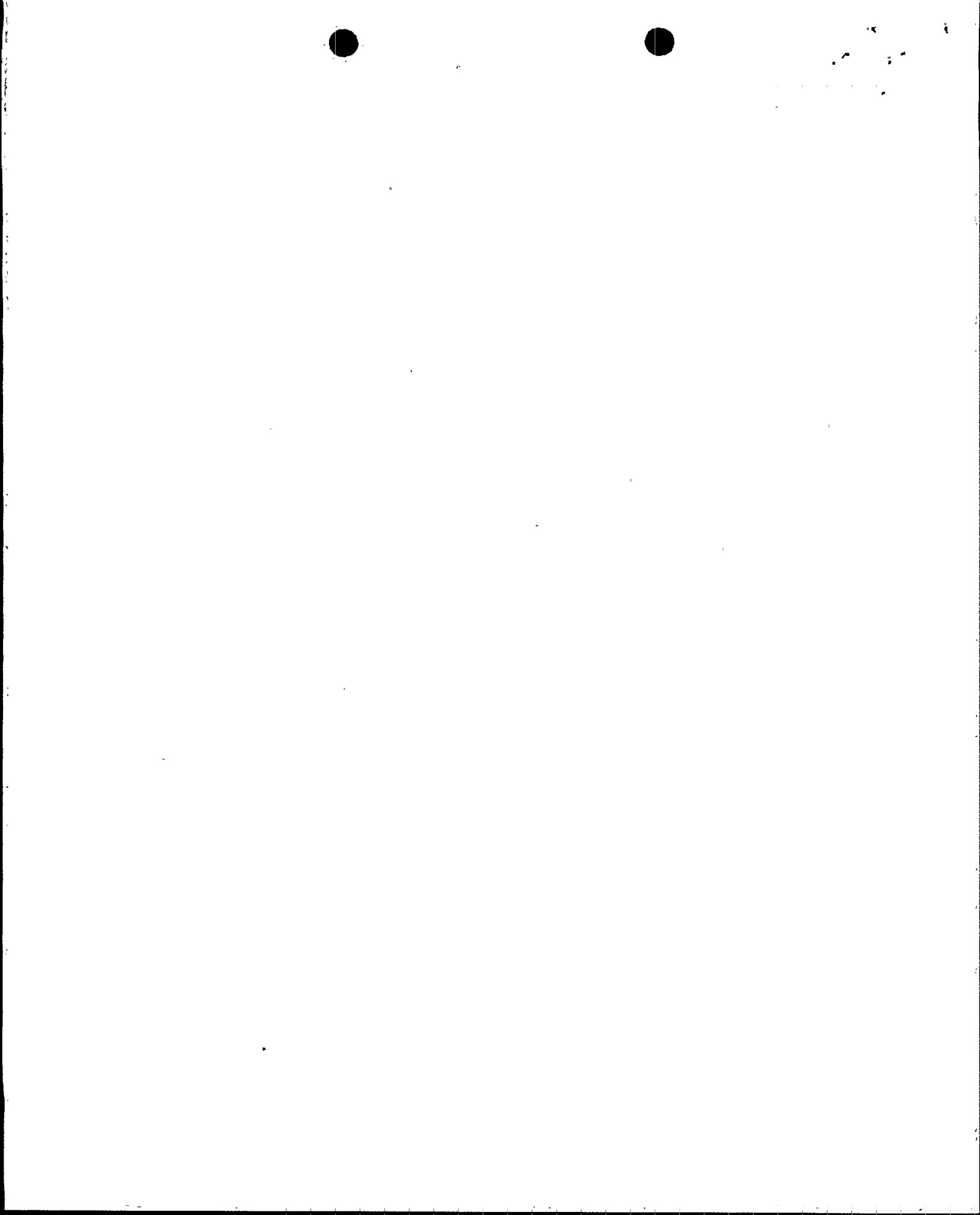
BROWNS FERRY NUCLEAR PLANT, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 167
License No. DPR-68

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

- A. The application for amendment by Tennessee Valley Authority (the licensee) dated July 23, 1992, as supplemented March 16 and April 6, 1993, 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.



