Enclosure 2
TVA Letter Dated October 29, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

Attachment 1

EDCR 52321 Draft Scope And Intent, Unit Difference And Technical Evaluation

EDCR COVER SHEET

GENERAL INFORMATION

Page No. 1

EDCR TYPE
(Check One Box Only)

☐ **EDCR #** **Rev.**
☒ **EDCR-2 #** 52321 **Rev.** A

☐ Check here if this is a Streamlined EDCR.
☐ Check here if this EDCR is for Documentation change only & No construction work is required.
☒ SR ☒ QR Check appropriate box if field material procurement quality requirements included.

094	*Various*	*Various*	*SR/QR*	*I&C*	*ASME Class 3*
System	***Building***	***Elevation***	***Quality Class***	***Lead Discipline***	***Code/Class***

WORK SCOPE STATEMENT:

Install the Westinghouse IN-Core Information, Surveillance, and Engineering (WINCISE) System. See continuation pages.

PREPARED:

Rufino Ayala 865-632-6504 07/09/10
Design Engineer **Phone** **Date**

VERIFIED:

Engineer **Date**

APPROVALS:

Civil EGS **Date**
I&C EGS **Date**
Electrical EGS **Date**
Mechanical EGS **Date**
Plant Design EGS **Date**
Project Engineering Manager **Date**

INTER DISCIPLINE REVIEWS:

Civil Engineer **Date**
I&C Engineer **Date**
Electrical Engineer **Date**
Mechanical Engineer **Date**
Plant Design Engineer **Date**
DELETED **Date**

ACCEPTANCE:

Responsible Superintendent
(If Constructability Walkdown is waived, this is N/A) **Date**

Field Engineer
(If Constructability Walkdown is waived, this is N/A) **Date**

TVA Engineering Manager **Date**

OTHER ORGANIZATIONS:

Signature/Org'n.: **Date**
Signature/Org'n.: **Date**
Signature/Org'n.: **Date**

Refer to the electronic documents in TVA Business Support Library (BSL) for current revision.

Work Scope Statement

EDCR 52321 installs the **W**estinghouse **IN-C**ore **I**nformation, **S**urveillance, and **E**ngineering (WINCISE) System to replace the Moveable Incore Detection System (MIDS) and the top-mounted Core Exit Thermocouples (CETs).

Overview

Below you will find the summary of work required to be implemented for WINCISE

Reactor Building

- Install the WINCISE Signal Processing System (SPS) Cabinets, 2-L-201 and 2-L-202, in the seal table room
    - 2-L-201, WINCISE SPS Cabinet 1, will be installed near elevation 730' azimuth 67°
        - In order to properly mount 2-L-201, the grating north of the seal table must be replaced with a solid plate
    - 2-L-202, WINCISE SPS Cabinet 2, willl be installed near elevation 730' azimuth 106°
        - 2-L-202 will be installed on the concrete south of the Seal Table
    - The cabinets shall be bolted to the base plate/concrete using mounting hardware specified by Westinghouse
- Westinghouse with the help of Bechtel craft will install Incore Instrumentation Thimble Assemblies (IITAs) <u>after</u> fuel load
    - This includes proper torquing and installation of maintenance fitting
- Field to route Westinghouse supplied cables from Seal Table to 2-L-201, 2-L-202, Penetration 18, and Penetration 33
    - Field to replace the following feedthroughs in Penetration 33 with Westinghouse supplied CET feedthroughs:
        - Feedthrough 33-8, -9, -10, -12, and -13
    - Field to replace the following feedthroughs in Penetration 18 with Westinghouse supplied CET feedthroughs:
        - Feedthrough 18-9, -10, -11,-12, and -13
- Route fiber optic cable from 2-L-201 to 2-L-437 and 2-L-202 to 2-L-437
    - For each cable, four single mode fibers shall be used
    - For each single mode fiber, an ST connector shall be used on the ends connecting to 2-L-201 and 2-L-202
    - For each single mode fiber, an SC connector shall be used on the ends connecting to 2-L-437
- Continue Routing of power cables from Breaker 9 of the 120V AC Vital Bd. 2-III and 2-IV to 2-L-201 and 2-L-202, respectively
    - 2-L-201 will be fed from 120V AC Vital Bd. 2-III Breaker 9
    - 2-L-202 will be fed from 120V AC Vital Bd. 2-IV Breaker 9
- Modify the moveable frame assembly to add a grid to support extraction of IITAs during refueling
- Remove remaining Manual Motor Controllers for Drive Unit 2A and 2D that were left as an option to re-use 480V feeds for SPS cabinets

    - Cabinet power is from 120V Vital Boards so the 480V feeds are no longer required

Co- and Prerequisite EDCRs for Reactor Building Work

- 52315 - (Co-req.) - Installs fiber optic panel in 2-L-437
- 54639 - (Co-req.) - Routes fiber optic cable from 2-L-437 to penetration 22
- 55233 - (Co-req.) - Routes fiber optic cable from penetration 22 to 2-R-177
- 53388 - (Pre-req.) - Removes platforms located on both sides of the Seal Table at EL 736'
- 52815 - (Pre-req.) - Removes equipment associated with the Moveable Incore Detection System (MIDS) located in the Seal Table Room

Computer Room

- Install the following equipment in 2-R-158:
    - Two (2) Application Servers [DELL R170 PowerEdge Servers]
    - One (1) Domain Server [DELL R170 Poweredge Server]
    - Two (2) IISNet Switches [Cisco WS-C2960-24TT-L]
    - Two (2) IP Switches [Cisco WS-C2960-24TT-L]
    - Two (2) BEACON Servers [HP Proliant DL380 G6 Servers]
    - Two (2) Ultrium 920 Tape Drives
    - Two (2) Media Converter Chassis [EtherWAN EMC1600]
- Route four single mode fibers from 2-R-155 to 2-R-158
    - The single mode fiber connecting to the media converters will have SC connectors
    - Electricals - Verify that I do NOT need a fiber optic panel (FOP) in 2-R-158.
- Route two Ethernet cables from 2-R-158 to 2-R-153 to connect to switch 2-XS-261-153A
- Route power cables from 120V AC Instrument Power Rack A (2-BD-278-M7A) Breaker 7 and 8 and 120V AC Instrument Power Rack B (2-BD-278-M7B) Breaker 7 and 8 to 2-R-158
- Westinghouse will provide all necessary dongles for connecting to KVM switch(es)
- Interconnections between components are identified on DRA 52321-018
- Field to procure and install necessary AC Distribution boxes and power outlets in 2-R-158
- Software Service request will be initiated to create Application Server/ICS software interface

Co-, Prerequesite, and Related EDCRs for Computer Room Work

- EDCR 52315 (Co-req.) - Installs fiber optic panels in computer room and purchased a spare rack that will be used for 2-R-158
- EDCR 54228 (Co-req.) - Verifies and lands fiber optic cables in various fiber optic panels
- EDCR 54639 (Rela.) - Bulk cable pull package that routes cables from L-437 to Penetration 22
- EDCR 55233 (Rela.) - Bulk cable pull package that routes cables from Penetration 22 to 2-R-177 and 2-R-177 to 2-R-155

EDCR UNIT DIFFERENCE FORM

EDCR# 52321 **Rev.** A **Page No.** ______

Operations Difference is identified as follows:

The Moveable Incore Detection System (MIDS) and top-mounted CETs are being completely replaced with the Westinghouse INCore Instrumentation, Surveillance, and Engineering (WINCISE) System:

- Controls and indication relating to MIDS is no longer required on 2-M-18 and ICS
- WINCISE introduces Incore Instrument Thimble Assemblies (IITAs) which create the following differences:
  - 58 CETs instead of 65 and CETs located in different core locations
  - 290 Self Powered Vanadium Detectors (SPD) [5 per IITA] located through the upper, middle, and lower areas of the core instead of using 6 detectors
  - Detectors do not need to be moved to obtain a flux map
  - During certain accident scenarios, it is possible for the CETs to see temperatures up to 20°F different from Unit 1
- In order to process the microampere analog signals, Signal Processing System (SPS) Cabinets 2-L-201 and 2-L-202 are installed in the Seal Table Room. As a result:
  - Each cabinet collects and does Analog-to-Digital conversions for 29 IITAs
  - SPS Cabinets shall operate at temperature up to 130°F ± 10°
    - Temperatures above this limit results in power being cutoff to the SPS electronics
    - Power is returned to SPS electronics once temperature drops below 110°F± 10° and breakers are cycled OFF/ON
  - Redundant communication paths are provided within each cabinet to ensure that no single component failure results in data not being sent to the Application Servers located in 2-R-158
  - Each cabinet has two single mode fiber outputs with the same cabinet status and neutron flux information corresponding with that cabinet going to 2-R-158
- BEACON Power Distribution Monitoring System (PDMS) system no longer interfaces directly with the Integrated Computer System (ICS):
  - Application Servers, Domain Server, fiber optic converters, and switches provide BEACON with data from both cabinets and other plant data
  - Information between BEACON and ICS is transferred by the Application Servers
  - Redundant communication paths allow for BEACON servers to receive data from each SPS cabinet regardless of a single failure

Unit 2 TVA Operations Acceptance (Mgr or Designee): **Date:**

Maintenance Difference is identified as follows:

The Moveable Incore Detection System (MIDS) and top-mounted CETs are being completely replaced with the Westinghouse INCore Instrumentation, Surveillance, and Engineering (WINCISE) System:

- Troubleshooting or maintenance activities for the Incore Instrumentation System will now only involve the IITAs, SPS Cabinets and internal electronics, Application Servers, Domain Server, BEACON servers, fiber optic converters, switches and all interconnecting cables and peripherals
- The outage activities related to the Incore Instrumentation System are different:
  - CETs cable are no longer connected to the reactor vessel head, thus no CET outage work in this area is required
  - IITAs are retracted until they are out of the fuel assembly and stored within the bottom mounted instrument (BMI) thimble guide tubes
    - Moveable frame assembly will hold retracted IITAs in place
  - Eddy current testing will not be required on IITAs
    - Westinghouse calculation notes have indicated that a comparison between IITA and U1 thimbles results in IITAs having a higher natural frequency and lower vibration amplitude. Thus the IITAs are expected to exhibit essentially no wear due to vibrations
    - Unlike U1 thimbles, a breach of the IITA outer sheath does **not** result in a loss of the RCS pressure boundary
  - "Pinging" of the loose parts monitoring system (LPMS) sensor at the bottom of the vessel must be done after fuel load and after IITAs are inserted back into the core
- Certain SPS electronics (further details are provided in SPS Cabinet Tech Manual) shall be removed prior to performance of any integrated leak rate testing

Unit 2 TVA Maintenance Acceptance (Mgr or Designee): **Date:**

Design Difference is identified as follows:

The Moveable Incore Detection System (MIDS) and top-mounted CETs are being completely replaced with the Westinghouse INCore Instrumentation, Surveillance, and Engineering (WINCISE) System:

- Fission chamber detectors, thimbles, 5-path and 10-path rotary devices, drive units, and all associated controls and indication are replaced by the IITAs
- IITAs each contain five vanadium self-powered detectors (SPD) and one Type-K thermocouple
    - The five detectors are distributed between lower and upper areas of the core
    - Due to the new CET location, it is possible for the CETs to measure temperatures up to 20°F different from Unit 1 under certain accident scenarios
    - WINCISE does not require input from more than 75%
- For MI cable system from the electrical connector at the end of the IITA to the SPS Cabinets and Penetration 18 and 33:
    - Certain portions of the cable system requires that PAM (CETs) signals be housed in the same cable with neutron flux (non-safety related)
    - The two channels/trains of the PAM 1/2 CET cables are bundled at the seal table and no protection is provided by the rod control mechanisms and rod position indicator stacks
    - Five feedthroughs on Penetration 18 and 33 will be replaced with Westinghouse supplied equipment
        - This allows for the reference junction boxes to be removed from containment and for Type-K thermocouple splices to be located outside of containment
- SPS cabinets will collect and provide analog-to-digital conversion from neutron flux signals prior to sending it along with cabinet status to the Application Servers
    - Redundant communication paths are provided within each cabinet to ensure that no single component failure results in data not being sent to the Application Servers located in 2-R-158
- BEACON receives neutron flux information and additional plant data from the Application Servers instead of directly from ICS
    - To address cybersecurity, only the Application Servers, via a firewall, communicate with the ICS. All other data traffic is maintained within the WINCISE network and not seen by any other devices
- Differences identified under Maintenance and Operating Differences also describe further design changes

Unit 2 TVA Engineering Acceptance (Mgr or Designee): **Date:**

Prepared By: **Date:**

Streamlined EDCR approved by TVA Oversight______________________________

SESG TO ROUTE A COPY OF THIS COMPLETED FORM TO TVA TRAINING MANAGER AND TO UNIT 2 LICENSING.

This attachment provides topics to be considered when evaluating the technical and safety aspect of changes being implemented in WBN Unit 0 and/or Unit 1 by the EDCR-2 process; see Reference 5.0A. It is not intended to be an all inclusive list of items to be considered. It is to be used as an aid in determining attributes that should be addressed in a technical evaluation. Information is also provided to aid in determining coordination interfaces. These are minimum guidelines which are primarily excerpts from SPP-9.3. It should be recognized that many topics and changes involve multiple disciplines and organizations and technical considerations must be coordinated accordingly. All parts of Attachment 1 must be considered for applicability for the associated EDCR-2.

GENERAL:

☑ YES ☐ NO 1. Are the nuclear safety functions, protective safety functions, Class IE requirements, or Seismic Category I or I(L) requirements of a design criteria, system description, FSAR, Technical Specification (Bases), or Technical Requirements Manual (Bases) affected?

Changes to the safety function, Class 1E requirements and Seismic Category IL requirements of the Incore Instrumentation System will described in the Unit 2 System Description. A Unit 2 System Description change package is required to be completed prior to issuing EDCR 52321.

Additionally, changes to FSAR, TS, TS Bases, TRM, and TRM (Bases), as a result of this modification, are required to be included as part of the final issued EDCR

☑ YES ☐ NO 2. Is there an operational/configuration change? Is a component being added to or removed from the plant? Is a component being disabled or abandoned in place? Is the normal or accident position of a valve changing? Is an electrical isolation device being added or deleted? Is a portion of the system being rerouted?

The replacement of the Moveable Incore Detection System (MIDS) and top mounted CETs with WINCISE will results in an operational/configuration change by:

- **Replacing 6 moveable fission chamber detectors and their associated drive units and controls with 58 fixed Incore Instrument Thimble Assemblies (IITAs). Each IITA consists of five (5) self-powered vanadium detectors (SPDs) and a Type K thermocouple**
  - **The MIDS controls and status information in 2-M-18 are no longer required**
  - **Flux mapping can now be done without having to move any detectors**
  - **The Integrated Computer System (ICS) status points relating to MIDS are no longer required**
- **Reducing the number of CETs from 65 to 58**
- **Requiring that IITAs only be retracted out of the fuel assembly instead of retracting them and placing them in storage within the crane wall as done for fission chamber detectors**
- **SPS cabinet status and neutron flux information will be transmitted from SPS cabinets to the Application Servers where it is collected and sent to the Best Estimate Analyzer for Core Operation - Nuclear (BEACON) Power Distribution Monitoring System (PDMS) along with additional Integrated Computer System (ICS) information.**

GENERAL:

☑ YES ☐ NO 2. **[continued from previous page]**

The following components are being added by this modification:

- **Two SPS Cabinets**
- **Swagelok Maintenance Fittings**
- **58 Incore Instrument Thimble Assemblies (IITAs)**
- **MI Cable system from seal table to SPS Cabinets and to Penetration 18 and 33**
- **WINCISE Server Rack 2-R-158 in Computer Room with BEACON, Application Servers, Domain Server, Switches, fiber optic converters and necessary peripherals**
- **Necessary fiber cables and connectors from SPS Cabinets to the IP Switches located in 2-R-158**

The following components are being deleted by this modification:

- **Manual Motor Controller for Drive Units 2A and 2D**

☑ YES ☐ NO 3. Could the change affect the basic function of a structure, system or component that performs or supports the performance of a safety function (deleting or changing logic interlocking, additional pumps, etc.)? Is the most limiting operating condition or design criteria imposed on the change, or by the change, evaluated? Include effects by or on Safety Related or Non-Safety Related systems in their various possible configurations. Does the change meet or exceed design criteria or other SSCs in similar applications?

The CETs continue to have the same function even though they are fewer in number and located in different core locations.

Since the MI cable system is shared between the safety related CET and non-safety related neutron flux signals, Class 1E power source with qualified isolation device is being used for the Signal Processing System (SPS) cabinets to provide adequate protection to CET signals and allows for classification of SPS cabinets as non-1E

☑ YES ☐ NO 4. Could the change affect environmental conditions such as pressure, temperature, humidity, flooding, corrosiveness, site elevation, nuclear radiation (both rate and total integrated dose), and duration of exposure in either harsh or mild areas?

There is a good possibility that the duration and amount of exposure during outages related to CET and Incore Instrumentation System activities to be lower in Unit 2

- **No work will be required for CETs at the top of reactor vessel**
- **Fission chamber detectors will not be required to be extracted from the core and placed into crane wall storage**

GENERAL:

If "YES", the change shall be coordinated with the Lead Electrical/I&C Engineer, and if applicable, with ME/NE for potential revisions to the EQ/MEQ Binders.

☑ YES ☐ NO

5. Could the change involve relocating or reorienting a device or system which could impact location-specific dose calculation or shielding analyses or place the device or system in an area with different environmental conditions?

Portions of the MI cable system for the CETs will be in areas with less severe environmental conditions as a result of IITAs providing neutron flux and CET signals.

If YES, coordinate with ME/NE to revise the affected location specific dose calculation, environmental drawings, and EQ/MEQ documentation.

☐ YES ☑ NO

6. Are Security Systems modified?

☐ YES ☑ NO

7. Does the modification add quantities of chemicals that may have an impact on control room habitability?

If YES, evaluate impact on control room habitability per NRC Reg. Guide 1.78.

☑ YES ☐ NO

8. Has the component being added or modified been evaluated for proper physical orientation? Components that require consideration are: capacitors, relays, check valves, steam traps, flow and level measuring devices, pressure switches, and solenoid valves. Other components may require consideration based on special applications, unique circumstances or vendor/manufacturer's recommendations.

Equipment being added and requiring considerations is being installed per vendor's recommendation and/or instructions.

☑ YES ☐ NO

9. Based on the following considerations does the change create an operating unit difference?

☑ YES ☐ NO

The change being made creates operational differences that would affect actions by the Operations staff.

Use of the new WINCISE system no longer requires the use of the manual controls or indication on 2-M-18.

If YES, coordinate with Operations to ensure impacts on training are considered.

☑ YES ☐ NO

The change being made creates operational differences that would affect the simulator.

With the installation of the WINCISE equipment, there is no longer a need to use the controls and indicators for MIDS located on 2-M-18

GENERAL:

If YES, coordinate with Operations to ensure simulator is updated.

☑ YES ☐ NO The change being made creates unit differences that are economically feasible and would improve the operation or maintenance of the other unit or units.

This change is intended to reduce the operating and maintenance cost of the Incore Instrumentation System and Incore Thermocouple System by:

- **Reducing radiation exposure during outages by not having to disconnecting/reconnecting CET cables from reactor vessel head**
- **Reducing radiation exposure during outages by not having to withdraw fission chamber detectors out of the core into storage within the crane wall**
- **Providing flux maps without needing to move the detectors**
- **Reducing risk associated with losing operability of Drive Units and being unable to access certain thimbles due to excessive wear**

If YES, initiate the appropriate package for Technical Review Committee.

☑ YES ☐ NO 10. Have considerations for mounting, connecting, and positioning of components included an evaluation of the required robustness of associated elements? Has the evaluation for robustness considered the need for protection from bumping, jarring, vibration, etc?"

Equipment being added and requiring consideration is being installed per vendor's recommendation and/or instructions.

☐ YES ☑ NO 11. Is this modification subject to vibration, thermal movement, and/or leaks on trip sensitive equipment? (i.e., replace carbon steel piping with stainless steel piping, modify routing such that thermal flexibility is reduced, modify support or support locations to resist thermal expansion, process and/or pneumatic leaks.) If yes, develop and incorporate a monitoring plan.

CIVIL

☐ YES ☑ NO 1. Does the change potentially impact pipe break considerations, pipe whip, or jet impingement? Consideration should include changes to operating modes, the addition or rerouting or high energy pipe greater than 1 inch nominal diameter, or change or modify pipe rupture protection devices. Does the change relocate or add potential targets such as electrical components, equipment, conduits, instruments or air lines to compartments containing fluid systems? The change may be evaluated generically rather than on a case-by-case basis as described in Civil Design Guide DG-C1.2.10.

☑ YES ☐ NO 2. Does the change affect piping vibration or testing requirements? Was there a mass change? Were supports added/deleted? Was an orifice, valve, or other flow device added or deleted? Was there an operational or configuration change?

For operational/configurational changes, see question 2 under GENERAL section

☑ YES ☐ NO 3. Are Seismic Category I or I(L) components added, deleted, or modified? Are components in a Seismic Category I structure added, deleted, or modified? Does the change affect the seismic or dead weight analyses?

The WINCISE cabinets are being installed in the Reactor Building (a seismic category I structure) and there will need to be a seismic analysis done on the cabinets.

☐ YES ☐ NO 4. Does the change involve an existing attachment on a Seismic Category I structure/civil feature (e.g., new loads generated, revise loads previously approved, physical modification required at interface points) or the addition of an attachment to and/or penetration of a Seismic Category I structure(s)? Does the change affect the attachment or add attachments of engineered features to masonry block walls in a Seismic Category I structure? Does the change impact the fire resistance rating of a fire barrier?

The WINCISE cabinets are being installed in the Reactor Building (a seismic category I structure) and there will need to be a seismic analysis done on the cabinets. They are not being attached to masonry blocks and will not impact the fire resistance rating of a fire barrier.

☐ YES ☑ NO 5. Could the change affect WBN Probable Maximum Precipitation (PMP) site drainage (i.e. add or obstruct surface to water flow, divert or reroute a flow path, change ground surface contours, change from vegetation to concrete or pavement, etc.).

If YES is the response to any of these questions, consult Civil Engineering.

ELECTRICAL/INSTRUMENTATION & CONTROLS:

☑ YES ☐ NO 1. Does the change affect breaker alignment, electrical loads, or electrical separation/isolation?