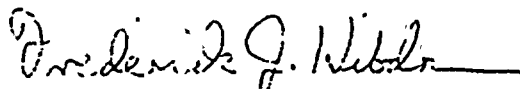
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-68 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 167, 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 its date of issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Frederick J. Hebbon, Director
Project Directorate II-4
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 13, 1993

1.0 DEFINITIONS (Cont'd)

10. Logic - A logic is an arrangement of relays, contacts, and other components that produces a decision output.
 - (a) Initiating - A logic that receives signals from channels and produces decision outputs to the actuation logic.
 - (b) Actuation - A logic that receives signals (either from initiation logic or channels) and produces decision outputs to accomplish a protective action.

11. Channel Calibration - Shall be the adjustment, as necessary, of the channel output such that it responds with necessary range and accuracy to known values of the parameters which the channel monitors. The channel calibration shall encompass the entire channel including alarm and/or trip functions and shall include the channel functional test. The channel calibration may be performed by any series of sequential, overlapping or total channel steps such that the entire channel is calibrated. Non-calibratable components shall be excluded from this requirement, but will be included in channel functional test and source check.

12. Channel Functional Test - Shall be:
 - a. Analog/Digital Channels - the injection of a simulated signal into the channel as close to the sensor as practicable to verify OPERABILITY including alarm and/or trip functions.
 - b. Bistable Channels - the injection of a simulated signal into the sensor to verify OPERABILITY including alarm and/or trip functions.

13. Source Check - Shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source or multiple of sources.



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1.1.0 DEFINITIONS (Cont'd)

- W. Functional Tests - A functional test is the manual operation or initiation of a system, subsystem, or components to verify that it functions within design tolerances (e.g., the manual start of a core spray pump to verify that it runs and that it pumps the required volume of water).
- X. Shutdown - The reactor is in a shutdown condition when the reactor mode switch is in the shutdown mode position and no core alterations are being performed.
- Y. Engineered Safeguard - An engineered safeguard is a safety system the actions of which are essential to a safety action required in response to accidents.
- Z. Reportable Event - A reportable event shall be any of those conditions specified in section 50.73 to 10 CFR Part 50.
- AA. Solidification - Shall be the conversion of radioactive wastes into a form that meets shipping and burial ground requirements.
- BB. Offsite Dose Calculation Manual (ODCM) - Shall be a manual describing the environmental monitoring program and the methodology and parameters used in the calculation of release rate limits and offsite doses due to radioactive gaseous and liquid effluents. The ODCM will also provide the plant with guidance for establishing alarm/trip setpoints to ensure technical specifications sections 3.8.A.1 and 3.8.B.1 are not exceeded.
- CC. Purge or purging - The controlled process of discharging air or gas from the primary containment to maintain temperature, pressure, humidity, concentration, or other operating condition in such a manner that replacement air or gas is required to purify the containment.
- DD. Process Control Program - Shall contain the sampling, analysis, and formulation determination by which SOLIDIFICATION of radioactive wastes from liquid systems is assured.
- EE. Radiological Effluent Manual (REM) - Shall be a manual containing the site and environmental sampling and analysis programs for measurements of radiation and radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposure to individuals from station operation. It shall also specify operating guidelines for radioactive waste treatment systems and report content.
- FF. Venting - The controlled process of discharging air or gas from the primary containment to maintain temperature, pressure, humidity, concentration, or other operating condition in such a manner that replacement air or gas is not provided or required. Vent, used in system names, does not imply a venting process.



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TABLE 3.2.A
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No. Instrument Channels Operable Per Trip Sys(1)(11)	Function	Trip Level Setting	Action (1)	Remarks
2	Instrument Channel - Reactor Low Water Level(6)	$\geq 538''$ above vessel zero	A or (B and E)	1. Below trip setting does the following: a. Initiates Reactor Building Isolation b. Initiates Primary Containment Isolation (Groups 2, 3, and 6) c. Initiates SGTS
1	Instrument Channel - Reactor High Pressure (PS-68-93 and 94)	100 ± 15 psig	D	1. Above trip setting isolates the shutdown cooling suction valves of the RHR system.
2	Instrument Channel - Reactor Low Water Level (LIS-3-56A-D, SW #1)	$\geq 378''$ above vessel zero	A	1. Below trip setting initiates Main Steam Line Isolation
2	Instrument Channel - High Drywell Pressure (6) (PS-64-56A-D)	≤ 2.5 psig	A or (B and E)	1. Above trip setting does the following: a. Initiates Reactor Building Isolation b. Initiates Primary Containment Isolation c. Initiates SGTS

3.2/4.2-7

AMENDMENT NO. 148

TABLE 3.2.A (Continued)
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No. Instrument Channels Operable Per Trip Sys(1)(1)	Function	Trip Level Setting	Action (1)	Remarks
2	Instrument Channel - High Radiation Main Steam Line Tunnel (6)	3 times normal rated full power background (13)	B	1. Above trip setting initiates Main Steam Line Isolation
2	Instrument Channel - Low Pressure Main Steam Line	≥ 825 psig (4)	B	1. Below trip setting initiates Main Steam Line Isolation
2(3)	Instrument Channel - High Flow Main Steam Line	$\leq 140\%$ of rated steam flow	B	1. Above trip setting initiates Main Steam Line Isolation
2(12)	Instrument Channel - Main Steam Line Tunnel High Temperature	$\leq 200^\circ\text{F}$	B	1. Above trip setting initiates Main Steam Line Isolation.
2(14)	Instrument Channel - Reactor Water Cleanup System Floor Drain High Temperature	160 - 180°F	C	1. Above trip setting initiates Isolation of Reactor Water Cleanup Line from Reactor and Reactor Water Return Line.
2	Instrument Channel - Reactor Water Cleanup System Space High Temperature	160 - 180°F	C	1. Same as above
1(15)	Instrument Channel - Reactor Building Ventilation High Radiation - Reactor Zone	≤ 100 mr/hr or downscale	G	1. 1 upscale channel or 2 downscale channels will a. Initiate SGTS b. Isolate reactor zone and refueling floor. c. Close atmosphere control system.

BFN
Unit 3

3.2/4.2-8.

Amendment 167

TABLE 3.2.A (Continued)
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No. Instrument Channels Operable per Trip Sys(1)(11)	Function	Trip Level Setting	Action (1)	Remarks
1(15)	Instrument Channel - Reactor Building Ventilation High Radiation - Refueling Zone	≤ 100 mr/hr or downscale	F	1. 1 upscale channel or 2 downscale channels will a. Initiate SGTS b. Isolate refueling floor c. Close atmosphere control system.
2(7) (8)	Instrument Channel SGTS Flow - Train A R. H. Heaters	≥ 2000 cfm and ≤ 4000 cfm	H and (A or F)	Below 2000 cfm airflow R.H. heaters shall be shut off.
2(7) (8)	Instrument Channel SGTS Flow - Train B R. H. Heaters	≥ 2000 cfm and ≤ 4000 cfm	H and (A or F)	Below 2000 cfm airflow R.H. heaters shall be shut off.
2(7) (8)	Instrument Channel SGTS Flow - Train C R. H. Heaters	≥ 2000 cfm and ≤ 4000 cfm	H and (A or F)	Below 2000 cfm airflow R.H. heaters shall be shut off.
1	Reactor Building Isolation Timer (refueling floor)	$0 \leq t \leq 2$ secs.	H or F	1. Below trip setting prevents spurious trips and system perturbations from initiating isolation.
1	Reactor Building Isolation Timer (reactor zone)	$0 \leq t \leq 2$ secs.	G or A or H	1. Below trip setting prevents spurious trips and system perturbations from initiating isolation.
2(10)	Group 1 (Initiating) Logic	N/A	A	1. Refer to Table 3.7.A for list of valves.