The new electrical components installed will increase loads on the 120V AC Vital Board 2-III and 2-IV, and the 120V AC Instrument Power A and B Racks.

The removal of the two remaining 480V feeds that were used for the Incore Flux Drive Units A and D reduces the load on

☐ YES ☑ NO 2. Is any low or medium voltage (V3, V4, or V5) electrical containment penetration protector (circuit breaker or fuse) involved?

☐ YES ☑ NO 3. Has any electrical load classification changed (non-1E to 1E)? Is the Class 1E classification for a fuse on the Fuse Tab changing?

☐ YES ☑ NO 4. Does the change involve instrument set points, instrument/relay settings or other instrument information found in EMPAC? Is the change consistent with N-specs (e.g., instrument line slopes and installation)? Has reset and deadband been evaluated?

☑ YES ☐ NO 5. Does the change alter, add, or delete Post Accident Monitoring (PAM) equipment or affect the type, category, or operating time of existing equipment? (See Design Criteria for the list of PAM variables.)

This modification will reduce the number of CETs required for PAMS from 65 to 5

If YES, coordinate with M/N, EE, Operations and Licensing to ensure continued Reg. Guide 1.97 compliance.

☐ YES ☑ NO 6. Does the change involve instrument ratings? (Relay or solenoid coil ratings, contact ratings, duty cycles, etc.)

☑ YES ☐ NO 7. Does the change challenge the capacity of another system (Air conditioning system heat load, control air load, electrical load)?

Calculations affected by the increased heat and electrical load will be reviewed and revised as necessary to ensure that this modifications does not exceed the allowable/maximum values

☑ YES ☐ NO 8. Does the change affect the operating or accident environment or instrumentation? Is the electrical equipment or instrumentation required to operate in the affected environment? Have potential operating and accident environments of equipment been considered?

ELECTRICAL/INSTRUMENTATION & CONTROLS:

Portions of the CET cables are now located in an environment less severe than its previous location.

The IITA electrical connector and CET portions of the MI cable system are required to operate in their new operating and accident environment. The SPS cabinets are only required to operate in their operating environment

☑ YES ☐ NO 9. Have the effects of EMI/RFI been considered?

The SPS cabinets have been tested and demonstrated to show compliance with the applicable requirements specified by Reg. Guide 1.180 Rev. 1

☑ YES ☐ NO 10. Is the logic of system operation changed? Are new or modified interfaces (physically or electrically) with safety related or important to safety equipment created?

New interfaces are created between safety and non-safety related equipment with the use of the same MI cable for the SPS cabinets (non-safety related) and CET signals (safety related).

The logic of the Incore Instrumentation System is changed by replacing MIDS with WINCISE.

☑ YES ☐ NO 11. Does the change affect, add, or delete equipment within the scope of 10CFR 50.49 (EQ)? Review appropriate documents such as MEL, Essentially Mild Calculations, Category & Operating Times Calculations, and/or equipment in a harsh environment? Cable must be considered (e.g., mild to harsh environment).

This modification adds/affects the following cables and equipment within the scope of 10CFR50.49 (EQ):

- **MI Cables**
    - **Although all portions of the MI cables are qualified, only those sections carrying CET signals will be added to EQ binders**
- **CETs and IITA Electrical Connector**
- **Reduces the number of CETs from 65 to 58**

If "YES", the change shall be coordinated with the EQ and MEQ Program Engineers for potential revisions to EQ/MEQ Binders.

☐ YES ☑ NO 12. Could the change affect materials such as lubricants, seals and O-rings, which could impact Qualification Maintenance Data Sheet (QMDS) requirements and qualification analyses, and invalidate test data, or could the change affect special maintenance (QMDS) and/or administrative requirements and controls that might impact the qualification of an item?

ELECTRICAL/INSTRUMENTATION & CONTROLS:

If YES, coordinate with the responsible discipline on revisions to the QMDS.

☐ YES ☑ NO 13. Does the change involve a power, control, or instrumentation circuit for a 10CFR50.49 component either by direct connection or relay logic or involve a non-10CFR50.49 power control or instrumentation circuit which have a credible circuit interaction failure mode with 10CFR50.49 power control or instrumentation circuit?

If YES, perform an analysis in accordance with SPP-9.2, Appendix I for any safety-related cables or components located in a harsh environment that are designated as Category C (i.e. not required to be addressed in the EQ program).

☐ YES ☑ NO 14. Does the change upgrade the function of an existing device/cable such that additional QA records and documentation are needed to support 10CFR50.49 Qualification in accordance with 10CFR50, Appendix B manufacturing, procurement, installation, etc.)?

If YES, provided additional documentation as required.

☐ YES ☑ NO 15. Does the modification affect components/equipment that require periodic testing of electrical test points.

If YES, provide appropriate test jacks which are accessible to prevent accidental contact with adjacent electrical terminations during testing.

☑ YES ☐ NO 16. Does the modification change functional logic which has the potential of affecting design characteristics?

If YES, evaluate PER/NER history on the equipment being modified to determine if problems have previously been identified.

Installation of WINCISE replaces the functional logic behind MIDS. Review of PERs associated with System 094 found the following issues:

- **Detectors cannot be inserted or are partially inserted into thimbles so a proper flux map using that core location is not possible**
- **Potential problems with withdrawal limit switch settings**
- **Detectors getting stuck during withdrawal from core**
- **Risk of not being able to perform flux map using a minimum of 44 core locations as required by TRM**
- **Continued failure of detectors**

ELECTRICAL/INSTRUMENTATION & CONTROLS:

☑ YES ☐ NO 17. Does the modification involve a programmatic or digital logic controller?

If YES, has the addition of uninterruptible power supplies been considered?

The SPS cabinets are fed from the 120V Vital Boards 2-III and 2-IV which are battery backed

☑ YES ☐ NO 18. Does the modification involve fault tolerant non-safety-related equipment important to operation such that the need for redundant power sources should be considered (such as CERPI control room devices)?

SPS cabinets 2-L-201 and 2-L-202 are fed from 120V AC Vital Board 2-III (Train A) and 2-IV (Train B), respectively

120V AC Instrument Power Racks A and B each provide two feeds to the WINCISE Computer Rack 2-R-158 to support redundancy.

☐ YES ☑ NO 19. Does the design or modification impact an Integrated Computer System (ICS) data point that is also an Emergency Response Data System (ERDS) data point?

If YES, coordination with Site Licensing is required in accordance with 10CFR50 Appendix E.

☐ YES ☑ NO 20. Does the design or modification impact off site power capability or ability to meet 10CFR50 Appendix A Criterion-17 requirements?

If YES, coordinate with Electrical Lead Engineer.

MECHANICAL:

Ensure EQ requirements addressed for ancillary subcomponents (e.g., Limit Switches on Mechanical only valves). Coordinate with Electrical EQ Engineer as necessary.

☐ YES ☑ NO 1. Does the change affect design conditions or requirements such as process pressure, temperature, chemistry or operating cycles? Is the change affected by operation of other systems, either Safety Related or Non-Safety Related in any of their various operating configurations?

If YES, ensure the evaluation encompasses all aspects of the affected system, including impacts on interfacing systems. Coordinate with MEQ Program Engineer for potential revisions to affected MEQ documentation.

☐ YES ☑ NO 2. Does the change affect ECCS, decay heat removal systems, or MPC cooling ancillary equipment? Ensure that any changes are consistent with the safety analyses for the plant including WBN SAR Chapter 15 NPSH minimum flow requirements, diesel loading sequencing, and ultimate heat sink limits.

☑ YES ☐ NO 3. Is the Auxiliary Building Secondary Containment Enclosures (ABSCE) as defined in WBN2-30AB-4001, affected by this change? Does this change modify any cable, cable tray, conduit, duct, pipe, or instrument tubing penetrating secondary containment? Consult 46W501 drawing series for the locations of the ABSCE Boundary, and discuss proposed changes with the NSSS EGS. A justification for the "Yes/No" is required.

The routing of power cables from 120V AC Vital Boards and 120V AC Instrument Power Racks is expected to require breaches into ABSCE boundary and/or the Main Control Room Habitability Zone

☑ YES ☐ NO 4. Does the change involve potential heating, ventilation, and air-conditioning (HVAC) system impacts resulting from adding heat loads, altering air flow or ductwork etc.?

The addition of the WINCISE Computer Servers and associated hardware in the Computer Room will cause an impact to the HVAC systems as a result of the added heat loads.

☐ YES ☑ NO 5. Does this change make any alterations or configuration changes to Motor Operated Valves (MOVs) or Air Operated Valves (AOVs)? Does this change impact any MOV or AOV Program documents? Impacts that should be considered include changes to instrumentation or control circuits, power supplies, or change system operating or design conditions such as pressure and flow rate.

☐ YES ☑ NO 6. Does this change involve replacement of a complete valve or valve internals which are located in a system that interfaces directly with the Reactor Coolant System (RCS)? Procurement requirements should evaluate valve and valve internals replacements that are located in or interfaces with the Reactor Coolant System (RCS) for hard faced components that are non-cobalt bearing. Hard facing alternatives include NOREM Nitronic 60 and may include other non-cobalt materials as approved by Engineering. Cobalt bearing hand materials is a concern in fluid systems that contain radioactive materials.

MECHANICAL:

☐ YES ☑ NO 7. Does the modification add a new check valve or impact an existing check valve? Ensure the valve is sized properly, proper type for required service, properly oriented, located suitable distance from upstream components that cause turbulent flow.

☑ YES ☐ NO 8. Does the modification add, delete, or reroute components in a mechanical piping system? If Yes, will the added components come in contact with borated water or some other harsh environmental area?

The Incore Instrument Thimble Assemblies (IITAs) will be installed in the Bottom Mounted Instrument (BMI) thimble guide tubes and are in contact with the RCS borated water. Additionally, the IITA connector is located in the seal table which is a harsh environment.

☐ YES ☑ NO 8a. Does the modification affect the ASME Section III Code (Class 1, 2, and 3) boundary. If "YES", ensure that the materials and installations meet the applicable ASME Code.

☐ YES ☑ NO 9. Does this modification introduce material into the containment that could become dislodged *during* LOCA *or other events and* contribute to Emergency Core Cooling system (ECCS) sump screen or strainer blockage? Does this modification affect protective coatings inside the containment?

☐ YES ☑ NO 10. Does the modification increase the possibility of flooding from a Moderate Energy Line Break?

☐ YES ☑ NO 11. Does the modification affect the power uprate?

☐ YES ☑ NO 12. Are there NUREG-0612 impacts? Does the change add, delete, or alter a permanent handling system? Does the change move a heavy load path over safe shutdown equipment or move safe shutdown equipment into a heavy load path?

☑ YES ☐ NO 13. Does the change affect barriers such as walls, doors, penetrations, relief panels, and ducts which could affect HVAC flow paths, fire barriers, or environmental conditions in either harsh or mild areas?

If the answer to any of the above questions is "YES", the change shall be coordinated with the Mechanical EGS.

It is expected that the routing of new power cables from 120V AC Vital Boards and 120V AC Instrument Power Racks will require breaches into ABSCE boundaries, fire barriers, and/or Main Control Room Habitability Zone

☐ YES ☑ NO 14. Is a new material being added and does the change affect components susceptible to Flow Accelerated Corrosion (FAC) or Microbiologically Induced Corrosion (MIC)?

☐ YES ☑ NO 15. Does the modification increase the susceptibility for cavitation?

MECHANICAL:

☐ YES ☑ NO

16. Could the change affect location or operation of high energy piping systems, location or operation of radioactive piping systems, operation of environmental control systems, or environmental barriers such as walls, doors, relief panels, piping/other thermal insulation, and ducts which could affect environmental conditions in either harsh or mild areas?

If YES, coordinate with ME for potential revision to the environmental drawings/design criteria and coordinate with EE for potential impact to EQ of equipment.

☐ YES ☑ NO

17. Does the change involve any valve tabulation information?

If YES, include the completed MEL Data Entry Sheet in the EDCR-2 Package.

☐ YES ☑ NO

18. Does this change affect the Seismic Category I boundary?

If YES, the applicable Seismic Category I Boundary calculations must be revised.

NOTE: Issuing a design calculation in accordance with NEDP-2 is the means of assuring that the applicable Seismic Category I Boundary calculation is revised.

☐ YES ☑ NO

19. Does the modification change ventilation, cooling requirements for electronic equipment?

If YES, coordinate with Mechanical Engineering for determination of impact on HVAC coolant.

☐ YES ☑ NO

20. Does the modification involve strainers for a raw water supply?

If YES, proper strainer selection should be based on industry guidelines (Fluid Controls Institute Std 89-1) and specific site criteria. Major consideration should be given to the following: type of strainer, redundant strainer capability, materials/housing, perforations number and arrangement, mesh size & free area, capacity and pressure loss, fluid type, particle weight & shape, macro fouling and aquatic debris potential, operating parameters, filtration versus separation, blow down line sizing, vendor recommendations, automatic back flushing and the necessity of a bypass line.

NOTE: Contact the appropriate program coordinator in the Mechanical Programs group (or in Plant Design for MOV questions) if any Engineering Design Program(s) are impacted by the proposed modification.

MECHANICAL:

☑ YES ☐ NO

21. Does the change directly or indirectly impact Mechanical or Electrical Appendix R equipment, or cables, required for safe-shutdown per 10CFR50 Appendix R (TI-277 at WBN)? (If the answer to any of the following questions is "YES", then the answer to Question 22 is "YES".)

☐ YES ☑ NO Does the modification involve a system, component or structure required for Appendix R safe shutdown capability?

☑ YES ☐ NO Does the modification involve a fire rated barrier (includes fire door, fire damper, fire wrap, walls, floors, ceilings, penetration seals, etc.)?

It is expected that the routing of new power cables from 120V AC Vital Boards and 120V AC Instrument Power Racks will require breaches into the ABSCE boundary, fire barriers, and/or Main Control Room Habitability Zone

☐ YES ☑ NO Does the modification affect a suppression system, the detection system, or Appendix R required lighting, including the illumination path?

☑ YES ☐ NO Does the modification introduce or remove combustible material or fire source in the area?

Combustibles will be added to the Computer Room (EL 708 room C-3). Unit 2 combustible loading calculation MDQ00299920090342 will be revised to reflect additional loading

If YES, contact the 10CFR 50 Appendix R Program Engineer.

PERATIONS/HUMAN FACTORS:

☐ YES ☑ NO 1. Does the change involve compensatory measures or require an increase in operator staffing to complete newly required actions?

☑ YES ☐ NO 2. Does the change affect the main control room or the backup control areas (Environment, workspace, controls and displays)?

If YES, human factors must be addressed.

HFE evaluation will be completed as part of final package

☑ YES ☐ NO 3. Are OSHA considerations included? Whenever replacement or major repair, renovation, or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment must be designed to accept a lockout device. This applies to mechanical and electrical devices.

Breakers aside from those at the 120V AC Vital Boards are provided in each SPS Cabinet for isolation of the system. Additionally, the WINCISE Computer Rack (2-R-158) can be isolated from its power feeds via the breakers located in the 120V AC Instrument Power Racks

☐ YES ☑ NO 4. Does the modification affect valves listed in the locked valve checklist maintained by Operations and the locked position shown on design output?

If YES, ensure that design output (DRAs/drawings) agree with the locked position of applicable valves or coordinate a revision to the locked valve checklist, if necessary.

OTHER:

☐ YES ☑ NO 1. Does the change affect equipment diversity, failure modes, single failure criteria (DS-E2.0.2, "Single Point Failure For Power Generation Reliability"), equipment redundancy, or equipment reliability?

☑ YES ☐ NO Does the modification install redundant equipment?

If YES, utilization of redundant attendant equipment (e.g., power from alternate sources) shall be considered and addressed.

☐ YES ☑ NO 2. Does the modification change System 18, 43, 66, 77, or 90, or potentially impact the plant Chemistry Organization (i.e., sampling, procedures, training, spare parts, chemical treatments, etc.)?

☐ YES ☑ NO 3. Does the change involve environmental impacts? (If ANY of the Below questions are answered "YES", then question 3 must be answered "YES".)

☐ YES ☑ NO Will the modification require new Chemicals (as defined in SPP-5.4) to be used anywhere onsite or result in a change in plant chemical storage or usage?

☐ YES ☑ NO Will the modification generate any new wastes? (Solid, Liquid, Hazardous, Universal, Used Oil, Radioactive, etc.) or result in the release of any new or different substances to the land, air, or water?

NOTE This does not include consumables used to facilitate the installation of the modification.

☐ YES ☑ NO Will the modification change the existing flow path or characteristics of any discharge to the land, air, or water?

☐ YES ☑ NO Will the modification involve any equipment containing PCBs, Mercury, or Asbestos?

☐ YES ☑ NO Will the modification result in all upgrade or alteration to any pollution control equipment?

☐ YES ☑ NO Will the modification affect the waters of the U.S. (e.g., dredging or discharging to the river)?

☐ YES ☑ NO Will the modification involve storage or use of oil or hazardous substance in an amount equal to or greater than 55 gallons?

OTHER:

If Question 3 is answered "YES", contact Environmental Staff to ensure that the applicable Environmental Review (in accordance with SPP-5.5 and TVA National Environmental Policy Act (NEPA) Process or chemical traffic control review are initiated/performed.

If Question 3 is answered "YES", Environmental shall be a Core Review group at the initial and final meetings. If the meetings are waived, then Environmental is required to review the EDCR-2 and sign the coversheet as an "Other Organization".

☐ YES ☑ NO 4. Does the modification affect the Radiological Emergency Plan (for example, radiation monitors, meteorological instrumentation, onsite emergency sirens, or onsite telephone system) or does the modification affect any equipment, boundaries, or plant structures in a manner that will affect any of the Emergency Action levels (EALs) in EPIP-1 or the REP Appendix A, B, or C?

If either question is YES, contact Radiological Emergency Plan Staff to ensure that a Plan Effectiveness Determination is initiated/performed (in accordance with 10CFR50.54 and EPIL-1, Emergency Preparedness Instruction Letter, "Procedures, Maps, and Drawings") to determine if NRC prior approval is required prior to any REP revision.

If NRC approval is required prior to any REP revision (i.e., EPIP changes), then document this in the Work Scope Statement on the "EDCR Cover Sheet."

☐ YES ☑ NO 5. Does this modification impact the fire protection system or equipment of an insured building?

If YES, coordinate with the 10CFR50 Appendix R Program Engineer to have the EDCR-2 documents reviewed by the insurance carrier.

☑ YES ☐ NO 6. Does the change affect information in the Q-List? (If the answer to any of the following questions is "YES", then the answer to Question 6 is "YES".)

☐ YES ☑ NO Are any attributes as defined in Limited QA appendix of NEDP-4 added, deleted, or modified?

☑ YES ☐ NO Is the UNID for a component in MEL altered?

☐ YES ☑ NO Is the MEL evaluation for the proposed modification adequate and complete?

☑ YES ☐ NO Is a UNID being added or modified in the MEL?

New UNIDs will be created for this modification

OTHER:

☑ YES ☐ NO 7. Does the modification change functional logic which has the potential of affecting design characteristics or change/impact an item listed in the Equipment Performance Information Exchange (EPIX) system?

If YES, evaluate PER/NER history and EPIX on the equipment being modified to determine if problems have previously been identified and are appropriately addressed in the EDCR-2 Package. Ensure appropriate coordination with affected organizations is performed such as Operations, Maintenance, Environmental, Chemistry, and Emergency Preparedness.

EPIX text search for "MIDS" had the following results:

- **Delayed power ascension due to the incore instrumentation system being unable to map the minimum required core locations**
- **RCS leak through MIDS thimble tube due to excessive wear caused by vibration**

☐ YES ☑ NO 8. Does the change substitute, change, add or modify materials, components or chemical treatments not previously evaluated to the system parameters or application?

If YES, an evaluation for material compatibility shall be performed.

10CFR50 APPENDIX R AND OTHER FIRE PROTECTION IMPACTS: (Contact the Program Owner)

☑ YES	☐ NO	a.	Does the change directly or indirectly impact Mechanical or Electrical Appendix R equipment, or cables, required for safe-shutdown (This includes manual actions required for safe shutdown.)? **See Question 21 under MECHANICAL section for further details.**
☐ YES	☑ NO	b.	Does the change impact Appendix R component availability in any fire area/zone?
☐ YES	☑ NO	c.	Have any Appendix R equipment parameters (e.g., flow rate, pressure, setpoints, load limitations, electrical load, interface with other components) changed?
☐ YES	☑ NO	d.	Have Appendix R cable tag/UNID numbers or cable fire area/zone routings changed?
☐ YES	☑ NO	e.	Have Appendix R cables been added/deleted or Appendix R control circuit logics been changed?
☐ YES	☑ NO	f.	Does the change involve a non-Appendix R circuit which interferes with an Appendix R Circuit (e.g., re-wiring to create associated circuits)?
☐ YES	☑ NO	g.	Does the change impact the use of Appendix R equipment in any fire area/zone?
☐ YES	☑ NO	h.	Has component been installed or relocated which obstructs the light pattern of an existing Appendix R emergency light?
☐ YES	☑ NO	i.	Has an Appendix R component been added, deleted, or relocated which would affect Appendix R light placement, including ingress/egress lights?
☐ YES	☑ NO	j.	Has an Appendix R component been installed or relocated in the same fire area/zone as its functionally redundant safe shutdown train/system? (This includes instrument sensing lines.) Note: The functionally redundant train is not necessarily the redundant divisional train.)
☐ YES	☑ NO	k.	Does the change affect in-plant communication systems?
☑ YES	☐ NO	l.	Does the change affect fire barriers, fire doors, fire dampers or fire wraps, or affect electrical or mechanical penetrations through fire rated walls, floors, ceilings or cable fire stops?

10CFR50 APPENDIX R AND OTHER FIRE PROTECTION IMPACTS: (Contact the Program Owner)

Routing of power cables is expected to affect electrical penetrations through fire rated walls, floors, ceilings or cable stops. The necessary Breach Evaluations will be done prior to issue of EDCR 52321.

☐ YES ☑ NO m. Does the change affect structural steel, raceway supports or raceway fire-proofing material?

☑ YES ☐ NO n. Does the change result in the addition or deletion of in-situ combustibles in a fire area/zone (e.g., panels, new cable trays, components with oil sumps, grease plastics)? (Note: Exclude cables routed entirely in conduits. Also exclude cables routed in existing trays without exceeding the tray fill capacity. Exclude combustibles less than 0.5 gallons oil, 4 lbs. plastic, 4 lbs. grease or equivalent amount of other combustible materials.) If yes, combustible loading calculation may be affected. Check with the 10CFR50 Appendix R Program Owner.