BFN
Unit 3

3.2/4.2-9 Amendment 167

TABLE 3.2.A (Continued)
PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

Minimum No. Instrument Channels Operable per Trip Sys(1)(1)	Function	Trip Level Setting	Action (1)	Remarks
1	Group 1 (Actuation) Logic	N/A	B	1. Group 1: The valves in Group 1 are actuated by any of the following conditions: a. Reactor Vessel Low Water Level b. Main Steamline High Radiation c. Main Steamline High Flow d. Main Steamline Space High Temperature e. Main Steamline Low Pressure
2	Group 2 (Initiating) Logic	N/A	A or (B and E)	1. Group 2: The valves in Group 2 are actuated by any of the following conditions: a. Reactor Vessel Low Water Level b. High Drywell Pressure
1	Group 2 (RHR Isolation-Actuation) Logic	N/A	D	
1	Group 8 (TIP-Actuation) Logic	N/A	J	
1	Group 2 (Drywell Sump Drains-Actuation) Logic	N/A	K	
1	Group 2 (Reactor Building & Refueling Floor, and Drywell Vent and Purge-Actuation) Logic	N/A	F and G	1. Part of Group 6 Logic
2	Group 3 (Initiating) Logic	N/A	C	1. Group 3: The valves in Group 3 are actuated by any of the following conditions: a. Reactor Vessel Low Water Level b. Reactor Water Cleanup System High Temperature c. Reactor Water Cleanup System High Drain Temperature

3.2/4.2-10

AMENDMENT NO. 181

NOTES FOR TABLE 3.2.A

1. Whenever the respective functions are required to be OPERABLE, there shall be two OPERABLE or tripped trip systems for each function. If the first column cannot be met for one of the trip systems, that trip system or logic for that function shall be tripped (or the appropriate action listed below shall be taken). If the column cannot be met for all trip systems, the appropriate action listed below shall be taken.
 - A. Initiate an orderly shutdown and have the reactor in COLD SHUTDOWN CONDITION in 24 hours.
 - B. Initiate an orderly load reduction and have main steam lines isolated within eight hours.
 - C. Isolate Reactor Water Cleanup System.
 - D. Administratively control the affected system isolation valves in the closed position within one hour and then declare the affected system inoperable.
 - E. Initiate primary containment isolation within 24 hours.
 - F. The handling of spent fuel will be prohibited and all operations over spent fuels and open reactor wells shall be prohibited.
 - G. Isolate the reactor building and start the standby gas treatment system.
 - H. Immediately perform a logic system functional test on the logic in the other trip systems and daily thereafter not to exceed 7 days.
 - I. DELETED
 - J. Withdraw TIP.
 - K. Manually isolate the affected lines. Refer to Section 4.2.E for the requirements of an inoperable system.
 - L. If one SGTS train is inoperable take action H or actions A and F. If two SGTS trains are inoperable take actions A and F.
2. Deleted
3. There are four sensors per steam line of which at least one sensor per trip system must be OPERABLE.

NOTES FOR TABLE 3.2.A (Cont'd)

4. Only required in RUN MODE (interlocked with Mode Switch).
5. Deleted
6. Channel shared by RPS and Primary Containment & Reactor Vessel Isolation Control System. A channel failure may be a channel failure in each system.
7. A train is considered a trip system.
8. Two out of three SGTS trains required. A failure of more than one will require actions A and F.
9. Deleted
10. Refer to Table 3.7.A and its notes for a listing of Isolation Valve Groups and their initiating signals.
11. A channel may be placed in an inoperable status for up to four hours for required surveillance without placing the trip system in the tripped condition provided at least one OPERABLE channel in the same trip system is monitoring that parameter. For the Reactor Building Ventilation system, one channel may be inoperable for up to 4 hours for functional testing or for up to 24 hours for calibration and maintenance, as long as the downscale trip of the inoperable channel is placed in the tripped condition.
12. A channel contains four sensors, all of which must be OPERABLE for the channel to be OPERABLE.

Power operations permitted for up to 30 days with 15 of the 16 temperature switches OPERABLE.

In the event that normal ventilation is unavailable in the main steam line tunnel, the high temperature channels may be bypassed for a period of not to exceed four hours. During periods when normal ventilation is not available, such as during the performance of secondary containment leak rate tests, the control room indicators of the affected space temperatures shall be monitored for indications of small steam leaks. In the event of rapid increases in temperature (indicative of steam line break), the operator shall promptly close the main steam line isolation valves.

13. The nominal setpoints for alarm and reactor trip (1.5 and 3.0 times background, respectively) are established based on the normal background at full power. The allowable setpoints for alarm and reactor trip are 1.2-1.8 and 2.4-3.6 times background, respectively.

NOTES FOR TABLE 3.2.A (Cont'd)

14. Requires two independent channels from each physical location; there are two locations.
15. There is a RBVRM trip function for the refueling zone and a RBVRM trip function for the reactor zone. Each trip function is composed of two divisional trip systems. Each trip system has one channel for each zone. Each channel contains two sensors, both of which must be OPERABLE for the channel to be OPERABLE. A channel downscale/inoperable trip occurs when either of the sensors are indicating less than the low radiation setpoint or are inoperable. A channel upscale trip occurs when both of the sensors are indicating higher than the high radiation setpoint. Only one channel upscale trip is required for trip function initiation. Two channel downscale trips in a zone are required for trip function initiation.

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TABLE 4.2.A
SURVEILLANCE REQUIREMENTS FOR PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

<u>Function</u>	<u>Functional Test</u>	<u>Calibration Frequency</u>	<u>Instrument Check</u>
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	once/3 months (27)	(5)	once/day
Instrument Channel - Low Pressure Main Steam Line	once/3 months (27)	once/3 months	None
Instrument Channel - High Flow Main Steam Line	once/3 months (27)	once/3 months	once/day

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TABLE 4.2.A
SURVEILLANCE REQUIREMENTS FOR PRIMARY CONTAINMENT AND REACTOR BUILDING ISOLATION INSTRUMENTATION

<u>Function</u>	<u>Functional Test</u>	<u>Calibration Frequency</u>	<u>Instrument Check</u>
Instrument Channel - Main Steam Line Tunnel High Temperature	once/3 months (27)	once/operating cycle	None
Instrument Channel - Reactor Building Ventilation High Radiation - Reactor Zone	(1) (30)	once/18 months	once/day (8)
Instrument Channel - Reactor Building Ventilation High Radiation - Refueling Zone	(1) (30)	once/18 Months	once/day (8)
Instrument Channel - SGTS Train A Heaters	(4)	(9)	N/A
Instrument Channel - SGTS Train B Heaters	(4)	(9)	N/A
Instrument Channel - SGTS Train C Heaters	(4)	(9)	N/A
Reactor Building Isolation Timer (refueling floor)	(4)	once/operating cycle	N/A
Reactor Building Isolation Timer (reactor zone)	(4)	once/operating cycle	N/A

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NOTES FOR TABLES 4.2.A THROUGH 4.2.L except 4.2.D AND 4.2.K

1. Functional tests shall be performed once per month.
2. Functional tests shall be performed before each startup with a required frequency not to exceed once per week.
3. This instrumentation is excepted from the functional test definition. The functional test will consist of injecting a simulated electrical signal into the measurement channel.
4. Tested during logic system functional tests.
5. Refer to Table 4.1.B.
6. The logic system functional tests shall include a calibration once per operating cycle of time delay relays and timers necessary for proper functioning of the trip systems.
7. The functional test will consist of verifying continuity across the inhibit with a volt-ohmmeter.
8. Instrument checks shall be performed in accordance with the definition of instrument check (see Section 1.0, Definitions). An instrument check is not applicable to a particular setpoint, such as Upscale, but is a qualitative check that the instrument is behaving and/or indicating in an acceptable manner for the particular plant condition. Instrument check is included in this table for convenience and to indicate that an instrument check will be performed on the instrument. Instrument checks are not required when these instruments are not required to be operable or are tripped.
9. Calibration frequency shall be once/year.
10. (DELETED)
11. Portion of the logic is functionally tested during outage only.
12. The detector will be inserted during each operating cycle and the proper amount of travel into the core verified.
13. Functional test will consist of applying simulated inputs (see note 3). Local alarm lights representing upscale and downscale trips will be verified, but no rod block will be produced at this time. The inoperative trip will be initiated to produce a rod block (SRM and IRM inoperative also bypassed with the mode switch in RUN). The functions that cannot be verified to produce a rod block directly will be verified during the operating cycle.