Combustibles will be added to the Computer Room (EL 708 room C-3). Unit 2 combustible loading calculation MDQ00299920090342 will be revised to reflect additional loading

☐ YES ☑ NO o. Does the change affect any of the fire protection systems (HPFP, SFFF, Halon, or CO_2) or affect any of the fire detection systems (e.g., smoke or heat)?

☐ YES ☑ NO p. Does the change impact the Fire Protection Reports?

If "YES", then a DCN must be issued.

☐ YES ☑ NO q. Does the change impact the property insurance carrier fire protection standards and/or associated commitments?

☐ YES ☑ NO r. Does the change involve the reactor coolant pump oil collection system?

☑ YES ☐ NO s. Does the modification introduce or remove combustible material or fire source in the area?

Combustibles will be added to the Computer Room (EL 708 room C-3). Unit 2 combustible loading calculation MDQ00299920090342 will be revised to reflect additional loading

If ANY of the above questions are answered "YES", contact the 10CFR50 Appendix R Program Engineer.

SINGLE POINT FAILURE/FAILURE MODES AND EFFECTS/RELIABILITY:

Checklist of questions to ask vendors of large scale systems, and our own designer(s) in regards to single point failures and margin to operation/trip/runback. The following questions should be considered when dealing with vendor supplied packaged solutions.

This section may be considered Not Applicable (N/A) if the Unit 2 change for this EDCR-2 is the same as the Unit 1 installed design.

☐ If this section is N/A, check this box.

☑ YES ☐ NO a. What are the system failure modes for the entire package (i.e., output fail-as-is, fail high or low, oscillate, trip system/plant, run back system plant, consider loss of motive power such as electric or control air, etc.)?

A failure modes and effects analyses will be documented and completed in calculation WBNOSG4220 "WB Incore Instrumentation System Failure Modes and Effects Analyses"

☑ YES ☐ NO b. What are the failure modes of the individual components which were considered, and what was their effect on the overall system (i.e., consider failures of the digital control systems related to the hardware and softloss of CPU, loss of communication connection, loss of an entire I/O board, etc.)?

A failure modes and effects analyses will be documented and completed in calculation WBNOSG4220 "WB Incore Instrumentation System Failure Modes and Effects Analyses"

☐ YES ☑ NO c. Will these system and/or component failures directly or indirectly via transient cause a plant trip or runback?

If YES,

1. What is the reliability of the individual components and system?
2. How can testing be performed to detect failure modes, miss configurations, and precursors to imminent failures?
3. What alarms or indications provide timely precursor indication of impending component/system failure?
4. What are bases for alarm, runback, trip, and operator action points.
5. What are the margins between normal operation and these alarm, runback, trip, and operator action points?
6. What redundancy is there in the alarms, indications, runback, or trip functions?
7. Which trips and runbacks are absolutely necessary? Which can be changed to alarms and what operator response is needed for the alarms?
8. Are digital systems developed in accordance with SPP-2.6 and SS-E18.15.01 software requirements for real time data acquisition and control computer systems?

SINGLE POINT FAILURE/FAILURE MODES AND EFFECTS/RELIABILITY:
9. Are there any reasons why redundancy was not considered in alarm, trip, runback systems, and can redundancy be added?

DIGITAL SYSTEM UPGRADES/MODIFICATIONS:

☑ YES ☐ NO Does the change involve a digital system, component or upgrade?(If "NO", then leave Questions 1-7 below blank.)

☑ YES ☐ NO 1. Have the requirements of SPP-2.6, SS-E18.15.01, and the guidelines of DG-E18.1.25 been considered?

☑ YES ☐ NO 2. Does the change involve and in-house modification? If so, implement in accordance with SPP-2.6.

The in-house modifications are involved with the ICS/BEACON/Application Server interface which will be implemented in accordance with SPP-2.6

☑ YES ☐ NO 3. Does the change involve a vendor performed modification? If so, implement in accordance with SS-E18.15.01.

☐ YES ☑ NO sidls Is the digital modification associated with a Safety Related Protection System upgrade? Has the potential for common cause software failure been considered?

IF "YES", use DG-E18.1.25 and SS-E18.15.01 for guidance and requirements.

NOTE: For digital upgrades, refer to NRC RIS 2002-2 which endorses NEI 01-01, Rev. 1.

☑ YES ☐ NO 5. Has the method and level of configuration control needed for the digital application been addressed?

Configuration control of software will be handled in accordance with SPP-2.6

NOTE: The configuration control method should be implemented using approved design control processes such as SPP-2.6 and/or an EDCR-2 (i.e., design output). This may involve the need to maintain configuration control of both the software and hardware revision levels. The level of control needed shall be based upon the application function (i.e., Safety Related, Quality Related, Critical to Plant Operations), capability to modify software such as software versus firmware, software and hardware revision compatibility, etc. Safety Related system configuration control must ensure that V&V qualification remains valid so prescriptive configuration control methods would be required. For Non Safety Related software, the configuration control may be less restrictive with focus on plant reliability and day to day operation. Firmware/Software includes both the Operating/Platform System firmware/software and the application specific firmware/software along with any configuration parameters such as setpoints, constants, scaling, etc.

☐ YES ☑ NO 6. Has a Cyber Security Assessment been completed to address NEI 04-04 requirements? Contact the Computer Engineering Group for instructions.

Cyber Security Assessment will be completed for modifications done under EDCR 52321 prior to closure of EDCR 52321

SINGLE POINT FAILURE/FAILURE MODES AND EFFECTS/RELIABILITY:			
☑ YES	☐ NO	7.	Is there a communication network interfaces such as an ICS interface? If "YES", implement design of this interface per the guidelines addressed in DG-E18.1.25.

Attachment 2

EDCR 52351 Draft Scope And Intent, Unit Difference And Technical Evaluation

EDCR COVER SHEET

GENERAL INFORMATION Page No. 1

EDCR TYPE ☒ EDCR # 52351 Rev. A

(Check One Box Only) ☐ EDCR-2 # Rev.

☐ Check here if this is a Streamlined EDCR.

☒ Check here if this EDCR is for Documentation change only & No construction work is required.

☐ SR ☐ QR Check appropriate box if field material procurement quality requirements included.

094, 261, 275	*CB*	*various*	*SR/QR*	*I&C*	*1E / Cat I*
System	*Building*	*Elevation*	*Quality Class*	*Lead Discipline*	*Code/Class*

WORK SCOPE STATEMENT:

Westinghouse to provide a system (Common Q) which performs the same function presently in service in Unit 1 for Inadequate Core Cooling System (ICCM-86). Each train will perform the following functions: Subcooled Margin, Reactor Vessel Level, and Core Exit Thermocouples. (Ref Westinghouse Shop Order 312 WBS 3.5)

PREPARED:			***VERIFIED:***	
Mat Merten, PE	**632-7526**			
Design Engineer	**Phone**	**Date**	**Engineer**	**Date**
APPROVALS:			***INTER DISCIPLINE REVIEWS:***	
Civil EGS		**Date**	**Civil Engineer**	**Date**
I&C EGS		**Date**	**I&C Engineer**	**Date**
Electrical EGS		**Date**	**Electrical Engineer**	**Date**
Mechanical EGS		**Date**	**Mechanical Engineer**	**Date**
N/A			**N/A**	
Plant Design EGS		**Date**	**Plant Design Engineer**	**Date**
Project Engineering Manager		**Date**	**DELETED**	**Date**
ACCEPTANCE:			***OTHER ORGANIZATIONS:***	
N/A				
Responsible Superintendent **(If Constructability Walkdown is waived, this is N/A)**		**Date**	**Signature/Org'n.:**	**Date**
N/A				
Field Engineer **(If Constructability Walkdown is waived, this is N/A)**		**Date**	**Signature/Org'n.:**	**Date**
TVA Engineering Manager		**Date**	**Signature/Org'n.:**	**Date**

Refer to the electronic documents in TVA Business Support Library (BSL) for current revision.

EDCR COVER SHEET (continued)

BACKGROUND (continued):

The EDCR procedure was reviewed and no corrections need to be made to this in-process EDCR to comply with the technical requirements listed herein.

Discussion: This EDCR completes the install of a new Post Accident Monitoring System or Common Q. This is fulfilling the role of the Inadequate Core Cooling Module (ICCM-86) currently on unit 1.

Common Q is a trained system consisting of two racks, R-179 and R-180, two touch screen displays on 2-M-4 and 2-M-6, and their associated PC Node boxes. Each rack and display corresponds to train A and B. Common Q's primary function is to display the following three parameters to aid the operators during primary plant casualties:

1. reactor vessel level
2. subcooled margin (SMM)
3. core exit temperatures

Other functions include providing input to the annunciator, plant computer, and an analog digital panel meter.

Common Q has the following inputs

- Reactor vessel level indication system (RVLIS) dp transmitter and hydraulic isolator (panel 2-L-388 and 2-L-340)
- RVLIS capillary line RTDs (penetration 38, 19)
- RCP status from SSPS (rack R-48, 51)
- Core exit thermocouples (CET) from WINCISE (penetration 33, 18)
- WR RCS Pressure from Eagle 21 (rack R-2,6)
- hot leg temperatures from Eagle 21 (rack R-2,6)
- ΔT from Eagle 21 (rack R-2,6)

Applicable WITEL codes

AP2	New EDCR
SP4.2	Reg Guide 1.97/Post Accident Monitoring
CP7.1	10 CFR50.48/Appendix R
CP6	Equipment Seismic Qualification
CP3.3	Calculations

Other notes

- Any future upgrades made to the simulator are not part of this EDCR.
- Neither ICCM-86 nor any predecessor was ever installed on u2.
- Due to WINCISE modifications, there will be 58 core exit thermocouples (CET) vice 65 on u1.
- In the location where R-179 and R-180 will go, is R-148 which will be removed by a separate destruction EDCR 53080.
- In ICCM-86, there is no +-5% band on WR RCS pressure like there are in most systems. Therefore during refueling when system pressure is 0psig ICCM-86 gets out of range alarms. This will be fixed with CQ.
- There is a USB port on the main control board that is an extension for ease of use to the PC node box. The USB port has been cut in the panel, but no USB will be utilized.
- The following statement is for use as a reference in calculation WBN-EEB-MS-TI12-0016 *120V AC Vital Inverter Loading*

EDCR COVER SHEET (continued)

BACKGROUND (continued):

- 2-R-59 and 2-R-60 were part a very preliminary design in which they would receive and process incore thermocouples. These racks will not be used in unit 2 and any reference to them can be removed.

Abbreviations

Common Q	Common Qualified platform of components
OM	Operator's Module - located in M-4/6
MTP	Maintenance test panel - located within the racks
FE	function enable switch
AIR	Auxiliary Instrument Room
FE	Function Enable (referring to a keyswitch on the OM and MTP)
DPM	Digital panel meter

Related EDCRs

52601 – Reactor vessel level indication (RVLIS), phase 1 (installs tubing, RTDs, and unistrut)
55385 - RVLIS phase 2, installs instruments
52322 – Integrated computer system (ICS)
52319 - Eagle-21 system
53080 – removal of rack 2-R-148
53301 – external connections for Eagle-21.
52987 – hot leg RTDs
52328 - SSPS
52322 - Foxboro IA (equipment will go into racks occupied by other Foxboro IA equipment)
52321 - WINCISE

52718 - cutout work M-4
52720 - originally M-6 cutout work but was superseded by 53337
53337 - cutout M-6
52361 - labels on M-4
52363 - labels on M-6

Cabling EDCRs

54636, 55233 – Auxiliary building V3 cables – (Sam Lettiere)

- supplying power cables for racks and PC node boxes

54637 - Auxiliary room V2 cables, (David Nuchols and Stephen Hopkins), (not fiber cables)

- AB to CB / AB to RB
- Not CB to CB

54639, 55231 – reactor building V2 and V3 (Terry Humbert).

- RVLIS RTD cabling

54632, 55232 – Control building – John Ostrander

- Only within CB to CB
- Includes fiber lines

Penetrations and the Auxiliary building secondary containment enclosure (ABSCE) boundary

There are no penetrations in this EDCR due to having no cabling.

EDCR COVER SHEET (continued)

BACKGROUND (continued):

The CET cables outside the reactor building will pick up on the ex-containment side of the penetrations on a 10ft pigtail. It will attach to the "CET Feedthrough Module Assembly" provided by Westinghouse. This will be installed per the WINCISE EDCR. See the WINCISE technical description for more information.

Racks

The racks utilized will be from group G04 (see section 4.2.1 of System Design Specifications). They have been specified to be painted color 34410 per federal standard 595c (this matches the other cabinets in the AIR. See WBT-D-846 and WBT-D-1057).

In May 2010 in came to design engineering's attention that the field had installed an approximate 6" column directly in between the proposed locations of the two cabinets in the AIR to support cable trays. It has been accessed that this column will not cause interference with the cabinets (although not ideal since this space was ear-marked for TVA to store a rack during maintenance).

Welding to Aux-Ins-Room

There is a PER that was submitted that the welds on u2 cabinets were not sufficient and need to be re-welded on the outside (the requirements call for welding to the inside of the cabinets on the lip). Therefore the CQ cabinets will need to be welded according to 1044E50-1 and DRA 52351-025.

There are precautions that must be taken when welding in the AIR. See DRA 52351-025 (reference EDCR 53310 for more information). There is no unique precaution that unit 1 must be shut down. See construction note #1 on DRA 52351-025.

Unit 1's ICCM-86 racks are not installed as far down the row as possible (ie rack 1-R-179 is not flush with the last racks on the other rows). In unit 2, 2-R-179 will be as far down the row as possible to create more room.

Interface with Plant Computer

There is an available feed from the OM for a print page command. This will not be utilized due to interdivisional communication and cyber security concerns, but will not be disabled. The ability will be left but under normal operations no printer will be installed. The print buttons on the plasma display will be not greyed out. **(NOTE - MAY CHANGE - MM 10/19/10)**

The signal to ICS from the MTP will go to 2-R-023 and 2-R-020. Here it will go through Owl Computing Data Diodes which are installed in Dell R200 servers. The Dell servers were specifically procured to except a fiber optic ethernet interface compatible with the network protocol Common Q is transmitting.

Westinghouse provide fiber optic to CAT5 modems that will be utilized downstream of the data diodes prior ICS. These will be by Transition Networks and the model number is J/FE-CF-04. Since these are not safety related, no other documentation will be sent regarding these modems. These modems will also be used for the print screen command from the OM. Reference WBT-D-1928 25402-011-G26-03546-001.

BACKGROUND (continued):

Installation of Fiber Optic Cable - including safety fiber

The safety function of Common Q PAMS is to display various parameters to the operators via the touch screen plasma display. Any piece of hardware or cable that plays a role in this must be safety related. **Therefore the fiber optic link between the racks and the OM is safety related**. Note the fiber optic cable from the MTP going to ICS is not safety related.

At the time of this writing, there is no requirement for safety related fiber optic cable, although IEEE Working Group P1692 is working on this problem. ISA has committee 67.17, *Fiber Optic Cable for Nuclear Power Plants & other Nuclear Facilities*, but they have not produced a standard.

- Electrical will procure safety fiber (1E) and complete this installation under the respective bulk cabling package. Connectors will be installed on one end. This will be routed in the same manner a safety related copper cable is routed. This will be accomplished in the applicable bulk cabling EDCR. This is a much stronger industrial cable compared to more standard fiber optic cables.
- There will be no patch panel in the rack. The cable is terminating to the AF100 modems which are at the bottom of the rack. There is space to wrap and tie down the cable. This will be adequate for strain relief. This is in compliance with G-38 section 16.4.2.
- There will be no fiber patch panel in the control room. The major purpose of a fiber patch panel is for strain relief. This can be accomplished via wrapping and tying the cable in the vicinity of the end point. Thus a fiber patch panel is not required.
    - The logic to this decision was any fiber patch panel would have to go through seismic testing and since many are plastic it is unsure if it would pass. As long as there is strain relief, this is technically acceptable.

The fiber link from the MTP to ICS will use the standard project cable of WOF-12. There will be no patch panel in the rack for the same reason as above, but there will be patch panels at the end points in the vicinity of the data diodes.

Cables

There are no cables in this EDCR. What follows is for background information only.

The power cables for rack 148 are present in accordance with the walkthrough for EDCR 53080 2-II and 2-I.

On the main control panel, there is an in-rack temperature indication. This is not a separate cable and will be part of the data sent on the main fiber cable.

The core exit thermocouples (CET) will traverse the penetration with the "CET Feedthrough Module Assembly with Integral Electrical Connector". Within the reactor building the cable is provided by Westinghouse and is considered part of the instrument. The cable design and procurement outside the reactor building is per the applicable bulk cabling package. This is type K thermocouple cable all the way to the rack.

EDCR COVER SHEET (continued)

BACKGROUND (continued):

The thermocouple reference junction, originally located inside containment, will be located inside the CQ cabinets with four RTDs per train. Thus no reference junction cables will be required. Additionally, the CET cable will be thermocouple type K all the way to the cabinets (ICCM-86 has a thermocouple to copper transition at containment).

Annunciator Interface

Common Q will feed two separate annunciator alarms.
Train A is on location 85F – see ARI-81-87 (unit 1 procedure) - 2-XA-55-4B – on M-4
Train B is on location 124E – see ARI-124-130 (unit 1 procedure) - 2-XA-55-6C – on M-6
The unit 2 ARI procedures will be created by Operations.

This alarm does not alarm on certain plant parameters (such as vessel level being too low), it alarms when something goes wrong internally of the Common Q System.

Common Q has five options to choose from (see *System Design Specifications* table 4.4-6). This alarm will utilize the "System trouble alarm" which is the closest in similarity to the ICCM-86 alarm. Reference *Software Requirement Specifications* table 7.1-2 and WBT-D-0889.

PC Node Box and display

The display will be mounted via a bolt and nut. Exact specifications have been forwarded to the CRDR group. The OM's node box will be mounted on the floor aft of M-4 and M-6.

There was a previous problem on unit 1 that the software operating system would freeze. Unit 2's Common Q and CERPI will be using a new QNX Operating System which does not exhibit the "data freeze". See WBT-D-0479.

The OM's node box has a port on the back for the Function Enable keyswitch which will not normally be plugged in. (Westinghouse's vision was this would be mounted on the main control board - there is no space). Since the FE keyswitch will not be permanently installed, no UNID will be assigned.

Not installing the FE keyswitch will result in the loss of some intended functionality as discussed in WBT-D-1897 (25402-011-G26-GAKS-03394-001). It has been assessed that these functions would not affect normal operations and is acceptable. The lost functions are more for setting up the system

The OM will come with a removable USB floppy drive to load addressable constants on the MTP. Since this floppy drive will not be permanently installed, no UNID will be assigned.

See discussion in *Interface with Plant Computer* section which discusses the fiber optic to CAT5 modem used for the print screen command from the OM.

RVLIS Inputs

Unit one has six RTDs on one train and 5 on the other train. Common Q will have an allowable of eight RTDs. Therefore there can be no more than eight vertical sections in the installed RVLIS system. The RTD location plan corresponds with this.

EDCR COVER SHEET (continued)

BACKGROUND (continued):

Both train A and B will have an RTD that will be for compensation of the seal table and the head capillary (note no differential pressure is ever taken across these two lines). This will be done with a single RTD. Addressable constants will be used within the software of Common Q to assign a single temperature value to both compensation calculations.

Each RVLIS RTD will be assigned a code RTD1 through RTD8 within Common Q PAMS. The list below is what code is being assigned to which RTD. This is very flexible can be fixed with software, but will be easier if it stays consistent throughout all documentation (SSDs, connection diagrams, control diagrams, ICS points...). Setup is similar to unit 1.

Train A

RTD#	UNID	Description
RTD1	NOT USED	
RTD2	WBN-2-TE -068-0376 -D	REACTOR LEVEL TEMP COMP (GUIDE TUBE) - train A
RTD3	WBN-2-TE -068-0377 -D	REACTOR LEVEL CAP TUBE TEMP COMP (SEAL TABLE and HEAD) - train A
RTD4	WBN-2-TE -068-0378 -D	REACTOR LEVEL CAP TUBE TEMP COMP (HEAD) - train A
RTD5	WBN-2-TE -068-0379 -D	REACTOR LEVEL CAP TUBE TEMP COMP (HEAD) - train A
RTD6	NOT USED	
RTD7	NOT USED	
RTD8	NOT USED	

EDCR COVER SHEET (continued)

BACKGROUND (continued):

Train B

RTD#	UNID	Description
RTD1	NOT USED	
RTD2	WBN-2-TE -068-0383 -E	REACTOR LEVEL TEMP COMP (GUIDE TUBE) - train B
RTD3	WBN-2-TE -068-0384 -E	REACTOR LEVEL CAP TUBE TEMP COMP (SEAL TABLE and HEAD) - train B
RTD4	WBN-2-TE -068-0385 -E	REACTOR LEVEL CAP TUBE TEMP COMP (HEAD) - train B
RTD5	WBN-2-TE -068-0393 -E	REACTOR LEVEL CAP TUBE TEMP COMP (SEAL TABLE and HEAD) - train B
RTD6	WBN-2-TE -068-0386 -E	REACTOR LEVEL CAP TUBE TEMP COMP (HEAD) - train B
RTD7	NOT USED	
RTD8	NOT USED	

The RVLIS level transmitters will also be assigned DP1, DP2, and DP3 designations within Common Q. Similar to the RTDs, they will be defined here for consistency (this is consistent with the *System Requirement Specifications* figure 2.5-1).

DP#	UNID	Description
TRAIN A		
DP1	WBN-2-LT -068-0369 -D	REACTOR VESSEL UPPER PLENUM LEVEL
DP2	WBN-2-LT -068-0368 -D	REACTOR VESSEL NARROW RANGE (LOWER) LEVEL
DP3	WBN-2-LT -068-0367 -D	REACTOR VESSEL WIDE RANGE (DYNAMIC) LEVEL.
TRAIN B		
DP1	WBN-2-LT -068-0372 -E	REACTOR VESSEL UPPER PLENUM LEVEL
DP2	WBN-2-LT -068-0371 -E	REACTOR VESSEL NARROW RANGE (LOWER) LEVEL
DP3	WBN-2-LT -068-0370 -E	REACTOR VESSEL WIDE RANGE (DYNAMIC) LEVEL

Labeling

All labels were designed in EDCR 52361 (M-4) and 52363 (M-6)

Recorders

Unit 1 has 1E grade CET recorders on M-4 and M-6. These recorders are selectable and can record various parameters, but highest CET is usually selected. Regulatory guide 1.97 rev 2 requires recorders for cat 1 PAM variables, but does not require them to be 1E.

For unit 2, these recorders will not be installed. The critical thinking is that Common Q will store and be able to trend CET's along with ICS being able to trend CETs. This will satisfy the Regulatory Guide 1.97 requirement.

BACKGROUND (continued):

Note that there is no requirement that the trended CET must be a default screen to the operators (this will not be part of the default screen for Common Q). This trend must be available only.

Digital Panel Meters (DPM)

1-TI-68-105-J and 105-K are subcooled margin digital panel meters made by Analogic that are 1/8 DIN size. These meters are routinely monitored by the operators in post accident environments. Analogic does not make these meters anymore and design engineering has decided to go with an Otek brand meter which has experience in the nuclear industry. This will be qualified by Nuclear Logistics Inc (NLI) to have a seismic and EMI analysis performed

The Otek DPM has an ASIC (application specific integrated circuit) that performs the A/D conversion via the sigma-delta method along with an integrated LED driver for the 4 1/2 display. This integrated circuit is simply an analog device that **does not contain software**. The Otek has potentiometers for GAIN and ZERO (most DPMs have buttons indicative of software).

Below is a functional diagram from Maxim, the ASIC manufacturer.

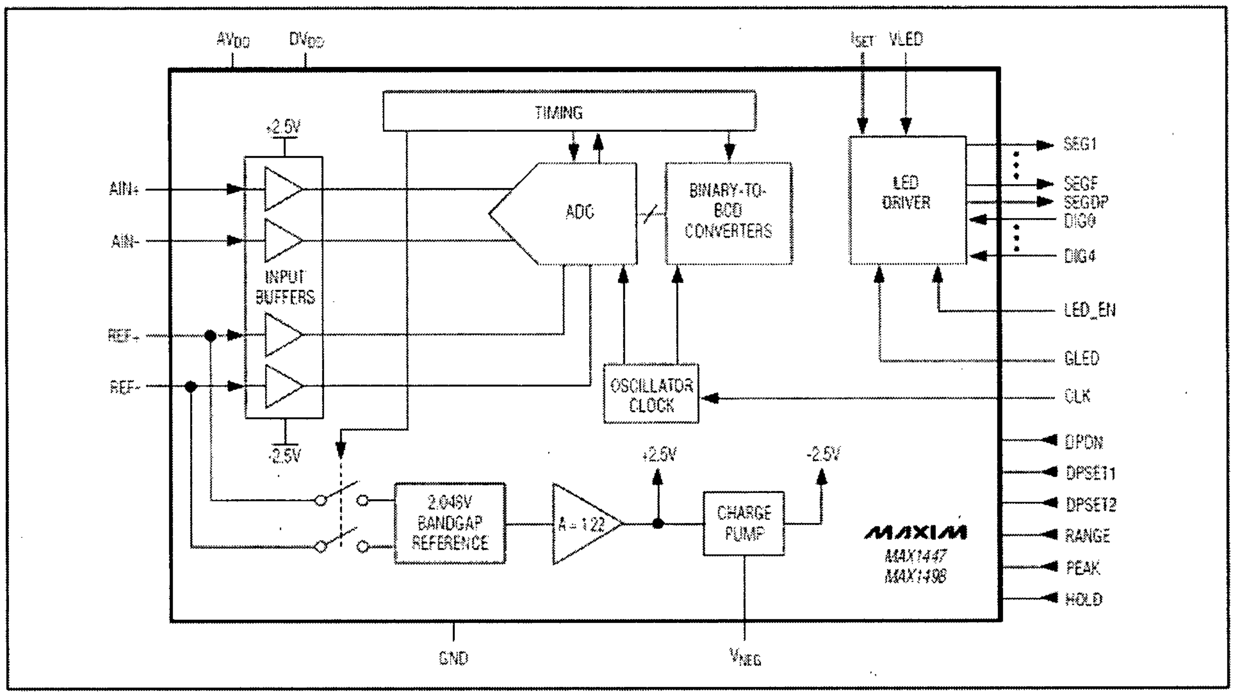

Figure 1. MAX1447/MAX1498 Functional Diagram

Figure 1

According to NUREG/CR-6992 section 5.3 third paragraph this is a “lower end digital device” and is “more like conventional hardware and can be tested as any other hardware device under IEEE603”, not IEEE 7-4.3.2.

EDCR COVER SHEET (continued)

BACKGROUND (continued):

In conclusion, due to the simple analog type nature of these DPM, it does not have to go through a V&V or ISG06.

PERS in Question

144982 – Mineral insulated cables for various cables in system 94 were installed in unistrut with no detailed installation instructions – or it had no supporting design input or output. Thus some of the cables were found to be damaged.

- Applicable DC
  - WB-DC-30-4 – separation of electrical equipment and wiring
  - WB-DC-30-5 – power, control, and signal cables used in CAT I structures
- This is being addressed in the RVLIS EDCR 52601.

145147 – Westinghouse RTD cables were not installed correctly according to the drawings. For example the drawings require no more than 24" separation, but this was routinely violated.

- This appears to mostly be a construction issue, but there were not as good document control as exists currently so it was difficult to identify applicable vendor drawings.
- This is being addressed in the RVLIS EDCR 52601.

143833 - This PER found that the welding was inadequate to drawing 47w605-3 and thus all cabinets in the aux instrument room will be welded from the outside.

- This EDCR will include welding information. No additional action required

172694 - Modify NCH cards (function generator) within ICCM-86 which will restore the RVLIS accuracy to plus or minus 6 percent. This modification was implemented by Westinghouse FCN WBTM-10717B.
This is not applicable to unit 2 because the Common Q hardware is completely different than the unit 1 hardware. Additionally, TVA has no requirement in any design basis or licensing document of what the RVLIS accuracy must be (although Westinghouse does make claims what its accuracy will be).

233598 - Reconcile the fact the design basis of WBN2 is RG 1.97 rev 2 but common Q PAMS is designed to RG 1.97 rev 3 (note at the time of issuing this package, the most up to date RG 1.97 rev 4). This analysis was performed and submitted to the NRC. No further action required.

Important TS/DS/ES

WB-DC-30-7 – post accident monitoring instrumentation
NRC's Technical specifications – section 3.3.3
WB-DC-30-20 – attaching cabinets
WB-DC-30-4 - separation

Procurement

- The Common Q system was procured via Procurement Request to Westinghouse. At time of issuance it is at revision 5
- Dual diodes from Owl Computing - purchased as NQR
- Digital panel meters from Otek - purchased as safety related
- Field will procure any fiber optic connectors for the interface with ICS as NQR

EDCR COVER SHEET (continued)

BACKGROUND (continued):

- Field will procure any fiber optic connectors for the interface between the racks and OM as safety related.

Calculations

- Electrical calculations - see Electrical and I&C Checklist for details
- SSD supporting calculations (various) - open itemed and mentioned in calculation checklist
- **ICCMCALCNOTE** - *Inadequate Core Cooling Monitor (ICCM) Calculation Note Supporting ICCM Setpoint and Scaling Documents*
    - This is the supporting calculation for the SSDs. These are being supplied by Westinghouse under alternative names.
- **WBPEVAR8902002** - *Determination of Devices Required for Indicating Safety-Related Trends for WBN PAM.* Defines the type of devices to display safety related trends for PAM monitoring of RG 1.97 compliance.
    - RG 1.97 rev 2 requires type A variables be category 1 which means a recorder is needed but it can be a computer. This is what WBN2 is intending to do with the display.
    - This calculation states in unit 1 their display was adequate for trending (even though they had a recorder). This wording is vague enough that it is still applicable to unit 2.
    - **No action or revision is needed** to this calculations
- **WBNOSG4076** - RG 1.97 variables needing trend recording
    - Establishes which of the CAT 1 parameters (which SMM is) must be provided with a continuously available trend recorder.
    - Since WBN2 is claiming the node box as the trend recorder, Common Q PAMS is still in compliance with the calculation and **no revision is required.**
- **WBPEVAR9202003** - *NON CLASS 1E cables required for PAM cat 2 Variables*
    - This determines which non 1E cables are required for PAM cat 2 variables. This is a unit 0, 1 calculation.
    - Out of the three PAM variables relevant to Common Q PAMS, none are listed in section 7.0 as identified that are not 1E.
    - Section 7.1.1 discusses all NON-1E recorders and all applicable variables (#6, 16 ,22 in WB-DC-30-7) are listed. This means it is acceptable that these variables can be recorded in a non 1E manner. Since Common Q PAMS is claiming the node box as its "qualified recorder", **no revision is needed for this calculation.**
- **WBNEEBIDQ29990901** - *Non-Class 1E Cables Required For Post Accident Monitoring Category 2 Variables*
    - This calculation contains the "block diagrams" from the respective RG 1.97 variables. However all variables are CAT 1. **No revision is needed for this calculation.**
- **WBPEVAR8809048** - *PAM Instrumentation Evaluation and Verification Methodology, Standards and Guidelines*
    - This is a unit 1 calc
    - The unit 2 calc is **WBNEEBIDQ29990903** and is being **open itemed -** see OI-52351-17. There is various instrumentation information including applicable UNID - these need to be updated for unit 2 UNIDs.
- **WBNEEBIDQ299909002** - *Instrument Loop Evaluation for Containment Isolation Valve Position*
    - RG 1.97 requirements of containment isolation valves

EDCR COVER SHEET (continued)

BACKGROUND (continued):

  - There are no isolation valves in Common Q - **this calculation is not applicable.**
- **MDQ00299920090342** - *WBN2CCP-COMBUSTIBLE LOADING DATA (CLD)*
  - Must be revised for adding burnable weights to various compartments.
- **EPMMCP071689** - *Cooling/Heating Load & Equipment/Component Performance Analysis For The Control Building Electrical Board Room Areas (el. 692.0 & 708.0)*
  - To be revised with new heat loads going into AIR. **This is being open itemed.**
- **EPMLCP072489** - *Cooling And Heating Load Analysis, Main Control Room HVAC*
- **WCGACQ0371**- *Seismic Qualification of Weld Anchorage of R Panels*
  - Unsure if revision is needed.

For the following three see write up in technical evaluation. Since all EQ instruments that feed Common Q are installed in other EDCRs, **no revision** to these calculations are needed.

- **WBNOSG4134 –** 10CFR50.49 methodology and listing of other calculations
- **WBNOSG4017 –** System 68 category and operating times calculation
- **WBNOSG4028 –** System 94 category and operating times calculation

IMPORTANT DOCUMENTS (U1 AND U2)

G-38	Installation, Modification, and Maintenance of Insulated Cables Rated Up To 15,000 VOLTS, see section 16.4.2
2-45W2623 series	R-179,180 connection diagrams
45N1643-1,4	1-M-4 connection diagram
45N1644-4	1-M-5 connection diagram
45N1645-2,10	1-M-6 connection diagram
45W1623-1	1-R-148 connection diagram (R-148 was removed in unit 1 and unit 2)
LSWD-1057	R-148 walkdown for EDCR 53080
3D20465 SERIES	Westinghouse ICCM-86 external connection diagrams
5D92409 series	Westinghouse ICCM-86 schematic diagrams
1775E24 series	Westinghouse ICCM-86 assembly diagrams
5D92298 series	Westinghouse ICCM-86 block diagrams

SSD-2-X-100	ICCM train A RVLIS level monitoring (by W)
SSD-2-X-110	ICCM train B RVLIS level monitoring (by W)
SSD-2-T-94-7905	ICCM train A heatup and cooldown rate (by W)
SSD-2-T-94-8005	ICCM train B heatup and cooldown rate (by W)
SSD-2-T-94-034	ICCM train A CET Monitoring (by W)
SSD-2-T-94-101	ICCM train A CET Monitoring (by W)
SSD-2-T-94-001	ICCM train A CET Monitoring (by W)
SSD-2-T-94-102	ICCM train B CET Monitoring (by W)
SSD-2-T-68-105	SMM monitoring (by W)
SSD-2-T-68-115	SMM monitoring (by W)
SSD-2-L-68-367	ICCM Train A RVLIS dynamic head (by W)
SSD-2-L-68-368	ICCM Train A RVLIS lower range (by W)
SSD-2-L-68-369	ICCM Train A RVLIS upper range (by W)
SSD-2-L-68-370	ICCM Train B RVLIS dynamic head (by W)
SSD-2-L-68-371	ICCM Train B RVLIS lower range (by W)
SSD-2-L-68-372	ICCM Train B RVLIS upper range (by W)

EDCR COVER SHEET (continued)

BACKGROUND (continued):

ARI-81-87	annunciator response instruction – unit 1 - train A
ARI-124-130	annunciator response instruction – unit 1 - train B

Project Correspondence

The following is the list of all correspondence between Westinghouse and TVA. Some of these are on the EDCR index because they led a direct role in the design. This list is for information only and will not be updated.

TO BE ADDED

EDCR UNIT DIFFERENCE FORM

EDCR# 52351 Rev. A Page No. __________

The Unit 1's ICCM-86 system is an outdated digital system. The Common Qualified Platform of components from Westinghouse is the newer echelon of digital I&C hardware that has become the industry standard. TVA made the early decision to accept the unit differences and utilize the Common Q system for Post Accident Monitoring.

Operations Difference is identified as follows:

- The outdated monochrome CRT is being replaced with a touch screen multi-color display. This difference is an improvement in that it is larger and more visible to the operators and therefore technically **acceptable**.
- The default screen will be different than unit 1. This difference is what was decided by TVA during the initial contract generation process. Additionally, the cost of software development to make the new system mirror the unit 1 default screen was prohibitive.
  - Unit 1 displays - reference WBN-VTD-W120-3020 figure 5-5
    - T_{HOT}
    - CET Highest quadrant average
    - RCS pressure
    - CET based subcooled margin
    - RVLIS level
    - Logo of pump in dynamic mode and the core in static mode
    - RCP status
    - RVLIS mode
  - Unit 2 will display - reference WBT-D-1675 (G26-GAKS-02739-001)
    - The highest CET value in each quadrant
    - CET and auctioneered T_{HOT} based subcooled margin
    - RVLIS level along with a much improved graphic of the core depicting the loops.
    - RCP status
    - RVLIS mode
    - RCS pressure
- Recorders on the control board are being removed. These recorders are selectable and can record various parameters, but highest CET is usually selected in unit 1. Regulatory guide 1.97 rev 2 requires recorders for cat 1 PAM variables, but does not require them to be 1E. The PC node box along with ICS is fulfilling the role of a recorder and thus this difference is **acceptable**.
- Push buttons are being removed and superseded with a touch screen display. The same functions are being accomplished with the touch screen and thus this difference is

Refer to the electronic documents in TVA Business Support Library (BSL) for current revision.

acceptable.

- Value feeding the ICCM trouble alarm (to be changed to "Common Q Trouble") will alarm on more items than what unit 1 does. However out of the five alarms that Common Q has to send to the annunciator, this is the closest. This alarm does not alarm on any parameters being too high or low, it alarms on various internal problems within the rack. There are differences between these two alarm configurations mainly due to the significant differences in hardware. Overall what CQ is alarming on seems to cover all failures and is **deemed acceptable** by Bechtel Engineering.
    - For the Common Q system trouble see the *Soft Req Specifications* table 7.1-2. For ICCM-86 reference VTD-W120-3020 section 5.10.8.4.

- There is high temp alarm for within the rack. This is an improvement and is **technically acceptable.**

- Operator will be able to print screen from the Operator's Module - but the printer will not normally be connected.

- The submargin monitor digital panel meter is an Otek brand vice an the outdated and unavailable Analogic. The LED display will be 0.6" tall vice approximately 0.5" tall. Although this meter is not off-the-shelf safety related, it is going through Nuclear Logistics Incorporated to get seismically and EMI testing (there is no V&V required - see scope statement or justification). The same color blue is being procured. Due to the similarity, this difference is acceptable.

- It is possible that due to the differences in CET values (estimated at a 20d difference) the SMM values will be up to 20 larger during normal operations. Post accident, we are told, will come back to normal. **MORE ANALYSIS NEEDED.**

Unit 2 TVA Operations Acceptance (Mgr or Designee): **Date:**

Maintenance Difference is identified as follows:

- There is no separate maintenance test panel box. All similar functions can be accomplished internal to the racks.
- Number and location of RVLIS RTDs are different. This is due to the route of the RVLIS capillary being different. This could affect maintenance if an RTD fails.
    - See Design Difference section for more background.
- There is a "simulator" hookup location at the bottom of the racks where signals can be input to replicate various plant conditions. This will be used by maintenance for their testing.
    - Westinghouse has designed a special apparatus for use in their FAT that will replicate various plant configurations. Whether TVA systems engineers build or procure a device similar to this is at their discretion and is not relevant to this EDCR.

Unit 2 TVA Maintenance Acceptance (Mgr or Designee): Date:

Design Difference is identified as follows:

- Different number of CETs, 58 in unit 2 and 65 in unit 1. This is based on the differences due to WINCISE and is Westinghouse's design responsibility.
- Reference junction for the CETs is accomplished within the rack vice in the reactor building. Therefore cabling for CETs is thermocouple type K all the way to the rack. Since this accomplishes the same goal, it is **technically acceptable.**
- Location and number of the RVLIS RTDs will be different. This is because the Unistrut was mostly installed in unit 2 and to save cost will be used. This was "field routed" as it was in unit 1 and thus is not exactly the same. For example on the hot legs, due to the horizontal routing of the capillary, there is no need for an RTD. Design engineering has noted the route as part of the reactor vessel level indication system EDCR 52601 and has adjusted the location of all RTDs. This difference is **technically acceptable.**
- In one location on train A and two locations on train B, a single RTD will be used for compensation of both the head and seal table capillary lines. This is because these two lines are run together during places where compensation is needed (vertical sections) and no differential pressure is taken across the head and bottom of the core. Common Q is sophisticated enough to take one input and use it for two separate compensation calculations depending on the plant status through the use of addressable constants. This decision was made to save cost and keep the system simpler. Since this setup serves the same end and Common Q can accommodate - it is **technically acceptable.**
- **THIS ALL MAY CHANGE - MM 6/15/10 -** The digital submargin monitor (SMM) displayed on a digital panel meter will not be selectable (unit 1 can select it with the portable maintenance test panel). It will display saturation margin based on effective thermocouple value T_{CREP}. Additionally, this value is assessed to be a smaller margin than unit 1.
  - Unit 1 could base SMM on auctioneered T_{HOT} <u>or</u> high quadrant average CET value by selecting it with the maintenance computer. Unit 2 constantly calculates both values and has the option to send an analog output for either, but they are on separate terminal blocks. Therefore Common Q has three options (a) select only one to display, (b) have two meters each per train, or (c) procure a more sophisticated multiple input meter. Bechtel engineering has chosen the first option
  - It is possible that SMM based on T_{CREP} will be different in unit 2 because (1) the calculation is different (T_{CREP} versus high quadrant average CET) and (2) the differences in WINCISE.
  - In unit 1, auctioneered T_{HOT} is around 2-4°F lower than highest average quadrant value. Therefore the saturation margin is lower and hence more conservative for the <u>CET based</u> calculation. This is why unit 1 utilizes this value (reference 1-SSD-T-105/115)
  - It is Westinghouse's engineering assessment that due to the flow differences with WINCISE, the CET values will be slightly higher than unit 1. Therefore Bechtel Engineering believes that utilizing the CET value for SMM will result in a smaller margin and is therefore the more conservative approach and thus **technically acceptable.**.

    - If this assessment turns to be untrue, TVA can easily remedy the situation by switching the terminals on the cable going to the panel meter within the Common Q racks.

- Analog output to SMM will be 4-20 mA vice 0-10Vdc. The scaling is different from -20 to 200°F in unit 1 to -200 to +800°F for Common Q. It is possible due to the scale increasing so dramatically there could be some "fluttering" of the values on the display. No action in this package will be taken to install any damping. If this is a problem, it will be addressed in the future by TVA. Note that this span is not something easily changeable by Westinghouse and would have cost and schedule impacts if changed. Bechtel Engineering has assessed that this change is **technically acceptable**.

- Various UNID differences due to the hardware differences. Attempts were made to assign UNIDs to individual items that would be replaced if it or a part within it fails. For example the termination units are fairly complex internally with multiple relays within it - however it was assessed that the entire assembly would be replaced if an individual relay failed. Thus a UNID was assigned to each termination unit, and not each of the relays within each unit.

- Link to ICS will have a data diode device to ensure one way TCP/IP network flow. This is for a dual reason of cyber security compliance (reference regulatory guide 5.71) along with minimal extra assurance that non-safety to safety communications will not be a problem. Since this difference is a significant reason Common Q PAMS will be acceptable from a Cyber Security perspective, it is **technically acceptable.**

- Data link to ICS is similar to, but does not exactly match unit 1. Some calculations are no longer being performed (for example average thermocouple value per quadrant) and hence cannot be sent. Error codes are no longer being sent. The values no longer being calculated are often replaced with other similar values. It is Bechtel Engineering's assessment that upon review of all the differences they are **acceptable**.
    - For Common Q reference *Soft Req Specifications* table 7.2-1 and 7.2-2
    - For unit 1 there is not a consolidated list of data points, but the design engineer created a list from searching PEDs (there is a list on 47W610-94-1 but does not contain all unit 1 points).

- The cabling connections into Common Q have a different setup in that they will be going to different terminal boards. This is causing the connection diagrams 2-45W2623 series to be different. This is Westinghouse's decision and it makes no difference to Bechtel Engineering as long as all cables are accounted for. This difference is **acceptable**.

- Safety related fiber optic cable will be used in the link between the racks and the Operator's Module. (This is <u>not</u> the same as the "data link" to ICS mentioned earlier). Safety related fiber optic cable has not been used in TVA to date and - as far as the author knows - has been used in two other U.S. plants to date. There is no specification that has established what "safety related fiber optic cable" is defined as, although there is an IEEE committee that is working on this problem from a harsh environment perspective (which this case is not). The project is in the process of acquiring 1E fiber (some vendor's can provide). This difference is **technically acceptable.**

Unit 2 TVA Engineering Acceptance (Mgr or Designee): **Date:**

Mat Merten, PE

Prepared By: **Date:**

Streamlined EDCR approved by TVA Oversight__________________________________

SESG TO ROUTE A COPY OF THIS COMPLETED FORM TO TVA TRAINING MANAGER AND TO UNIT 2 LICENSING.