NOTES FOR TABLES 4.2.A THROUGH 4.2.L except 4.2.D AND 4.2.K (Cont'd)

14. (Deleted)
15. The flow bias comparator will be tested by putting one flow unit in "Test" (producing 1/2 scram) and adjusting the test input to obtain comparator rod block. The flow bias upscale will be verified by observing a local upscale trip light during operation and verified that it will produce a rod block during the operating cycle.
16. Performed during operating cycle. Portions of the logic is checked more frequently during functional tests of the functions that produce a rod block.
17. This calibration consists of removing the function from service and performing an electronic calibration of the channel.
18. Functional test is limited to the condition where secondary containment integrity is not required as specified in Sections 3.7.C.2 and 3.7.C.3.
19. Functional test is limited to the time where the SGTS is required to meet the requirements of Section 4.7.C.1.a.
20. Calibration of the comparator requires the inputs from both recirculation loops to be interrupted, thereby removing the flow bias signal to the APRM and RBM and scrambling the reactor. This calibration can only be performed during an outage.
21. Logic test is limited to the time where actual operation of the equipment is permissible.
22. (Deleted)
23. (Deleted)
24. This instrument check consists of comparing the thermocouple readings for all valves for consistence and for nominal expected values (not required during refueling outages).
25. During each refueling outage, all acoustic monitoring channels shall be calibrated. This calibration includes verification of accelerometer response due to mechanical excitation in the vicinity of the sensor.



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NOTES FOR TABLES 4.2.A THROUGH 4.2.L except 4.2.D AND 4.2.K (Cont'd)

26. This instrument check consists of comparing the background signal levels for all valves for consistency and for nominal expected values (not required during refueling outages).
27. Functional test frequency decreased to once/3 months to reduce the challenges to relief valves per NUREG-0737, Item II.K.3.16.
28. 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.
29. 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 its output relay changes state at or more conservatively than the analog equivalent of the trip level setting.
30. Functional testing for the Reactor Building Ventilation Radiation Monitoring System (RBVRMS) shall consist of verifying the High Voltage Power Supply (HVPS) voltage at the Sensor and Convertors (detectors) is within its design limits. A channel functional test as defined in Section 1.0, "Definitions" shall be performed once per 18 months as part of the RBVRM channel calibration.



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3.2 BASES (Cont'd)

steam line isolation valve closure, fission product release is limited so that 10 CFR 100 guidelines are not exceeded for this accident. Reference Section 14.6.2 FSAR. An alarm with a nominal setpoint of 1.5 x normal full-power background is provided also.

Pressure instrumentation is provided to close the main steam isolation valves in RUN Mode when the main steam line pressure drops below 825 psig.

The HPCI high flow and temperature instrumentation are provided to detect a break in the HPCI steam piping. Tripping of this instrumentation results in actuation of HPCI isolation valves. Tripping logic for the high flow is a 1-out-of-2 logic, and all sensors are required to be operable.

High temperature in the vicinity of the HPCI equipment is sensed by four sets of four bimetallic temperature switches. The 16 temperature switches are arranged in two trip systems with eight temperature switches in each trip system.

The HPCI trip settings of 90 psi for high flow and 200°F for high temperature are such that core uncover is prevented and fission product release is within limits.

The RCIC high flow and temperature instrumentation are arranged the same as that for the HPCI. The trip setting of 450" water for high flow and 200°F for temperature are based on the same criteria as the HPCI.

High temperature at the Reactor Cleanup System floor drain could indicate a break in the cleanup system. When high temperature occurs, the cleanup system is isolated.

The instrumentation which initiates CSCS action is arranged in a dual bus system. As for other vital instrumentation arranged in this fashion, the specification preserves the effectiveness of the system even during periods when maintenance or testing is being performed. An exception to this is when logic functional testing is being performed.