Attachment 1

TECHNICAL EVALUATION CONSIDERATIONS OF 0-TI-2

This attachment provides topics to be considered when evaluating the technical and safety aspect of changes being implemented in WBN Unit 0 and/or Unit 1 by the EDCR process; see Reference 5.1. It is not intended to be an all inclusive list of items to be considered. It is to be used as an aid in determining attributes that should be addressed in a technical evaluation. Information is also provided to aid in determining coordination interfaces. These are minimum guidelines which are primarily excerpts from SPP-9.3. It should be recognized that many topics and changes involve multiple disciplines and organizations and technical considerations must be coordinated accordingly. All parts of Attachment 1 must be considered for applicability for the associated EDCR.

GENERAL:

☒ YES ☐ NO 1. Are the nuclear safety functions, protective safety functions, Class IE requirements, or Seismic Category I or I(L) requirements of a design criteria affected?

Design Criteria – yes - WB-DC-30.7 *Post Accident Monitoring Instrumentation* has three PAM variables that are measured by the Common Q system
6 – Core Exit Temperature
16 – Subcooling margin monitor
22 – reactor vessel level
There are two other parameters – RCS WR pressure and WR temperature – which are PAM variables that are fed into Common Q. The operator will be able to see these values on the OM, but this is not the primary way these variables are viewed.

System Description – yes - Common Q is a mix of system 68 and 94. Therefore it is impacted by and requires changes to N3-94-4003 *Incore Instrumentation System* and N3-68-4001 *Reactor Coolant System*. Package is included in this EDCR.

FSAR - yes - see PP10's for all impacted sections of the FSAR.

Tech Spec – yes - Common Q is impacted by and requires some minor changes to the Technical Specifications. See attached PP-10 package.

x YES ☐ NO 2. Is there an operational/configuration change? Is a component being added to or removed from the plant? Is a component being disabled or abandoned in place? Is the normal or accident position of a valve changing? Is an electrical isolation device being added or deleted? Is a portion of the system being rerouted?

Operational/configuration change – yes – Common Q will have operator differences, the most significant being a touch-screen plasma display. See the Unit Difference Form for a detailed write-up.

Component added – yes – multiple components are being added to the plant. See the MEL package.

Component disabled or abandoned – no – Common Q is a new system. The rack that was in the same place in the AIR, R-148, was removed by a separate EDCR. See the scope statement for details.

Valve normal position – no – there are no valves in this system

Electrical isolation – yes – there are two 1E to non 1E transitions per train that are being accomplished optically. These isolations are on the hardware level (not software) and are within Westinghouse's cabinet and are Westinghouse's responsibility. One transition is from the data link from R-179/180 to ICS. The other is from the OM to a non 1E fiber to cat5 modem and to a non 1E printer.

Portion being rerouted – N/A

GENERAL:

x YES ☐ NO 3. Could the change affect the basic function of a structure, system or component that performs or supports the performance of a safety function (deleting or changing logic interlocking, additional pumps, etc.)?

Common Q is a safety system and hence performs the safety function of mitigating damage in a post accident environment. All components in this EDCR are in the mild environments of the control room and the aux instrument room and all components are mounted to seismic cat 1 standards. Therefore the most limiting operating condition is being accounted for.

Common Q is specifically designed that non-safety failures will have no impact on Common Q's safety related function (annunciator, ICS, printer). Additionally Common Q is trained.

Note that Common Q does not perform any "action". It merely provides information to the operator.

☐ YES x NO 4. Could the change affect environmental conditions such as pressure, temperature, humidity, flooding, corrosiveness, site elevation, nuclear radiation (both rate and total integrated dose), and duration of exposure in either harsh or mild areas?

There are no conceivable ways Common Q will cause any environmental impact.

If the answer to any of the above questions is "YES", the change shall be coordinated with the Lead Electrical/I&C Engineer, and if applicable, with ME/NE for potential revisions to the EQ/MEQ Binders.

☐ YES x NO 5. Could the change involve relocating or reorienting a device or system which could impact location-specific dose calculation or shielding analyses or place the device or system in an area with different environmental conditions?

Common Q is not "relocating or reorienting" any other devices.

If YES, coordinate with ME/NE to revise the affected location specific dose calculation, environmental drawings, and EQ/MEQ documentation.

☐ YES x NO 6. Are Security Systems modified?

☐ YES x NO 7. Does the modification add quantities of chemicals that may have an impact on control room habitability?

If YES, evaluate impact on control room habitability per NRC Reg. Guide 1.78.

GENERAL:

x YES ☐ NO 8. Has the component being added or modified been evaluated for proper physical orientation? Components that require consideration are: capacitors, relays, check valves, steam traps, flow and level measuring devices, pressure switches, and solenoid valves. Other components may require consideration based on special applications, unique circumstances or vendor/manufacturer's recommendations.

All components will be installed according to manufacturers' installation instructions. The devices that need to be installed are...

- **Racks**
- **PC Node Box**
- **Touch screen display**
- **AF100 modems 1 and 2 (each train has two)**
- **Fiber optic to cat5 modem**
- **Printer**
- **OWL data diode**
- **Fiber optic patch panels**

GENERAL:

x YES ☐ NO 9. Based on the following considerations does the change create an operating unit difference?

x YES ☐ NO The change being made creates operational differences that would affect actions by the Operations staff.

There are unit differences, the most significant being the touch screen display. See the Unit Difference Form for a detailed write-up.

This change would affect "actions" because the Common Q panel is a completely different design and operated differently. Note that efforts were taken to give the display the same "feel" and "look" as the u1 ICCM display.

If YES, coordinate with Operations to ensure impacts on training are considered.

x YES ☐ NO The change being made creates operational differences that would affect the simulator.

The differences that affect the operators would also be applicable to the simulator.

If YES, coordinate with Operations to ensure simulator is updated.

The simulator is a unit 1 simulator. Any changes being made to unit2 that would affect the simulator will be handled with independent operator training or another process separate from this EDCR.

x YES ☐ NO The change being made creates unit differences that are economically feasible and would improve the operation or maintenance of the other unit or units.

If YES, initiate the appropriate package for Technical Review Committee.

☐ YES ☐ NO 10. Have considerations for mounting, connecting, and positioning of components included an evaluation of the required robustness of associated elements? Has the evaluation for robustness considered the need for protection from bumping, jarring, vibration, etc."

All components are being installed per the vendor's installation details. This analysis was done by the vendor, not Bechtel Engineering.

Note as of 12/15 – it is unsure the mounting configuration of the PC Node Box and AF100 modems, specifically can it be mounted sideways for example. This was asked in a formal letter and has not had a response.

TECHNICAL EVALUATION CONSIDERATIONS OF 0-TI-2

GENERAL:			
☐ YES	☐ NO	11.	Is this modification subject to vibration, thermalmovement, and/or leaks on trip sensitive equipment? (i.e., replace carbon steel piping with stainless steel piping, modify routing such that thermal flexibility is reduced, modify support or support locations to resist thermal expansion, process and/or pneumatic leaks.) If yes, develop and incorporate a monitoring plan. **Common Q has no ability to trip the plant.**

CIVIL

☐ YES x NO 1. Does the change potentially impact pipe break considerations, pipe whip, or jet impingement? Consideration should include changes to operating modes, the addition or rerouting or high energy pipe greater than 1 inch nominal diameter, or change or modify pipe rupture protection devices. Does the change relocate or add potential targets such as electrical components, equipment, conduits, instruments or air lines to compartments containing fluid systems? The change may be evaluated generically rather than on a case-by-case basis as described in Civil Design Guide DG-C1.2.10.

This EDCR, which contains no cabling, has components in the AIR and control room. There is no conceivable way that this would impact pipe break considerations.

x YES ☐ NO 2. Does the change affect piping vibration or testing requirements? Was there a mass change? Were supports added/deleted? Was an orifice, valve, or other flow device added or deleted? Was there an operational or configuration change?

Piping vibration – no

Mass change – yes – multiple components are being added

Supports – no?

Orifice, valve, flow device – no

Operation or configuration change – yes – see unit difference form for detailed write-up.

x YES ☐ NO 3. Are Seismic Category I or I(L) components added, deleted, or modified? Are components in a Seismic Category I structure added, deleted, or modified? Does the change affect the seismic or dead weight analyses?

Seismic components – yes there are multiple Seismic Cat I components being added.

Seismic structure – I don't know – need to verify control building is seismic structure

Seismic or dead weigh analysis – I don't know

☐ YES ☐ NO 4. Does the change involve an existing attachment on a Seismic Category I structure/civil feature (e.g., new loads generated, revise loads previously approved, physical modification requried at interface points) or the addition of an attachment to and/or penetration of a Seismic Category I structure(s)? Does the change affect the attachment or add attachments of engineered features to masonry block walls in a Seismic Category I structure? Does the change impact the fire resistance rating of a fire barrier?

Involve an attachment to Seismic Cat I structure - yes - all components are located in the control building which is a CAT I structure

Masonry block walls in CAT1 structure – I don't know

Fire barrier – no fire barriers are impacted. All cabling is dealt with in separate bulk cabling EDCRs. See scope statement for explanation

CIVIL

☐ YES x NO 5. Could the change affect WBN Probable Maximum Precipitation (PMP) site drainage (i.e. add or obstruct surface to water flow, divert or reroute a flow path, change ground surface contours, change from vegetation to concrete or pavement, etc.).

If YES is the response to any of these questions, consult Civil Engineering.

ELECTRICAL/IINSTRUMENTATION & CONTROLS:

x YES ☐ NO 1. Does the change affect breaker alignment, electrical loads, or electrical separation/isolation?

The racks, PC Node box, fiber to cat5 modems, digital panel meters, printer, and data diodes all need power.

The racks and Node box require safety power.

☐ YES x NO 2. Is any low or medium voltage (V3, V4, or V5) electrical containment penetration protector (circuit breaker or fuse) involved?

☐ YES x NO 3. Has any electrical load classification changed (non-1E to 1E)? Ishe Class 1E classification for a fuse on the Fuse Tab changing?

☐ YES x NO 4. Does the change involve instrument setpoints, instrument/relay settings or other instrument information found in EMPAC? Is the change consistent with N-specs (e.g., instrument line slopes and installation)? Has reset and deadband been evaluated?

Common Q receives inputs from various instruments (RTDs, thermocouples, differential pressure transmitters, pressure transmitters, contact settings for RCPs, and hydraulic isolators). However, instruments are being installed by other EDCRs (see scope statement).

x YES ☐ NO 5. Does the change alter, add, or delete Post Accident Monitoring (PAM) equipment or affect the type, category, or operating time of existing equipment? (See Design Criteria for the list of PAM variables.)

Common Q is one of the primary providers of post accident information. WB-DC-30.7 *Post Accident Monitoring Instrumentation* has three PAM variable that are measured by the Common Q system
6 – Core Exit Temperature
16 – Subcooling margin monitor
22 – reactor vessel level

There are no applicable "operating times" that Common Q is accountable to.

If YES, coordinate with M/N, EE, Operations and Site Licensing and include appropriate changes within the DCN Package to ensure continued Reg. Guide 1.97 compliance.

There are three RG 1.97 calculations WBN2 project is creating

- **WBNEEBIDQ29990901 - *Non-Class 1E Cables Required For Post Accident Monitoring Category 2 Variables***
    - **All variables are CAT 1 - this calculation is not applicable.**
- **WBNEEBIDQ29990903 - PAM Instrumentation Evaluation and Verification Methodology, Standards and Guidelines**
    - **Is being open itemed - see OI-52351-17.**
    - **WBPEVAR8809048 is the unit 1 calculation**
- **WBNEEBIDQ299909002 - *Instrument Loop Evaluation for Containment Isolation Valve Position***
    - **RG 1.97 requirements of containment isolation valves**

There are no isolation valves in Common Q - this calculation is not applicable.

ELECTRICAL/IINSTRUMENTATION & CONTROLS:

☐ YES ☐ NO 6. Does the change involve instrument ratings? (Relay or solenoid coil ratings, contact ratings, duty cycles, etc.)

Common Q receives inputs from various instruments (RTDs, thermocouples, differential pressure transmitters, pressure transmitters, contact settings for RCPs, and hydraulic isolators).

☐ YES ☐ NO 7. Does the change challenge the capacity of another system (Air conditioning system heat load, control air load, electrical load)?

Common Q consumes 4A in the racks and 1.25A in the PC Node boxes. The fiber/cat5 modems consume 0.5A each. Even if all this was converted to heat, it would be an insignificant heat load increase. See WBT-D-0600 and the electrical and I&C calculation checklist for full loading analysis and affected calculations.

☐ YES ☐ NO 8. Does the change affect the operating or accident environment or instrumentation? Is the electrical equipment or instrumentation required to operate in the affected environment? Have potential operating and accident environments of equipment been considered?

<u>Changes to environment</u> – no - there is no conceivable way Common Q will affect the environment

<u>Required to operate</u> – yes – Common Q is required to operate in any of the designed for post accident environments. It is built to 1E and seismic CAT1 standards. All components are in mild environmental areas. An additional mitigation is that Common Q is trained.
Note that many of the instruments that feed Common Q are in harsh environments. These are being analyzed in their prospective EDCRs. See the scope statement for this list.

<u>Potential environments considered</u> – yes – Common Q is located in a mild environment. The largest concern is seismic design basis accidents and these are mitigated by having all safety components installed to CAT I standards.

x YES ☐ NO 9. Have the effects of EMI/RFI been considered?.

According to the design basis document, Westinghouse will not comply to TVA SS-E18.14.01. They will submit an EQ summary report. This report will be received after EDCR issuance, so will be an open item 52351-001 for review and approval of this report.

<u>During the installation</u> (welding) of the cabinets in the AIR...
Construction will implement precautionary measures to preclude EMI/RFI with Unit 1 components. For example using Faraday Cages to protect components required for Unit 1 operation from Electromagnetic Interference (EMI).

Construction shall perform all welding activities in accordance with Bechtel Special Process Manual 25402-000-GMX-GCE-00001 and shall fulfill all requirements in accordance with plant procedures to assure no adverse consequences to Unit 1 operations and safety.

ELECTRICAL/IINSTRUMENTATION & CONTROLS:

x YES ☐ NO 10. Is the logic of system operation changed? Are new or modified interfaces (physically or electrically) with safety related or important to safety equipment created?

Logic – no – logic and associated logic diagrams imply that decisions are made based on various conditions. Common Q makes no "decisions" and takes no "action" other than sending an alarm. Common Q merely calculates values and displays them to an operator.

Interface – yes – there are safety to non-safety interfaces in Common Q. See question #2 in the General section.

☐ YES ☐ NO 11. Does the change affect, add, or delete equipment within the scope of 10CFR 50.49 (EQ)? Review appropriate documents such as MEL, Essentially Mild Calculations, Category & Operating Times Calculations, and/or equipment in a harsh environment? Cable must be considered (e.g., mild to harsh environment).

All components in this EDCR are located in mild environments.

Note that many of the instruments that feed Common Q are EQ related, but these are being dealt with in their respective EDCRs. See the scope statement for details.

If the answer to any of the above questions is "YES", the change shall be coordinated with the Lead Electrical/I&C Engineer, and if applicable, with ME/NE for potential revisions to EQ/MEQ Binders.

☐ YES x NO 12. Could the change affect materials such as lubricants, seals and O-rings, which could impact Qualification Maintenance Data Sheet (QMDS) requirements and qualification analyses, and invalidate test data, or could the change affect special maintenance (QMDS) and/or administrative requirements and controls that might impact the qualidication of an item?

If YES, coordinate with the responsible discipline on revisions to the QMDS.

x YES ☐ NO 13. Does the change involve a power, control, or instrumentation circuit for a 10CFR50.49 component either by direct connection or relay logic or involve a non-10CFR50.49 power control or instrumentation circuit which have a credible circuit interaction failure mode with 10CFR50.49 power control or instrumentation circuit?

Many of the instruments that have a direct connection with Common Q are EQ related, but these are being dealt with in their respective EDCRs. See the scope statement for details.

ELECTRICAL/IINSTRUMENTATION & CONTROLS:

If YES, perform an analysis in accordance with SPP-9.2, Appendix I for any safety-related cables or components located in a harsh environment that are designated as Category C (ie. not required to be addressed in the EQ program).

- **RVLIS TE's have a direct connection and are EQ related, CAT A for all events**
- **RVLIS LTs in aux building are EQ related , CAT A for all events**
- **WINCISE CETs are EQ related, CAT A for all events**
- **WR RTDs (2-TE-068-1,24,43,65) are all EQ and CAT A for all events. These do not have a direct connection, they go to Eagle 21 first.**
- **WR PT (2-PT-068-63,64) are EQ and CAT A for all events. These go to Eagle 21 first.**
- **RVLIS XISs in aux building are not EQ related (they are QR).**

Since all interactions are with CAT A EQ components or non-EQ components, there are no CAT C components involved. Looking at the block diagram located within the EDCR, there are minimal interactions with other systems. Some instruments (CET, RVLIS RTD, D/P pressure transmitter, XIS) are fed directly into Common Q. The WR RTDs, WR pressure, and ΔT signal come from Eagle 21. The RCP signals come from SSPS. If any of these inputs fail, Common Q will not function accordingly. If any of the outputs fail (ICS, annunciator, print screen) Common Q will continue to perform its safety function.

In conclusion, since the interacting devices are all safety related, except the XIS, and classified as CAT A or non EQ there is no reason for concern concerning interaction with CAT C components.

Reference...
WBNOSG4134 – 10CFR50.49 methodology and listing of other calculations
WBNOSG4017 – system 68 category and operating times calculation
WBNOSG4028 – system 94 category and operating times calculation

☐ YES x NO 14. Does the change upgrade the function of an existing device/cable such that additional QA records and documentation are needed to support 10CFR50.49 Qualification in accordance with 10CFR50, Appendix B manufacturing, procurement, installation, etc.)?

If YES, provided additional documentation as required.

x YES ☐ NO 15. Does the change involve any instrument tabulation information?

If YES, evaluate MEL to determine if the Instrument Tabulation information for the affected system(s) is not being maintained in MEL.

MEL package is included

If the information is bieng maintained in MEL, provide normal changes for I-Tab and include the completed MEL data entry sheets in the EDCR Package.

ELECTRICAL/IINSTRUMENTATION & CONTROLS:

NOTE: Since the information on the instrument tabulation drawings is now maintained in MEL for affected systems the instrument tabulation drawings for these systems have been superseded and are no longer updated. If the information is not being maintained in MEL, continue to process the drawing.

x YES	☐ NO	16.	Does the modification affect components/equipment that require periodic testing of electrical test points.
			If YES, provide appropriate test jacks which are accessible to prevent accidental contact with adjacent electrical terminations during testing.
			Common Q is being provided with external simulator that the can be used to simulate various plant configurations for maintenance and testing purposes.

ELECTRICAL/INSTRUMENTATION & CONTROLS:

☐ YES x NO 17. Does the modification change functional logic which has the potential of affecting design characteristics?

If YES, evaluate PER/NER history on the equipment being modified to determine if problems have previously been identified.

See question #7 in "other".

x YES ☐ NO 18. Does the modification involve a programmatic or digital logic controller?

Common Q has PLC racks where it does a lot of the processing and analyzing of inputs and outputs. There are twenty PLC modules per train. Westinghouse has not designed the cabinets to have UPSs in their racks.

If YES, has the addition of uninterruptible power supplies been considered?

The PLCs are powered from redundant power supplies in each rack. The rack is powered from safety related power from the vital boards. There are redundancies and backups built into the design of the vital boards to ensure they are always powered. Utilizing uninterruptible power supplies are not required.

☐ YES x NO 19. Does the modification involve fault tolerant non-safety-related equipment important to operation such that the need for redundant power sources should be considered (such as CERPI control room devices)?

There are no fault tolerant pieces of information

☐ YES x NO 20. Does the design or modification impact an Integrated Computer System (ICS) data point that is also an Emergency Response Data System (ERDS) data point?

It is expected that some variables originating from Common Q PAMS will be sent to ERDS; however the initial Data Point List has not been submitted to the NRC for unit 2.

If YES, coordination with Site Licensing is required in accordance with 10CFR50 Appendix E.

Okay

☐ YES x NO 21. Does the design or modification impact off site power capability or ability to meet 10CFR50 Appendix A Criterion-17 requirements?

This EDCR does not impact onsite or offsite electric power system.

If YES, coordinate with Electrical Lead Engineer.

MECHANICAL:

Ensure EQ requirements addressed for ancillary subcomponents (e.g., Limit Switches on Mechanical only valves). Coordinate with Electrical EQ Engineer as necessary.

x YES ☐ NO 1. Does the change affect design conditions or requirements such as process pressure, temperature, chemistry or operating cycles?

<u>Affect design conditions</u> – no

<u>Affected by other systems</u> – yes - if any of the inputs into Common Q fail, then Common Q will not perform its safety function. These inputs are all installed in other EDCRs, see scope statement for details.

If YES, ensure the evaluation encompasses all aspects of the affected system, including impacts on interfacing systems. Coordinate with mechanical EGS for potential revisions to affected MEQ documentation.

There are no mechanical systems in this EDCR

☐ YES x NO 2. Does the change affect ECCS, decay heat removal systems, or MPC cooling ancillary equipment? Ensure that any changes are consistent with the safety analyses for the plant including WBN SAR Chapter 15 NPSH minimum flow requirements, diesel loading sequencing, and ultimate heat sink limits.

☐ YES x NO 3. Is the Auxiliary Building Secondary Containment Enclosures (ABSCE) as defined in WBN2-30AB-4001, affected by this change? Does this change modify any cable, cable tray, conduit, duct, pipe, or instrument tubing penetrating secondary containment? Consult 47W501 drawing series for the locations of the ABSCE Boundary, and discuss proposed changes with the NSSS EGS. A justification for the "Yes/No" is required.

<u>ABSCE modified</u> – no

<u>Adjacent to ABSCE</u> – no

<u>Penetrating ABSCE</u> – no – the bulk cabling EDCR for the RVLIS RTDs will penetrate ABSCE. The RVLIS EDCR will penetrate ABSCE with the sense lines.

x YES ☐ NO 4. Does the change involve potential heating, ventilation, and air-conditioning (HVAC) system impacts resulting from adding heat loads, altering air flow or ductwork etc.?

Common Q components all require power and produce heat. It consumes 4A in the racks and 1.25A in the PC Node boxes. The fiber/cat5 modems consume 0.5A each. Even if all this was converted to heat, it would be an insignificant heat load increase.