The control rod block functions are provided to prevent excessive control rod withdrawal so that MCPR does not decrease to 1.07. The trip logic for this function is 1-out-of-n: e.g., any trip on one of six APRMs, eight IRMs, or four SRMs will result in a rod block.

The minimum instrument channel requirements assure sufficient instrumentation to assure the single failure criteria is met. The minimum instrument channel requirements for the RBM may be reduced by one for maintenance, testing, or calibration. This does not significantly increase the risk of an inadvertent control rod withdrawal, as the other channel is available, and the RBM is a backup system to the written sequence for withdrawal of control rods.

3.2 BASES (Cont'd)

The APRM rod block function is flow biased and prevents a significant reduction in MCPR, especially during operation at reduced flow. The APRM provides gross core protection; i.e., limits the gross core power increase from withdrawal of control rods in the normal withdrawal sequence. The trips are set so that MCPR is maintained greater than 1.07.

The RBM rod block function provides local protection of the core; i.e., the prevention of critical power in a local region of the core, for a single rod withdrawal error from a limiting control rod pattern.

If the IRM channels are in the worst condition of allowed bypass, the sealing arrangement is such that for unbypassed IRM channels, a rod block signal is generated before the detected neutrons flux has increased by more than a factor of 10.

A downscale indication is an indication the instrument has failed or the instrument is not sensitive enough. In either case the instrument will not respond to changes in control rod motion and thus, control rod motion is prevented.

The refueling interlocks also operate one logic channel, and are required for safety only when the mode switch is in the refueling position.

For effective emergency core cooling for small pipe breaks, the HPCI system must function since reactor pressure does not decrease rapid enough to allow either core spray or LPCI to operate in time. The automatic pressure relief function is provided as a backup to the HPCI in the event the HPCI does not operate. The arrangement of the tripping contacts is such as to provide this function when necessary and minimize spurious operation. The trip settings given in the specification are adequate to assure the above criteria are met. The specification preserves the effectiveness of the system during periods of maintenance, testing, or calibration, and also minimizes the risk of inadvertent operation; i.e., only one instrument channel out of service.

Two post treatment off-gas radiation monitors are provided and, when their trip point is reached, cause an isolation of the off-gas line. Isolation is initiated when both instruments reach their high trip point or one has an upscale trip and the other a downscale trip or both have a downscale trip.

Both instruments are required for trip but the instruments are set so that the instantaneous stack release rate limit given in Specification 3.8 is not exceeded.

Two radiation monitors are provided for each unit which initiate Primary Containment Isolation (Group 6 isolation valves) Reactor Building Isolation and operation of the Standby Gas Treatment System. These instrument channels monitor the radiation in the reactor zone ventilation exhaust ducts and in the refueling zone.

3.2 BASES (Cont'd)

Trip setting of 100 mr/hr for the monitors in the refueling zone are based upon initiating normal ventilation isolation and SGTS operation so that none of the activity released during the refueling accident leaves the Reactor Building via the normal ventilation path but rather all the activity is processed by the SGTS.

The allowed inoperable time of 4 hours for functional testing or 24 hours for calibration and maintenance (with the downscale trip of the inoperable channel in the tripped condition) of the Reactor Building Ventilation system is based upon a Probabilistic Risk Assessment (PRA). The assessment considered the failures, relay failures and the probability of an accident occurring for which the RBVRMs are required to operate.

Flow integrators and sump fill rate and pump out rate timers are used to determine leakage in the drywell. A system whereby the time interval to fill a known volume will be utilized to provide a backup. An air sampling system is also provided to detect leakage inside the primary containment (See Table 3.2.E).

For each parameter monitored, as listed in Table 3.2.F, there are two channels of instrumentation except as noted. By comparing readings between the two channels, a near continuous surveillance of instrument performance is available. Any deviation in readings will initiate an early recalibration, thereby maintaining the quality of the instrument readings.