Electrical engineering will create the power consumption calculation and then this is inputted into the mechanical heat load calculation EPMMCP071689 - *Cooling/Heating Load & Equipment/Component Performance Analysis For The Control Building Electrical Board Room Areas*. The heat load calculation may or may not need to be revised depending on the added load. OI-52351-20 will track this analysis.

☐ YES x NO 5. Does this change make any alterations or configuration changes to Motor Operated Valves (MOVs) or Air Operated Valves (AOVs)? Does this change impact any MOV or AOV Program documents? Impacts that should be considered include changes to instrumentation or control circuits, power supplies, or change system operating or design conditions such as pressure and flow rate.

MECHANICAL:			
☐ YES	X NO	6.	Does this change involve replacement of a complete valve or valve internals which are listed in the Engineering Specification N1M-007 or is the valve located in a system that interfaces directly with the Reactor Coolant System (RCS)? Procurement requirements should evaluate valve and valve internals replacements that are located in or interfaces with the Reactor Coolant System (RCS) for hard faced components that are non-cobalt bearing. Hard facing alternatives include NOREM Nitronic 60 and may include other non-cobalt materials as approved by Engineering. Cobalt bearing hand materials is a concern in fluid systems that contain radioactive materials. **There are no valves in this system**
☐ YES	x NO	7.	Does the modification add a new check valve or impact an existing check valve? Ensure the valve is sized properly, proper type for required service, properly oriented, located suitable distance from upstream components that cause turbulent flow.

MECHANICAL:

☐ YES	x NO	8.	Does the modification add, delete, or reroute components in a mechanical piping system? If Yes, will the added components come in contact with borated water or some other harsh environmental area?
☐ YES	x NO	8a.	Evaluate to determine if the change affects the ASME Section III Code (Class 1, 2, and 3) boundary. If ASME Section III boundary is affected were materials in accordance with ASME Section II Code used in installation? Was the installation performed in accordance with ASME Section III Code?
x YES	☐ NO	9.	Specify applicable welding requirements (e.g., AISC/AWS, ANSI B31.1, or other applicable codes) on safety-related DRAs or for drawing, original issues or revisions. **Only applicable welding is for the racks. All welding requirements are on DRA 52351-025**
☐ YES	x NO	10.	Does this modification introduce material into the containment that could become dislodged during LOCA or other events and contribute to Emergency Core Cooling system (ECCS) sump screen or strainer blockage? Does this modification affect protective coatings inside the containment?
☐ YES	x NO	11.	Does the modification increase the possibility of flooding from a Moderate Energy Line Break?
☐ YES	x NO	12.	Does the modification affect the power uprate?
☐ YES	x NO	13.	Are there NUREG-0612 impacts? Does the change add, delete, or alter a permanent handling system? Does the change move a heavy load path over safe shutdown equipment or move safe shutdown equipment into a heavy load path? **According to 44W411-3, these components are not being placed in a NUREG-0612 area.**
☐ YES	x NO	14.	Does the change affect barriers such as walls, doors, penetrations, relief panels, and ducts which could affect HVAC flow paths, fire barriers, or environmental conditions in either harsh or mild areas?
			If the answer to any of the above questions is "YES", the change shall be coordinated with the Mechanical EGS.
☐ YES	x NO	15.	Is a new material being added and does the change affect components susceptible to Flow Accelerated Corrosion (FAC) or Microbiologically Induced Corrosion (MIC)?
☐ YES	x NO	16.	Does the modification increase the susceptibility for cavitation?
☐ YES	x NO	17.	Could the change affect location or operation of high energy piping systems, location or operation of radioactive piping systems, operation of environmental control systems, or environmental barriers such as walls, doors, relief panels, piping/other thermal insulation, and ducts which could affect environmental conditions in either harsh or mild areas?

MECHANICAL:

If YES, coordinate with ME for potential revision to the environmental drawings/design criteria and coordinate with EE for potential impact to EQ of equipment.

☐ YES x NO 18. Does the change involve any valve tabulation information?

Irf YES, include the completed MEL Data Entry Sheet in the EDCR Package.

☐ YES x NO 19. Does this change affect the Seismic Category I boundary?

If YES, the applicable Seismic Category I Boundary calculations must be revised.

<u>NOTE</u> Issuing a design calculation in accordance with NEDP-2 is the means of assuring that the applicable Seismic Category I Boundary calculation is revised.

☐ YES x NO 20. Does the modification change ventilation, cooling requirements for electronic equipment?

If YES, coordinate with Mechanical Engineering for determination of impact on HVAC coolant.

☐ YES x NO 21. Does the modification involve strainers for a raw water supply?

If YES, proper strainer selection should be based on industry guidelines (Fluid Controls Institute Std 89-1) and specific site criteria. Major consideration should be given to the following: type of strainer, redundant strainer capability, materials/housing, perforations number and arrangement, mesh size & free area, capacity and pressure loss, fluid type, particle weight & shape, macro fouling and aduatic debris potential, operating parameters, filtration versus separation, blow down line sizing, vendor recommendations, automatic back flushing and the necessity of a bypass line.

NOTE: Contact the appropriate program coordinator in the Mechanical Programs group (or in Plant Design for MOV questions) if any Engineering Design Program(s) are impacted by the proposed modification.

☐ YES x NO 22. Does the change directly or indirectly impact Mechanical or Electrical Appendix R equipment, or cables, required for safe-shutdown per 10CFR50 Appendix R (TI-277 at WBN)?

☐ YES x NO Does the modification involve a system, component or structure required for Appendix R safe shutdown capability?

Note that 2-PT-68-63 and the hot leg WR RTDs are on the appendix R list (See FPR section III, table 3-2). However, these are installed and connected to Common Q with separate EDCRs. See the scope statement and the Appendix R section of this evaluation.

MECHANICAL:

☐ YES	x NO	Does the modification involve a fire rated barrier (includes fire door, fire damper, fire wrap, walls, floors, ceilings, penetration seals, etc.)?
☐ YES	x NO	Does the modification affect a suppression system, the detection system, or Appendix R required lighting, including the illumination path?
x YES	☐ NO	Does the modification introduce or remove combustible material or fire source in the area? **The existing ICCM-related panel (R-148) is being replaced with two Common Q-related panels (R-179 & -180). Combustible loading calc. MDQ 00299920090342 must be reviewed for impact**

If YES, see the 10CFR 50 Appendix R Program Owner.

OPERATIONS/HUMAN FACTORS:			
☐ YES	x NO	1.	Does the change involve compensatory measures or require an increase in operator staffing to complete newly required actions? **There is a print screen capability from the OM that u1 does not have. But this does not require any extra staffing.**
x YES	☐ NO	2.	Does the change affect the main control room or the backup control areas (Environment, workspace, controls and displays)? If YES, human factors must be addressed. **See attached human factors review.**
☐ YES	x NO	3.	Are OSHA considerations included? Whenever replacement or major repair,renovation, or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment must be designed to accept a lockout device. This applies to mechanical and electrical devices.
☐ YES	x NO	4.	Does the modification affect valves listed in the locked valve checklist maintained by Operations and the locked position shown on design output? If YES, ensure that design output (DRAs/drawings) agree with the locked position of applicable valves or coordinate a revision to the locked valve checklist, if necessary.

OTHER:

x YES ☐ NO 1. Does the change affect equipment diversity, failure modes, single failure criteria (DS-E2.0.2, "Single Point Failure For Power Generation Reliability"), equipment redundancy, or equipment reliability?

Common Q installs redundant equipment in that it is trained.

- x YES ☐ NO Does the modification install redundant equipment?

  If YES, utilization of redundant attendant equipment (e.g., power from alternate sources) shall be considered and addressed.

  Common Q is trained.

☐ YES x NO 2. Does the modification change System 18, 43, 66, 77, or 90, or potentially impact the plant Chemistry Organization (i.e., sampling, procedures, training, spare parts, chemical treatments, etc.)?

☐ YES x NO 3. Does the change involve environmental impacts.

- ☐ YES x NO Will the modification require new Chemicals (as defined in SPP-5.4) to be used anywhere onsite or result in a change in plant chemical storage or usage?
- ☐ YES x NO Will the modification generate any new wastes? (Solid, Liquid, Hazardous, Universal, Used Oil, Radioactive, etc.) or result in the release of any new or different substances to the land, air, or water?

  NOTE This does not include consumables used to facilitate the installation of the modification.

- ☐ YES x NO Will the modification change the existing flow path or characteristics of any discharge to the land, air, or water?
- ☐ YES x NO Will the modification result in demolition of any building or the purchase of real-estate, regardless of size?
- ☐ YES x NO Will the modification result in disturbance of more than 1 acre of site property?
- ☐ YES x NO Will the modification involve any equipment containing PCBs, Mercury, or Asbestos?
- ☐ YES x NO Will the modification result in all upgrade or alteration to any pollution control equipment?
- ☐ YES x NO Will the modification affect the waters of the U.S. (e.g., dredging or discharging to the river)?

OTHER:

☐ YES x NO Will the modification involve storage or use of oil or hazardous substance in an amount equal to or greater than 55 gallons?

If YES, contact Environmental Staff to ensure that the applicable Environmental Review (in accordance with SPP-5.5 and TVA National Environmental Policy Act (NEPA) Process or chemical traffic control review are initiated/performed.

If YES, Environmental shall be a Core Review group at the initial and final meeting.

☐ YES x NO 4. Does the modification affect the Radiological Emergency Plan (for example, radiation monitors, meteorological instrumentation, onsite emergency sirens, or onsite telephone system) or does the modification affect any equipment, boundaries, or plant structures in a manner that will affect any of the Emergency Action levels (EALs) in EPIP-1 or the REP Appendix A, B, or C?

If either question is YES, contact Radiological Emergency Plan Staff to ensure that a Plan Effectiveness Determination is initiated/performed (in accordance with 10CFR50.54 and EPIL-1, Emergency Preparedness Instruction Letter, "Procedures, Maps, and Drawings") to determine if NRC prior approval is required prior to any REP revision.

If NRC approval is required prior to any REP revision (i.e., EPIP changes), then annotates in block 10 on Attachment B, "EDCR Cover Sheet."

☐ YES x NO 5. Does this modification impact the fire protection system or equipment of an insured building?

If YES, a Site Engineering representative shall coordinate review and concurrence of the EDCR documents with the insurance carrier.

x YES ☐ NO 6. Does the change affect information in the Q-List?

☐ YES x NO Are any attributes as defined in Limited QA appendix of NEDP-4 added, deleted, or modified?

x YES ☐ NO Is the UNID for a component in MEL altered?

See MEL package

x YES ☐ NO Is the MEL evaluation for the proposed modification adequate and complete?

x YES ☐ NO Is a UNID being added or modified in the MEL?

See MEL package

OTHER:

x YES ☐ NO **7.** Does the modification change functional logic which has the potential of affecting design characteristics or change/impact an item listed in the Equipment Performance Information Exchange (EPIX) system?

If YES, evaluate PER/NER history and EPIX on the equipment being modified to determine if problems have previously been identified and are appropriately addressed in the EDCR Package. Ensure appropriate coordination with affected organizations is performed such as Operations, Maintenance, Environmental, Chemistry, and Emergency Preparedness.

The Common Qualified Group of components can be used for different functions depending on the plants' need. WBN2 is using it for Post Accident Monitoring. Other U.S. plants that have utilized Common Q are...

- **Calvert Cliffs 1&2 is using it for PAM, but utilizes a heated junction thermocouple assembly for measuring reactor vessel level vice differential pressure**
- **Palo Verde 1,2,3 uses CQ for core protection calculations**
- **Vogtle 1,2 uses CQ for the diesel generator**
- **Watts Bar u1 uses CQ for CERPI**

Various searches were done in EPIX for only the plants listed. The results are...

- **Calvert Cliffs, failure #1068, 2005.**
  - **There was a blown fuse for one of the heated thermocouples. This is not relevant to the WBN2 design.**
- **Calvert Cliffs, failure #1114, 2006**
  - **During routing calibration of the analog input card AI685, they found the as left value was OOS high. This card could not be calibrated and had to be replaced.**
  - **This card <u>is used</u> in WBN2**
- **WBN U1, failure #380, 2004**
  - **Multiple dropped rods. Cause was bad transistor on the rod control side of the system (not the rod position or CERPI side). This failure has no impact for WBN2.**

Note there has been another failure noted referred to as the "data freeze" where the OM locks up. This is discussed in detail in *Single Point Failure* section of this technical evaluation.

☐ YES x NO **8.** Does the change substitute, change, add or modify materials, components or chemical treatments not previously evaluated to the system parameters or application?

If YES, an evaluation for material compatibility shall be performed.

☐ YES x NO **9.** Does the change involve a component or component parts whose function and usage have been made obsolete as result of the change?

One of the reasons Common Q is being installed is because it is the industry standard that has replaced ICCM-86.

If YES, ensure that the materials organization is notified in order to perform an inventory evaluation.

10CFR50 APPENDIX R AND OTHER FIRE PROTECTION IMPACTS: See the Program Owner			
x YES	☐ NO	a.	Does the change directly or indirectly impact Mechanical or Electrical Appendix R equipment, or cables, required for safe-shutdown (This includes manual actions required for safe shutdown.)? **Common Q only indirectly impacts the Appendix R list only because one of the WR pressure transmitters, 2-PT-68-63 and the hot leg WR RTDs are on the appendix R list (See FPR section III, table 3-2). However, these are installed and cabling connected to Common Q with separate EDCRs. See the scope statement.**
☐ YES	x NO	b.	Does the change impact Appendix R component availability in any fire area/zone?
☐ YES	x NO	c.	Have any Appendix R equipment parameters (e.g., flow rate, pressure, setpoints, load limitations, electrical load, interface with other components) changed?
☐ YES	x NO	d.	Have Appendix R cable tag/UNID numbers or cable fire area/zone routings changed?
☐ YES	x NO	e.	Have Appendix R cables been added/deleted or Appendix R control circuit logics been changed? **Cabling will be installed with the bulk cabling EDCRs. See the Scope Statement**
☐ YES	x NO	f.	Does the change involve a non-Appendix R circuit which interferes with an Appendix R Circuit (e.g., re-wiring to create associated circuits)?
☐ YES	x NO	g.	Does the change impact the use of Appendix R equipment in any fire area/zone?
☐ YES	x NO	h.	Has component been installed or relocated which obstructs the light pattern of an existing Appendix R emergency light?
☐ YES	x NO	i.	Has an Appendix R component been added, deleted, or relocated which would affect Appendix R light placement, including ingress/egress lights?
☐ YES	x NO	j.	Has an Appendix R component been installed or relocated in the same fire area/zone as its functionally redundant safe shutdown train/system? (This includes instrument sensing lines.) Note: The functionally redundant train is not necessarily the redundant divisional train.)
☐ YES	x NO	k.	Does the change affect in-plant communication systems?
☐ YES	x NO	l.	Does the change affect fire barriers, fire doors, fire dampers or fire wraps, or affect electrical or mechanical penetrations through fire rated walls, floors, ceilings or cable fire stops?
☐ YES	x NO	m.	Does the change affect structural steel, raceway supports or raceway fire-proofing material?

10CFR50 APPENDIX R AND OTHER FIRE PROTECTION IMPACTS: See the Program Owner

x YES	☐ NO	n.	Does the change result in the accition or deletion of in-situ combustibles in a fire area/zone (e.g., panels, new cable trays, components with oil sumps, grease plastics)? (Note: Exclude cables routed entirely in conduits. Also exclude cables routed in existing trays without exceeding the tray fill capacity. Exclude combustibles less than 0.5 gallons oil, 4 lbs. plastic, 4 lbs. grease or equivalent amount of other combustible materials.) If yes, combustible loading calculation may be affected. Check with the 10CFR50 Appendix R Program Owner. **The fully loaded Common Q cabinet has a maximum weight approximately 1000lbs fully loaded. The PC node box weights 20lbs fully loaded.** **MDQ00299920090342 - *WBN2CCP-Combustible Loading Data (CLD)* is being revised (or will be OI'd).**
☐ YES	x NO	o.	Does the change affect any of the fire protection systems (HPFP, SFFF, Halon, or CO_2) or affect any of the fire detection systems (e.g., smoke or heat)?
☐ YES	x NO	p.	Does the change impact the Fire Protection Reports? If "YES", then a DCN must be issued.
☐ YES	x NO	q.	Does the change impact the property insurance carrier fire protection standards and/or associated commitments?
☐ YES	x NO	r.	Does the change involve the reactor coolant pump oil collection system? If YES, see the Appendix R Program Owner.

SINGLE POINT FAILURE/FAILURE MODES AND EFFECTS/RELIABILITY:

Checklist of questions to ask vendors of large scale systems, and our own designer(s) in regards to single point failures and margin to operation/trip/runback. The following questions should be considered when dealing with vendor supplied packaged solutions.

x YES ☐ NO a. What are the system failure modes for the entire package (i.e., output fail-as-is, fail high or low, oscillate, trip system/plant, run back system plant, consider loss of motive power such as electric or control air, etc.)?

Mechanical components addressed by EDCR do not include these failure modes.

The most likely failure modes in the system is a hardware failure within the cabinet or node box. This could have numerous different impacts, the most likely is that one of the three primary functions will stop working (1) RV level (2) submargin monitoring, and (3) CET temperatures.

According to the *Technical Specification* this will put the plant in different types of LCOs, the least severe is loss of RV level. Essentially if one train goes down completely, a shutdown is not required (a letter/justification is needed). If both trains are lost, then the loss of the CETs and SMM will force the plant to shut down in 30 days.

In previous uses of Common Q there had been a data freeze problem in that the OM had frozen. This will not be a concern in WBN2 because the operating system is a newer version. See 25402-011-G26-GAKS-00257-000, WBT-D-0479. Note that a "new version" is not the same as a "patch". Patches were applied to other plants Common Q systems (U1 CERPI for example), U2 Common Q will get a complete new software version.

x YES ☐ NO b. What are the failure modes of the individual components which were considered, and what was their effect on the overall system (i.e., consider failures of the digital control systems related to the hardware and softloss of CPU, loss of communication connection, loss of an entire I/O board, etc.)?

Mechanical components addressed by EDCR do not include these failure modes.

For the below analysis it is important to note that the alarm Common Q sends the annunciator can be one of five options (low SMM, low RV level, high T_{CREP}, system trouble, or ICC trouble). The alarm that unit 1's ICCM-86 is most similar to is the "<u>system trouble</u>" and therefore this is the alarm u2 is utilizing. This alarm does not alarm on any physical parameter being too high or low. It alarms only on a type of system failure. The ICC trouble alarm is more for if any of the first three physical parameters trigger.

Additionally, Common Q itself alarms non-audibly in the event of the other above five alarms. There is also the ability to label some signals as <u>suspect</u>. When this happens common Q will label the applicable calculated result as "suspect". There are also minimum requirements of the number of incoming variables that are needed. There is also the ability to label the value as <u>failed</u>.

NEED TO UPDATE/VERIFY WITH REV 2 DOCUMENTATION

<u>SUBMARGIN CALCULATION</u>

Failure of <u>CET input</u> impacts the calculation of T_{CREP} only. T_{CREP} requires two

SINGLE POINT FAILURE/FAILURE MODES AND EFFECTS/RELIABILITY:

CETs per quadrant to be valid. Therefore one CET failure would not result in SMM value failing. However the SMM would be labeled as "suspect". See 00000-ICE-30156 section 2.5.3.4.26 and *System Req Spec R2.5.3.2-12*.

Failure of <u>WR temperatures</u> from Eagle 21 would not affect the SMM calculation. Normally these two are auctioneered in that the highest is selected. If one fails then the other will be used. See *System Req Spec* R2.5.3.2-6. The SMM value will not be labeled as "suspect" or "failed".

Failure of <u>WR pressure</u> from Eagle 21 would cause the SMM calculation to be labeled as "failed". This is mitigated by Common Q being trained along with the two pressure transmitters that feed Common Q (2-068-PT-063/064) and are separate brands (Barton and Weed). The purpose of these different brands is to support an RCS/RHR interlock, but this can still be used to mitigate the failure of a single WR pressure transmitter.

<u>REACTOR VESSEL CALCUALTION</u>

Failure of <u>D/P transmitter</u>

- **with no pumps running this will cause the water level to be labeled as "failed". See 2.5.3.4.6**

Failure of <u>hydraulic isolator (XIS)</u> will cause the water level quality with that range to be labeled as "failed". See 2.5.3.4.8.

Failure of <u>SSPS RCP status</u> will result is the associated level being labeled as "suspect". See section 2.5.3.4.9 of the *System Req Spec.*

Failure of <u>RVLIS RTD</u> – open or short
The failure of a RVLS RTD is unique. There will be a user adjustable substitute for each RTD input when they are bypassed. So if an RTD fails either open or short, then the technicians will bypass that value and be able to adjust to another value at their discretion.

Failure of <u>ΔT</u> or core <u>thermal power</u> will result in RV level being "failed".

Failure of a single <u>WR temperature</u> from Eagle 21 would not affect the RVLIS calculation. Normally these two are auctioneered in that the highest is selected. If one fails then the auctioneered T_{hot} value will be "suspect" (see 2.5.3.4.5).

- **The auctioneered T_{hot} is used to calculate the temperature fluid density $\rho_l(T)$ which is compared to the pressure based fluid density $\rho_l(P)$ and then the highest density ρ_l is selected. If the auctioneered T_{hot} value is suspect then $\rho_l(T)$ will be "suspect". This will cause the overall ρ_l be "suspect". See *System Req Spec* 2.5.3.4.3.**
  - **If both temperatures fail, then the calculated $\rho_l(T)$ be labeled as "failed", the overall density ρ_l will be "suspect".**
- **The same argument applies to vapor based density ρ_g. Section 2.5.3.4.4.**
- **Will cause Upper Range and Lower Range Levels to be "suspect". See 2.5.3.4.6. The normal EUDH will be used**
- **Will cause the expected uncompensated dynamic head, EUDH(T) to be "suspect", see R2.5.3.4.10-4. The normal EUDH value will be used.**
- **End result is if one WR temperature fails, the final RV level will be**

SINGLE POINT FAILURE/FAILURE MODES AND EFFECTS/RELIABILITY:

"suspect"

<u>WR pressure</u> is used to calculate different aspects is the vessel level algorithm.