Instrumentation is provided for isolating the control room and initiating a pressurizing system that processes outside air before supplying it to the control room. An accident signal that isolates primary containment will also automatically isolate the control room and initiate the emergency pressurization system. In addition, there are radiation monitors in the normal ventilation system that will isolate the control room and initiate the emergency pressurization system. Activity required to cause automatic actuation is about one mRem/hr.

Because of the constant surveillance and control exercised by TVA over the Tennessee Valley, flood levels of large magnitudes can be predicted in advance of their actual occurrence. In all cases, full advantage will be taken of advance warning to take appropriate action whenever reservoir levels above normal pool are predicted. Therefore, during flood conditions, the plant will be permitted to operate until water begins to run across the top of the pumping station at elevation 565. Seismically qualified, redundant level switches each powered from a separate division of power are provided at the pumping station to give main control room indication of this condition. At that time an orderly shutdown of the plant will be initiated, although surges even to a depth of several feet over the pumping station deck will not cause the loss of the main condenser circulating water pumps.



3.2 BASES (Cont'd)

The operability of the meteorological instrumentation ensures that sufficient meteorological data is available for estimating potential radiation dose to the public as a result of routine or accidental release of radioactive materials to the atmosphere. This capability is required to evaluate the need for initiating protective measures to protect the health and safety of the public.

The operability of the seismic instrumentation ensures that sufficient capability is available to promptly determine the seismic response of those features important to safety. This capability is required to permit comparison of the measured response to that used in the design basis for Browns Ferry Nuclear Plant and to determine whether the plant can continue to be operated safely. The instrumentation provided is consistent with specific portions of the recommendations of Regulatory Guide 1.12 "Instrumentation for Earthquakes."

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments will be calculated in accordance with guidance provided in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. This instrumentation also includes provisions for monitoring the concentration of potentially explosive gas mixtures in the offgas holdup system. The operability and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with guidance provided in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20 Appendix B, Table II, Column 2. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

ATWS/RPT, Anticipated Transients without Scram/Recirculation Pump Trip system provides a means of limiting the consequences of the unlikely occurrence of a failure to scram during an ATWS event. The response of the plant to this postulated event (ATWS/RPT) follows the BWR Owners Group Report by General Electric NEDE-31096-P-A and the accompanying NRC Staff Safety Evaluation Report.

ATWS/RPT utilizes the engineered safety feature (ESF) master/slave analog trip units (ATU) which consists of four level and four pressure channels total. The initiating logic consists of two independent trip systems each consisting of two reactor dome high pressure channels and two reactor vessel low level channels. A coincident trip of either two low levels or two high pressures in the same trip system causes initiation of ATWS/RPT. This signal from either trip system opens one of two EOC

The conclusions to be drawn are these:

1. A 1-out-of-n system may be treated the same as a single channel in terms of choosing a test interval; and
2. more than one channel should not be bypassed for testing at any one time.

The radiation monitors in the reactor and refueling zones which initiate building isolation and standby gas treatment operation are arranged such that two sensors high (above the high level setpoint) in a single channel or one sensor downscale (below low level setpoint) or inoperable in two channels in the same zone will initiate a trip function. The functional testing frequencies for both the channel functional test and the high voltage power supply functional test are based on a Probabilistic Risk Assessment and system drift characteristics of the Reactor Building Ventilation Radiation Monitors. The calibration frequency is based upon the drift characteristics of the radiation monitors.

The off-gas post treatment monitors are connected in a 2-out-of-2 logic arrangement. Based on experience with instruments of similar design, a testing interval of once every three months has been found adequate.

The automatic pressure relief instrumentation can be considered to be a 1-out-of-2 logic system and the discussion above applies also.

The criteria for ensuring the reliability and accuracy of the radioactive gaseous effluent instrumentation is listed in Table 4.2.K.

The criteria for ensuring the reliability and accuracy of the radioactive liquid effluent instrumentation is listed in Table 4.2.D.

The RCIC and HPCI system logic tests required by Table 4.2.B contain provisions to demonstrate that these systems will automatically restart on a RPV low water level signal received subsequent to a RPV high water level trip.



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