- **pressure based fluid density $\rho_l(P)$. This is compared to $\rho_l(T)$ and the highest of the densities is utilized. If the pressure signal fails then $\rho_l(P)$ will be labeled "failed", and ρ_l will be "suspect". See section R2.5.3.4.3-3.**
- **The same argument applies to vapor based density ρ_g in that it will be "suspect". Section 2.5.3.4.4**
- **Will cause Upper Range and Lower Range Levels to be "suspect". See 2.5.3.4.6.**
- **Will cause expected uncompensated dynamic head, EUDH(P) to be "failed", see R2.5.3.4.10-5. The normal EUDH value will be used.**
- **End result is if the WR pressure fails, RV level will still be calculated and be labeled as "failed" with no pumps running and "suspect" with pumps running.**

OTHER FAILURES

Failure <u>ICS/printer/annunciator</u> – Common Q is specifically designed so any of these external failures will not affect the safety function

Failure of <u>AC160 data link</u> to the OM – there is a heartbeat that the operator can see along with an alarm.

Failure of <u>PC Node box</u> would result in failure of the entire train. This would put the plant in a 30 day LCO until a report is required to the NRC. Long term operation is acceptable.

Failure of <u>fiber to cat 5 modems</u> will affect the printing capability only. No safety related function will be lost.

Failure of <u>AF100 modem</u> will have no effect. There is a redundant data link that each end has an AF100 modem. If one fails the other link will still function.

Failure of <u>OWL Dual Data Diode</u> will result in the data link ceasing to function. There will be no other impacts.

COMPONENT WITHIN RACK

There are numerous components within the rack that would cause a diversity of failures. It is assessed that these failures will result in either a failure similar to the one mentioned above, or a complete system failure resulting in the loss of a whole train.

☐ YES x NO c. Will these system and/or component failures directly or indirectly via transient cause a plant trip or runback?

Common Q does not have the ability to affect the plant in any way. It is a monitoring device only.

If YES,

Attachment 1
(Page 29 of 32)
TECHNICAL EVALUATION CONSIDERATIONS OF 0-TI-2

SINGLE POINT FAILURE/FAILURE MODES AND EFFECTS/RELIABILITY:

1. What is the reliability of the individual components and system?
2. How can testing be performed to detect failure modes, miss configurations, and precursors to imminent failures?
3. What alrms or indications provide timely precursor indication of impending component/system failure?
4. What are bases for alarm, runback, trip, and operator action points.
5. What are the margins between normal operation and these alrm, runback, trip, and opreator action points?
6. What redundancy is there in the alarms, indications, runback, or trip functions?
7. Which trips and runbacks are absolutely necessary? Which can be changed to alarms and what operator response is needed for the alarms?
8. Are digital systems developed in accordance with SPP-2.6 and SS-E18.15.01 software requirements for real time data acquisition and control computer systems?

SINGLE POINT FAILURE/FAILURE MODES AND EFFECTS/RELIABILITY:

9. Are there any reasons why redundancy was not considered in alarm, trip, runback systems, and can redundancy be added?

DIGITAL SYSTEM UPGRADES/MODIFICATIONS:

If the change involves a digital system, component or upgrade:

Common Q is a safety related digital computer system. There are numerous regulations involved,

- **the primary one being NRC Regulatory Guide 1.152 - *Criteria For Use of Computers in Safety Systems of Nuclear Power Plants***
- **RG 1.152 endorses IEEE 7-4.3.2 *Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations*, however it does not endorse Annexes B through F**
- **TVA's SPP 2.6 *Computer Software Control***
- **TVA's SS-E18.15.01 *Software Requirements For Real-Time Data Acquisition And Control Computer Systems* which implements SPP 2.6**
- **TVA's DG-E18.1.25 *Digital System Development, Procurement, and Implementation***

The contract with Westinghouse states "the Codes, Standards, and/or licensing requirements and regulations shall be those applicable to the standard Westinghouse product(s) or service(s) and/or product licensing basis for the identified product(s) or service(s)." This means that Westinghouse was not designing to any of the specific TVA requirements mentioned below.

Westinghouse created this software via the Westinghouse Software Program Manual which was reviewed by the NRC and complies with accepted industry standards and regulatory guidance. This process guarantees the software was developed by the applicable life cycle processes.

☐ YES ☐ NO 1. Implement digital upgrade using SPP-2.6, SS-E18.15.01, and the guidelines of DG-E18.1.25.

This was not completed, see section above.

☐ YES ☐ NO 2. If the change involves a modification of a digital system or component, use SPP-2.6 for in-house modifications and SS-E18.15.01 for modifications performed by a vendor.

This is not a modification, it is a new system.

☐ YES ☐ NO 3. For digital upgrades, refer to NRC RIS 2002-22 (Replaced Generic Letter 95-02) which endorses NEI 01-01, Rev. 1. The potential for common cause software failure must be considered (normally only required to be analyzed for when associated with a Safety Related Protection System upgrade) in the design phase (See DG-E18.1.25 and SS-E18.15.01 for guidance and requirements).

The Common Q system is a high quality, highly dependable digital system and is approved by the NRC in their applicable Safety Evaluation Reports (SER). Automated self testing is provided to monitor system health and alert the operators of failures. A failure modes and effects analysis has found that no single component failure will result in failure of both trains.

A software common mode failure, while not quantifiable, is not expected to decrease the dependability of the new PAM system. NEI-01-01 states that software developed with such processes should not result in more than a minimal increase in the likelihood of malfunction. A software common failure should relate to the same likelihood of a hardware common malfunction.

☐ YES ☐ NO 4. Determine the method and level of configuration control needed for the digital application. The configuration control method should be implemented using approved design control processes such as SPP-2.6 and/or SPP-9.3 (i.e., design output). This may involve the need to maintain configuration control of both the software and hardware revision levels. The level of control needed shall be based upon the application function (i.e., Safety Related, Quality Related, Critical to Plant Operations), capability to modify software such as software versus firmware, software and hardware revision compability, etc. Safety Related system configuration control must ensure that V&V qualification remains valid so prescriptive configuration control methods would be required. For Non Safety Related software, the configuration control may be less restrictive with focus on plant reliability and day to day operation. Firmware/Software includes both the Operating/Platform System firmware/software and the application specific firmware/software along with any configuration parameters such as setpoints, constants, scaling, etc.

SPP-2.6's configuration control section discusses that the

> ***"application's source code and/or executables shall be stored in an environment that it is protected from inadvertent changes. Cyber security considerations should be addressed in the storage environment. Cyber security considerations may include protection against source code contamination by malicious codes (viruses, worm Trojans, etc.), protection against code information exploited for malicious intent (i.e., storage area is not connected to a LAN that has internet connectivity), username and password required to access source code, firewall protection to prevent unwanted access, and Intrusion Detection to monitor access."***

TVA will not be given the source code, this is Westinghouse proprietary information. The requirements of having a username and password is met (reference *Software Req Spec* – R.8.2.1-12). The unwanted access requirement is being met, see the cyber security section.

☐ YES	☐ NO	5.	Perform Cyber Security Assessment to address NEI 04-04 requirements. Contact the Computer Engineering Group for instructions. **Preliminary cyber security assessment completed on February 24th 2010. Action items consisted of updating the UNIDs for the data diodes to have system 068 on the Common Q side and ICS's 261 on the ICS side.** **Note that this assessment was not according to Regulatory Guide 5.71 because this has not been updated into NEI 04-04. When this is done, Common Q will get "fast tracked" through this assessment process. End result is the intent of the question is that this assessment is not complete.**
☐ YES	☐ NO	6.	If there is communication network interfaces such as an ICS interface, implement design of this interface per the guidelines addressed in DG-E18.1.25. **There is a data link that transmits approximately seventy data points every second to ICS. This network interface is TCP/IP, will be done optically, and the signal will traverse a DualDiode device (cyber security device guaranteeing one way network flow).** **See Software Service Request included in package.**

Enclosure 2
TVA Letter Dated October 29, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

Attachment 3

Draft FSAR Amendment 102 Change Markups

and 13869, "Reactor Protection System Diversity in Westinghouse Pressurized Water Reactors," Reference [2] and Reference [6]. Generally, two or more diverse protection functions would automatically terminate an accident before unacceptable consequences could occur.

For example, there are automatic reactor trips based upon nuclear flux measurements, reactor coolant loop temperature and flow measurements, pressurizer pressure and level measurements, reactor coolant pump under frequency and under voltage measurements, and steam generator water level measurements, as well as manually, and by initiation of a safety injection signal.

Regarding the engineered safety features actuation system for a loss-of-coolant accident, a safety injection signal can be obtained manually or by automatic initiation from diverse parameter measurements as shown in Table 7.3-1.

7.1.2.1.9 Trip Setpoints

Insert new Trip Setpoint Section

~~The reactor protection system trip setpoints have been selected to ensure that core damage and loss of integrity of the reactor coolant system are prevented during anticipated operational events. These setpoints were analytically determined in accordance with the methodology described in References [3] and [5]. Both the nominal (trip setpoint) and limiting (allowable value) settings have been incorporated into the Technical Specifications. Nominal settings are more conservative than the limiting setpoints. This allows for measurement and calibration uncertainties and instrument channel drift which may occur between periodic tests without exceeding the limiting setpoints. Trip setpoint values are monitored by periodic performance of surveillance tests in accordance with Technical Specification requirements.~~
~~The setpoint calculations include the effects of both measurable and unmeasurable uncertainties to ensure the associated protective actions are performed before analytical limits are exceeded. Incorporating these uncertainties provides assurance that the analytical limit will not be exceeded under accident conditions if the Allowable Value is satisfied under normal conditions.~~

~~The square root sum of the squares (SRSS) method is used for combining uncertainty terms to meet the following three criteria: random, independent, and approximately normal distribution. The probability that all of the independent processes would simultaneously be at their maximum value (i.e., + or -) is very small. The SRSS method provides a means to combine individual random uncertainty terms to establish a net random uncertainty term. All other uncertainties that do not meet any of the three criteria are arithmetically summed.~~

~~The following sections describe the methodologies used for the calculation of RPS setpoints within the scope of TSTF-493 revision 4 as incorporated into the WBN Unit 2 Technical Specifications. WBN Unit 2 uses two methodologies in the performance of calculations associated with these functions. A majority of the RPS functions which are NSSS supply scope use the Westinghouse Setpoint Methodology (Reference 5). The functions in TVA's scope of supply utilize the TVA methodology based on ISA standard 67.04 (Reference 3) and defined in TVA technical instructions.~~

~~Definitions~~

~~Safety Limit (SL) - A safety limit is specified to protect the integrity of physical barriers that guard against the uncontrolled release of radioactivity. The safety limit for a parameter is typically provided in the plant safety analyses in accordance with 10 CFR 50.36(c).1.ii.A.~~

~~Analytical Limit (AL) - The analytical limit represents the parameter value at which a safety action is assumed to be initiated to ensure that the safety limits are not exceeded during either accidents or anticipated operational occurrences.~~
~~Nominal Trip Setpoint (NTSP) - The NTSP is the nominal value at which the instrument is set when it is calibrated. Since most instruments cannot be set to an exact value, the instrument is set to the nominal setpoint within an allowed tolerance band defined as~~

~~Acceptable As Left (AAL).~~

~~Allowable Value (AV) - The limiting value of the as-found trip setting used during surveillance testing, for the portion of the channel being tested, beyond which the operability of the channel must be evaluated. The AV ensures that sufficient margin exists to the AL to account for unmeasurable uncertainties such as process effects to ensure that the protective action is performed under worst case conditions before the analytical limit is exceeded.~~

~~Acceptable As Found Tolerance (AAF) - A tolerance band on either side of the NTSP which defines the limits of acceptable instrument performance and which, if exceeded, may require corrective action. The AAF is based on measurable instrument channel uncertainties, such as drift, expected during the surveillance interval. The RPS functions use double-sided tolerance limits for the AAF. Instruments which exceed their as-found tolerance limits will be documented and evaluated in the Corrective Action Program.~~

~~Acceptable As Left Tolerance (AAL) - The condition a transmitter, process rack module or process instrument loop is left in after calibration or setpoint verification. The as-left calibration tolerance is based on the reference accuracy of the device being calibrated but may take calibration history into consideration. The RPS functions use doublesided tolerance limits for the AAL. The trip setpoint must be adjusted within the as-left tolerance prior to returning the channel to service.~~

~~Operational Limit (OL) - The operational limit is a value which the operating parameter is not expected to exceed during normal operation. The NTSP is set beyond the OL so that spurious trips of the instrument do not occur.~~

~~7.1.2.1.9.1 Westinghouse Setpoint Methodology~~

~~The WBN Unit 2 RPS nominal trip setpoints and allowable values are determined in accordance with the Westinghouse setpoint methodology as described in Reference 5. The following Technical Specification functions use the Westinghouse setpoint methodology:~~

~~Reactor Trip Functions:~~

- ~~Power Range Neutron Flux - High~~
- ~~Power Range Neutron Flux - Low~~
- ~~Power Range Neutron Flux - High Positive Rate~~
- ~~Overtemperature ΔT~~
- ~~Overpower ΔT~~
- ~~Pressurizer Pressure - Low~~
- ~~Pressurizer Pressure - High~~
- ~~Pressurizer Water Level - High~~
- ~~Reactor Coolant Flow - Low~~
- ~~RCPs Undervoltage~~
- ~~RCPs Underfrequency~~
- ~~SG Water Level Low-Low~~
- ~~Vessel ΔT Equivalent to Power for SG Water Level Low-Low~~

~~Essential Safety Features Actuation System Functions:~~

- ~~Safety Injection - Containment Pressure High~~
- ~~Safety Injection - Pressurizer Pressure Low~~
- ~~Safety Injection - Steamline Pressure Low~~
- ~~Containment Spray - Containment Pressure High-High~~
- ~~Containment Isolation Phase B - Containment Pressure High-High~~
- ~~Steamline Isolation - Containment Pressure High-High~~
- ~~Steamline Isolation - Steamline Pressure Low~~
- ~~Steamline Isolation - Steamline Pressure Negative Rate High~~
- ~~Turbine Trip and Feedwater Isolation - Steam Generator Water Level High-High~~
- ~~Auxiliary Feedwater - Steam Generator Water Level Low-Low~~
- ~~Vessel ΔT Equivalent to Power for Auxiliary Feedwater, SG Water Level Low-Low~~
- ~~Switchover to Containment Sump on Refueling Water Storage Tank Level Low~~
- ~~Switchover to Containment Sump on Containment Sump Level High~~

~~The as-found tolerance for setpoints using the Westinghouse setpoint methodology is the algebraic sum of the following measurable uncertainties for the surveillance interval:~~

~~For sensors: drift, measurement and test equipment (M&TE) accuracy, and calibration accuracy.~~

~~For rack components: drift, M&TE accuracy, calibration accuracy, and, for analog channels, the bistable setting accuracy.~~

~~Acceptable As Left Tolerance~~

~~The as-left calibration tolerance is equal to or greater than the reference accuracy of the device being calibrated and may take calibration history into consideration.~~

~~7.1.2.1.9.2 TVA Setpoint Methodology~~

~~TVA's instrument setpoint methodology is based on ISA standard 67.04 (Reference 3) and is incorporated into TVA technical instructions for performance of instrument uncertainty calculations. The following Technical Specification functions use the TVA methodology:~~

~~Reactor Trip System Instrumentation Functions:~~

- ~~Source Range Neutron Flux~~
- ~~Intermediate Range Neutron Flux~~
- ~~Turbine Trip - Low Fluid Oil Pressure~~

~~Engineered Safety Feature Actuation System Instrumentation Functions:~~

- ~~Auxiliary Feedwater - Loss of Offsite Power~~
- ~~Auxiliary Feedwater - Trip of all Turbine-Driven Main Feedwater Pumps~~
- ~~Auxiliary Feedwater - Auxiliary Feedwater Pumps Suction Transfer on Low Suction Pressure~~

~~Acceptable As Found Tolerance~~

~~The Acceptable As Found tolerance is the SRSS combination of the drift, M&TE accuracy, calibration accuracy, and other measurable uncertainties as appropriate (i.e., those present during calibration, such as normal radiation effects or temperature effects).~~

~~Acceptable As Left Tolerance~~

~~The Acceptable As Left tolerance is equal to or greater than the reference accuracy of the device being calibrated and may take calibration history into consideration.~~

~~Allowable Value~~

~~The allowance between the AL and the NTSP is to be large enough to contain the total uncertainty (measurable and unmeasurable), during accident or seismic and normal operation, as determined using the SRSS method. The allowance between the AV and the NTSP is limited to that portion of the instrument channel being tested for the surveillance interval and should account for only the measurable uncertainties.~~

~~Examples of this are:~~

- ~~Drift (based on surveillance interval).~~
- ~~Instrument uncertainties for the portion of the instrument channel tested.~~

- ~~Instrument uncertainties during normal operation which are measured during testing.~~

~~In the discussion which follows, it is assumed that the process variable increases toward the AL. If the process variable decreases toward the AL, the directions given would be reversed.~~

~~The limiting AV is determined by subtracting the unmeasurable uncertainty effects from the AL. The NTSP could then be calculated by subtracting the normal measurable uncertainties plus any margin from the AV. This calculated AV is the bounding maximum limit AVmax. If margin exists between both the NTSP versus the AL and the NTSP versus the operational limit, the NTSP could be reduced to a lower limit OL plus the normal uncertainties, and then the AV could be reduced to the new NTSP plus the measurable uncertainties. This calculated AV is the bounding minimum limit AVmin to prevent spurious initiations. The actual AV can be set within these two limits.~~

7.1.2.2 Independence of Redundant Safety-Related Systems

The safety-related systems in Section 7.1.1.1 are designed to meet the independence and separation requirements Criterion 22 of the of General Design Criteria (GDC) (Appendix A to 10CFR50) and Paragraph 4.6 of IEEE 279-1971. The administrative responsibility and control provided during the design and installation is discussed in Chapter 17 which addresses the Quality Assurance programs applied by Westinghouse and TVA.

The electrical power supply instrumentation and control conductors for redundant circuits of a nuclear plant have physical separation including PAM Category 1 and protection set I, II, III and IV instrumentation and control. Their cables are run in separate raceways to preserve divisional integrity and to ensure that no single credible event will prevent operation of the associated function due to electrical conductor damage. Detailed information pertaining to electrical cable for safety-related systems is given in Section 8.3.1.4. Critical circuits and functions include: power, control, and process protection channels associated with the operations of the reactor trip system or engineered safety features actuation system. Failure events are evaluated for credibility and credible events shall include, but not be limited to, the effects of short circuits, pipe rupture, missiles, etc., and are considered in the basic plant design. Control board details are given in Section 7.7.1.10. In the control board, separation of redundant circuits is maintained as described in Section 7.1.2.2.2.

Instrument sensing lines (including capillary systems) which serve safety-related systems identified in Section 7.1.1.1 are designed to meet the independence requirements of criterion 22 of the 1971 General Design Criteria and IEEE 279-1971 Section 4.6. The requirements consider the following events: (1) normal activities in the area (e.g., maintenance); (2) high and moderate energy jet streams, missiles, and pipe whip; and (3) possible damage caused by falling loads from the plant lifting systems (e.g., cranes, monorails). Exceptions to these requirements shall be evaluated for technical adequacy and documented in Design Basis Documents.

7.1.2.1.9 Trip Setpoints

The scope of TSTF-493 includes setpoints within the reactor protection system (RPS) which includes the Reactor Trip System (RTS) and the Engineered Safeguards Features Actuation System (ESFAS). The specific setpoints within the scope of TSTF-493 are identified in Technical Specifications 3.3.1 and 3.3.2. These trip setpoints have been selected to ensure that core damage and loss of integrity of the reactor coolant system are prevented during anticipated operational events. These setpoints were analytically determined in accordance with the methodology described in References 3 and 5. The TVA instrument setpoint methodology is based on ISA standard 67.04 (Reference 3) and is incorporated into TVA technical instructions. The Westinghouse setpoint methodology is described in Reference 5. Both the nominal (trip setpoint) and limiting (allowable value) settings have been incorporated into the Technical Specifications. Nominal settings are more conservative than the limiting setpoints. This allows for measurement and calibration uncertainties and instrument channel drift which may occur between periodic tests without exceeding the allowable value. Trip setpoint values are monitored by periodic performance of surveillance tests in accordance with Technical Specification requirements.

The setpoint calculations include the effects of both measurable and unmeasurable uncertainties to ensure the associated protective actions are performed before analytical limits are exceeded. The square root sum of the squares (SRSS) method is used for combining uncertainty terms to meet the following three criteria: random, independent, and normal distribution. The probability that all of the independent processes would simultaneously be at their maximum value (i.e., + or -) is very small. The SRSS method provides a means to combine individual random uncertainty terms to establish a net random uncertainty term. All other uncertainties that do not meet any of the three criteria are arithmetically summed. Single-sided correction factors are not used in setpoint calculations within the scope of TSTF-493.

The following describes the methodology used for the setpoint calculations within the scope of TSTF-493 revision 4 as incorporated into the WBN Unit 2 Technical Specifications.

Safety Limit (SL) - A safety limit is specified to protect the integrity of physical barriers that guard against the uncontrolled release of radioactivity. The safety limit for a parameter is typically provided in the plant safety analyses in accordance with 10 CFR 50.36(c).1.ii.A.

Analytical Limit (AL) - The analytical limit represents the parameter value at which a safety action is assumed to be initiated to ensure that the safety limits are not exceeded during either accidents or anticipated operational occurrences.

Nominal Trip Setpoint (NTSP) - The NTSP is the nominal value at which the instrument is set when it is calibrated. Since most instruments cannot be set to an exact value, the instrument is set to the nominal setpoint within an allowed tolerance band defined as Acceptable As Left (AAL).

Operational Limit (OL) - The operational limit is a value which the operating parameter is not expected to exceed during normal operation. The NTSP is set beyond the OL so that spurious trips of the instrument do not occur.

Acceptable As Found Tolerance (AAF) - A tolerance band on either side of the NTSP which defines the limits of acceptable instrument performance, beyond which the channel may be considered degraded and must be evaluated for operability prior to returning it to service. Channels which exceed the AAF will be entered into the

Corrective Action Program for further evaluation and trending. The Acceptable As Found tolerance is the SRSS combination of drift, maintenance and test equipment (M&TE) accuracy and readability, and calibration/reference accuracy. Other uncertainties may be included in the AAF if applicable.

Acceptable As Left Tolerance (AAL) - A tolerance band on either side of the NTSP within which an instrument or instrument loop is left after calibration or setpoint verification. The Acceptable As Left tolerance is equal to or less than the SRSS combination of reference accuracy, M&TE accuracy and M&TE readability. Other uncertainties may be included in the AAL if applicable.

The trip setpoint must be adjusted within the AAL tolerance prior to returning the channel to service.

Allowable Value (AV) - The limiting value of the as-found trip setting used during surveillance testing for the portion of the channel being tested, beyond which the channel is inoperable. The AV ensures that sufficient margin exists to the AL to account for unmeasurable uncertainties such as process effects to ensure that the protective action is performed under worst case conditions before the analytical limit is exceeded when the channel is reset to within the AAL tolerance.

Calculation of the allowable value by the Westinghouse setpoint methodology is described in Reference 5. In the Westinghouse methodology, the AV is limited to rack surveillance testing. Two values are calculated. The first value is the arithmetic sum of the measurable rack uncertainties. The second value is based on the total allowance between the trip setpoint and the safety analysis limit. This value is the difference between the total allowance and those uncertainties which are not present during the rack surveillance test. These uncertainties are combined in accordance with Reference 5. The AV is the nominal trip setpoint plus or minus, dependent on the trip setpoint direction, the minimum of the two calculated values.

The TVA methodology for the allowable value calculation is described in TVA technical instructions based on Reference 3. An upper limit of AV is determined by subtracting the unmeasurable uncertainties from the AL. A lower limit of AV is determined by adding the measurable uncertainties to the NTSP. The actual AV is set within these limits. This applies to a high setpoint with an upper Analytical Limit; the directions would be reversed for a low setpoint with a lower AL.

FCV 63-1	(8812)	FCV 63-67	(8808D)	FCV 63-98	(8808B)
FCV 63-3	(8813)	FCV 63-72	(8811A)	FCV 63-118	(8808A)
FCV 63-5	(8806)	FCV 63-73	(8811B)	FCV 63-156	(8802A)
FCV 63-8	(8804A)	FCV 63-80	(8808C)	FCV 63-157	(8802B)
FCV 63-11	(8804B)	FCV 63-93	(8809A)	FCV 63-172	(8840)
FCV 63-22	(8835)	FCV 63-94	(8809B)	FCV 62-98	(8110)
				FCV 62-99	(8111)

Means have been provided to preclude such spurious misalignment. Except for FCV 62-98 and FCV 62-99, the design consists of modified control circuits for these valves to ensure that no single failure will be able to energize the opening and/or closing coils for the valve operator. The design utilizes separate contacts which are wired before and after each opening and closing coil as required. Figure 7.6-4 illustrates this protection scheme. In this typical schematic, isolation of the opening and closing coils is provided by contacts R11-R12, R31-R32, L2I-L22, and (L41-L42). Valves FCV 63- 67, FCV 63-72, FCV 63-73, FCV 63-80, FCV 63-98, and FCV 63-118 require this protection scheme only for the closing coil.

In addition, single failure has been considered on the part of the operator. The design includes easily accessible, clear protective covers attached to the main control board panel over each respective control room switch except for valves FCV 62-98, FCV 62-99 and FCV-63-1. The operator would be required to open this protective cover before he operates the control switch.

For FCV 63-1, FCV 63-22, FCV 63-67, FCV 63-80, FCV 63-98, and FCV 63-118 operating instructions specify the removal of power during specific modes of Plant operation. For FCV 62-98 and FCV 62-99, the motive power has been removed.

For FCV 63-8, FCV 63-11 power will be removed and will be administratively controlled just prior to use of the ~~the~~ RHR system for plant cooldown (<350 Deg. F) to prevent inadvertent valve opening and over pressurization of the SI pump and CCP suction piping.

7.6.7 Loose Part Monitoring System (LPMS) System Description

~~Digital Metal Impact Monitoring System (DMIMS-DX™)~~

General System Description

The ~~metal impact monitoring system (DMIMS-Dx™)~~LPMS is designed to detect loose parts in the reactor coolant system. The system consists of sensors, preamplifiers, signal conditioners, signal processors, and a display. It contains 12 active instrument channels, each comprised of a piezoelectric accelerometer (sensor), signal conditioning and diagnostic equipment. Conformance with Regulatory Guide 1.133, Revision 1 is discussed in Table 7.1-1.

Two redundant sensors are fastened mechanically to the RCS at each of the following potential loose parts collection regions:

- Reactor pressure vessel: upper head region
- Reactor pressure vessel: lower head region
- Each steam generator: reactor coolant inlet region

The output signal from each accelerometer is passed through a preamplifier and an amplifier. The amplified signal is processed through a discriminator to eliminate noises and signals that are not indicative of loose parts. The processed signal is compared to a preset alarm setpoint. Alarm setpoints for each channel are determined through the analysis of baseline test data taken with the system prior to plant start-up. During baseline testing, the reactor vessel and steam generator are impacted three feet from each sensor with a force of 0.5 ft-lb. Loose parts detection is accomplished at a frequency of 1 kHz to 20 kHz, where background signals from the RCS are acceptable. Spurious alarming from control rod stepping is prevented by a module that detects CRDM motion commands and automatically inhibits alarms during control rod stepping.

If measured impact signals exceed the preset alarm level, audible and visible alarms in the control room are activated. Digital signal processors record the times that the first and subsequent impact signals reach various sensors. This timing information provides a basis for locating the loose part. The ~~DMIMS-DX™ so~~LPMS has a provision for audio monitoring of any channel. The audio signal can be compared to a previously recorded audio signal, if desired.

The online sensitivity of the ~~DMIMS-DX™~~LPMS is such that the system will detect a loose part that weighs from 0.25 to 30 lb. and impacts with a kinetic energy of 0.5 ft-lb on the inside surface of the RCS pressure boundary within 3 ft of a sensor.

The ~~DMIMS-DX™~~LPMS audio and visual alarm capability will remain functional after an Operating Basis Earthquake (OBE). All of the ~~DMIMS-DX™~~LPMS components are qualified for structural integrity during a Safe Shutdown Earthquake (SSE) and will not mechanically impact any safety-related equipment. In addition, the equipment inside containment is designed to remain functional through normal radiation exposures anticipated during a 40-year operating lifetime. Physical separation of the two instrument channels, associated with the redundant sensors at each reactor coolant system location, exists from each sensor to the in-containment signal conditioning devices except the upper head channels which shall be physically separated, starting at the sensor location and extending out to the patch panel. The in-containment signal conditioning devices are accessible during power operation with the exception of the upper head signal conditioning modules which ~~will be~~are mounted in junction boxes on upper head support in reactor cavity. The ~~DMIMS-DX™~~LPMS components outside containment located in a mild environment. Capabilities exist for subsequent periodic online channel checks and channel functional tests and for offline channel calibrations at refueling outages.

Key Features, Components and Architecture

Key features of system components and architecture are discussed in the following sections.

Sensors (in containment)

The sensors are piezoelectric accelerometers that convert acceleration to electric charge. The acoustic waves created by an impacting metallic object can be detected by the piezoelectric accelerometers. While the excitation of the impact produces a very wideband frequency response, the frequency range of interest for most loose parts is 1 kHz to 20 kHz.

Piezoelectric accelerometers are high output impedance devices that convert acceleration to electric charge. The flat frequency response range for the accelerometers used in ~~DMIMSDX™~~the LPMS is from ~~5~~10 Hz to 10 kHz, and they have a useful frequency upper limit of over 20 kHz. The resonant frequency of the accelerometers is greater than 30 kHz. The accelerometers are designed to operate at high temperature (nominally 625°F-) and have high radiation capability.

The piezoelectric elements in the accelerometers are electrically isolated from the component to which they are attached in order to prevent unwanted noise due to ground loops. The accelerometers typically have an integral 4 foot mineral-insulated ("hardline") cable and a large triax connector. This hardline cable is also built to withstand high temperatures, while the connector allows for interfacing to lower temperature softline cables.

Softline Cable (in containment)

Because the charge output of an accelerometer is a very low level signal, and normal cables can emit charge upon being vibrated, a special low-noise, radiation-resistant softline cable is used between the accelerometer and preamplifier.

Preamplifier (in containment)

The remote preamplifier is mounted in a sealed metal enclosure inside containment. The charge signal from the accelerometer is converted to a voltage signal. The preamplifier operates in a "charge" amplifier mode such that the capacitance of the cable between the high-output-impedance accelerometer and the preamplifier has very little effect on the signal or its calibration. The charge preamplifier output voltage is then a normal, low-impedance millivolt instrument signal requiring only normal cabling and shielding considerations.

Signal Conditioner

The signal conditioner module provides power to the remote preamplifier, provides final amplification of the signal to a calibrated full scale range, and provides low-pass and high-pass filtering.

Audio Subsystem

The audio patch panel, audio amplifier, and speakers make up the audio subsystem. Listening by a trained ear can be a very effective tool for evaluation and validation of signal characteristics. The system is designed such that any channel may be selected at any time for audio monitoring. The audio subsystem features are only available locally in the ~~DMIMS-DX™~~LPMS cabinet.

Digital Signal Processing (DSP) Processor

In the Digital Signal Processing (DSP) processor, the signals are converted from analog to digital at a high rate, and the impact detection algorithm is applied by a special microprocessor optimized for digital signal processing. The board contains a buffer memory that can store the complete impact signal time history for its monitored channels. Upon the detection of an impact, the data are normally transferred to the main Central Processing Unit (CPU) process for further evaluation, waveform storage, and alarm generation. However, if for some reason the CPU processor fails, the DSP processor has the capability for generating alarms on its own.

Central Processing Unit (CPU) Processor

The CPU processor is a personal computer architecture device. It takes the data from the DSP processors, controls the mass storage devices, provides displays of monitoring system information, drives the printer, and generates alarms. The CPU uses a PCI bus for high speed communication with the other processor modules and drives the tape and disk peripherals by means of a parallel Small Computers System Interface (SCSI) interface. Addition of the peripherals provides for mass data storage onto high speed digital tape and writeable CDs.

Display

The display is a qualified, high-resolution, color panel that is overlaid with a high resolution touch screen surface. The display shows the system and alarm statuses at a glance, presents the waveforms used in impact analysis, and shows the analysis conclusions. By means of the touch screen, which has all of the capabilities of a standard mouse, many system functions can be run without opening the keyboard drawer. The color display features are only available locally in the ~~DMIMS-DX™~~LPMS cabinet.

Alarm Panel

The alarm panel provides continuous indication of alarm or trouble status, allowing the color display to be turned off when not being viewed. The panel contains red LEDs for alarm indication, orange LEDs for trouble indication, yellow LEDs that flash each time an impact event is detected by their respective channels, and green LEDs for indication of proper DSP operation. The alarm panel features are only available locally in the ~~DMIMS-DX™~~LPMS cabinet.

Printer

A high-resolution laser printer is provided for printout of system status, waveform graphs, and other data for the generation of reports. The printer features are only available locally in the ~~DMIMS-DX™~~LPMS cabinet.

The ~~training~~ testing program scope is addressed in Reference [6].

7.6.8 Interlocks for RCS Pressure Control During Low Temperature Operation

The basic function of the RCS overpressure mitigation system during low temperature operation is discussed in Section 5.2.2.4. As noted in Section 5.2.2.4, this pressure control system includes manually armed semi-automatic actuation logic for the two Pressurizer Power Operated Relief Valves (PORVs). The function of this actuation logic is to continuously monitor RCS temperature and pressure conditions; the actuation logic is manually unblocked when plant operation is at a temperature below the arming setpoint. The monitored system temperature signals are processed to generate the reference pressure limit program which is compared to the actual measured system pressure. This comparison will provide an actuation signal to cause the PORV to automatically open if necessary to prevent pressure conditions from exceeding allowable limits. See Figure 7.6-5 for the block diagram showing the interlocks for RCS pressure control during low temperature operation.

Two separated, independent sets of controls are provided for the interlocks, with the required process variables being derived from redundant protection sets as follows:

(1) Protection Set I

(a) Wide Range RCS Temperature (TE-68-1, TE-68-18, TE-68-24, TE-68-41)

(2) Protection Set II

(a) Wide Range RCS System Pressure (PT-68-68).

(b) Wide Range RCS Temperature (TE-68-43, TE-68-60, TE-68-65, TE-68-83)

(3) Protection Set III

(a) Wide Range RCS System Pressure (PT-68-66).

The wide range temperature signals, as inputs to the Protection Sets I and II, continuously monitor RCS temperature conditions. In Protection Set I, the existing RCS wide range temperature channels on RCS loops 1 and 2 provide inputs to the Eagle 21 digital process protection system. Eagle 21 provides isolated analog signals to the digital process control system. An auctioneer function selects the lowest temperature signal which is then used to calculate an acceptable reference pressure limit (PORV setpoint) considering the plant's allowable pressure and temperature limits. An isolated wide range RCS pressure signal is also provided from Eagle 21 indicated. The assemblies are always moved in preselected banks and the banks are always moved in the same preselected sequence.

Each bank of RCCAs is divided into two groups except Shutdown Banks C and D which have one group each. The rods comprising a group operate in parallel through multiplexing thyristors. The two groups in a bank move sequentially such that the first group is always within one step of the second group in the bank. A definite sequence of actuation of the stationary gripper, movable gripper, and lift coils of a mechanism is required to withdraw or insert the RCCA attached to the mechanism. Since the stationary gripper, movable gripper, and lift coils associated with the RCCAs of a rod group are driven in parallel, any single failure which would cause rod withdrawal would affect just that one group. Mechanical failures are in the direction of insertions, or immobility.

A dropped RCCA or RCCA bank is detected by:

(1) Sudden drop in the core power level is seen by the nuclear instrumentation system;

(2) Asymmetric power distribution as seen on out of core neutron detectors or core exit thermocouples;

(3) Rod at bottom signal;

(4) Rod deviation alarm (control banks only);

(5) Rod position indication;

(6) Power Distribution Monitoring System.

Misaligned RCCAs are detected by:

(1) Asymmetric power distribution as seen on out of core neutron detectors or core exit thermocouples;

(2) Rod deviation alarm (control banks only);

(3) Rod position indicators;

(4) Power Distribution Monitoring System.

The resolution of the rod position indicator channel is ± 12 steps~~± 5% of span (± 7.2 inches)~~. Deviation of any RCCA from its group by twice this distance (~~10% of span, 14.4 inches~~24 steps) will not cause power distributions worse than the design limits. The deviation alarm alerts the operator to rod deviation with respect to group demand position in excess of ~~5%~~12 steps.~~of span.~~ If the rod deviation alarm is not operable, the operator is required to take action as required by the Technical Specifications.

If one or more rod position indicator channels should be out of service, detailed plant instructions are followed to assure the alignment of the non-indicated RCCAs. The

Table 7.7-1 Plant Control System Interlocks

DESIGNATION	DERIVATION	FUNCTION
C-1	1/2 Neutron flux (intermediate range) above setpoint	Blocks automatic and manual control rod withdrawal
C-2	1/4 Neutron flux (power range) above setpoint	Blocks automatic and manual control rod withdrawal
C-3	2/4 Overtemperature ΔT above setpoint	Blocks automatic and manual control rod withdrawal Actuates turbine runback via load reference
C-4	2/4 Overpower ΔT above setpoint	Blocks automatic and manual control rod withdrawal Actuates turbine runback via load reference
C-5	1/1 Turbine impulse pressure below setpoint	Blocks automatic control rod withdrawal Defeats remote load dispatching
C-7	1/1 Time derivation (absolute value) of turbine impulse pressure (decrease only) above setpoint	Makes steam dump valves available for operation
C-9	2/2 Condenser pressure below setpoint, and any condenser circulation water pump breaker closed	Makes steam dump valves available for operation.
C-11	~~1/1~~2/2 Control Bank D rod position above setpoint	Blocks automatic rod withdrawal

Enclosure 2
TVA Letter Dated October 29, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

Attachment 4

EDCR 55385 Draft Scope And Intent, Unit Difference And Technical Evaluation

BECHTEL

EDCR COVER SHEET

GENERAL INFORMATION		**Page No.**	1
EDCR TYPE	☐ **EDCR #**	**Rev.**	
(Check One Box Only)	☒ **EDCR-2 #** **55385**	**Rev.**	**A**

☐ Check here if this is a Streamlined EDCR.

☐ Check here if this EDCR is for Documentation change only & No construction work is required.

☒ SR ☐ QR Check appropriate box if field material procurement quality requirements included.

068	*RB / AUX*	*Various*	*SR*	*I&C*	*ASME class 3*
System	***Building***	***Elevation***	***Quality Class***	***Lead Discipline***	***Code/Class***

WORK SCOPE STATEMENT:

EDCR 55385 is installing the reactor vessel level indicating system (RVLIS) in similar fashion as unit 1. RVLIS works by measuring various differential pressures across the core and sending this information to Common Q for calculation. There is no cabling in this EDCR.

PREPARED:

Mat Merten **632-7526**

Design Engineer **Phone** **Date**

VERIFIED:

Engineer **Date**

APPROVALS:

Civil EGS **Date**

I&C EGS **Date**

Electrical EGS **Date**

Mechanical EGS **Date**

Plant Design EGS **Date**

Project Engineering Manager **Date**

INTER DISCIPLINE REVIEWS:

Civil Engineer **Date**

I&C Engineer **Date**

Electrical Engineer **Date**

Mechanical Engineer **Date**

Plant Design Engineer **Date**

Project QA Manager **Date**

ACCEPTANCE:

Responsible Superintendent **Date**

Field Engineer **Date**

TVA Engineering Manager **Date**

OTHER ORGANIZATIONS:

Signature/Org'n.: **Date**

Signature/Org'n.: **Date**

Signature/Org'n.: **Date**

Refer to the electronic documents in TVA Business Support Library (BSL) for current revision.

Statement of Work
EDCR 55385 – RVLIS – WBS 2.6.2.7, WBS 3.20

This EDCR is to install the second phase of the Reactor Vessel Level Indication System. The rest of the system will be installed in EDCR 52601 (this is being driven by the receipt of as-built hardware drawings).

Phase 1 (EDCR 52601) consists of
- Unistrut (reactor and auxiliary buildings)
- Capillary tubing
- Compensating RTDs
- Steel containment vessel penetration connection
- concrete shield wall sleeves(DCN 55050(ABSCE Reversal) is a predecessor for doing the on the concrete shield wall sleeves)
- crane wall sleeves
- Piping **(done by FCR)**

Phase 2 (EDCR 55385)
- Local panel work
- Mounting Westinghouse instruments in reactor building
- Tee "above seal table"

Applicable WITEL codes are

AP2	New EDCR
XP9	ASME Related
L19	FSAR
CP11	Instrument Sensing Lines
CP6	Equipment Seismic Qualification

Background

Unit one and two RVLIS systems were designed with ECN 2329 in September 1980. ECN 5513 separated the two unit's RVLIS systems in 1985. From 1985 and 1987 unit 1 and 2 RVLIS systems were being designed separately. The last modification done to unit 2 was with ECN 6772. All subsequent modifications (ECNs and DCNs) were done on unit 1 only. **RVLIS was partially installed in unit 2.**

This EDCR does not incorporate any electronic signal once it leaves any component and enters into Common Q (EDCR 52351) or Eagle 21 (EDCR 53301). This EDCR installs the local panels in the AIR and the Westinghouse provided instrumentation in the reactor building.

The tee below the seal table for mid-loop monitoring will be installed with EDCR 53756; however Westinghouse is supplying it under the RVLIS WBS.

Changes made to unit one's RVLIS system

- **DCN 06514** - Rotated RVLIS head sensor bellows assembly to be inverted so that the connection is on the bottom of the sensor to prevent air inleakage and venting.

- **DCN 51287** - Replaced RVLIS tee fitting at Seal Table with a Swagelok deep bore compression fitting.
- **DCN 38619** increased the span of the dynamic head transmitter by 5% due to results obtained in power operation testing. The actual DP across the core with all four RCPs running and highest density was higher than anticipated. Therefore the transmitter was re-spanned to the maximum extent possible of 5%. This DCN updated the SSDs appropriately.
    - Westinghouse asked the question of what should the new transmitters be re-spanned to with letter WBT-D-0289. Bechtel responded that it is desired to have the same span that would have been desired if the 5% re-spanning limit was not the limiting factor. This corresponds to **-315.25 – 0 – 1760" WC**
        - Original span was **-315.25" – 0 – 1540" WC** (total span 1855.25" WC)
        - It was anticipated that the highest head was 1540" H_2O, but was actually 1760" H_2O.
        - The span was increased to **-313.25 – 0 – 1633** (total span of 1948.25" H_2O) corresponding to a 5% increase.
        - For unit 2, we will use the actual span of -315.25 – 0 – 1760" WC.
    - Note that this differential pressure is dependent on the internals for the reactor vessel, some of which are changing (WINCISE). Therefore this is a best guess of what will be needed.
- **DCN 08058** – Due to changes in the design criteria for post accident monitoring – DC-30-7 – three new transmitters had to be installed. These were obtained from spares.
    - The model changed from 752 to 764 which they are currently. No extra work required in this EDCR.
- **SCR WBNNEB8522R0 (associated PER 143774)** – SEE WRITE-UP IN PER SECTION OF THIS DOCUMENT
- **DCN 33964** – Fixed unsatisfactory connections to the hydraulic isolators. These have been updated on the current isometric drawings.
- **NEW MM 9/11** – calc WBNOSG4-017 mentions DCN 05836 – RHR auto closure interlock.

Affected PERS

-

Related EDCRs

- 52601 - RVLIS phase 1
- 52319 - Eagle-21 system
- 53301 - external wiring for Eagle-21, including for the two wide range pressure transmitters in this EDCR.
- 52351 - Common Q PAMs
- 53756 – installs the tee "below the seal table" as part of the MID Loop Monitoring installation. (the tee will be provided with the RVLIS WBS 2.6.2.7)

Procurements

- See letter WBT-D-310 – there are multiple items to be procured of a mechanical nature, but are in I&C's scope since they are downstream of the root valve. An MR is in progress
- All fittings and tubing procured under EDCR 52601.
    - 25402-011-MRA-JXF0-00015
- Procurement Request - WBS 2.5.2.7 - sensor bellows, hydraulic isolators, level transmitters, 3/16" tubing, tee "above the seal table"
- Procurement Request - WBS 3.20 - wide range pressure transmitter 2-PT-68-63
- Single Weed Wide range pressure transmitter -
    - 25402-011-MRA-JP02-00012

All items associated with this EDCR are safety related. For ASME details, see attachment N or N3E-934.

This EDCR's material requirements were reviewed with the PQAM or designee.

Wide Range Pressure Transmitters

These are attached to RVLIS (only indirectly part of RVLIS), but will be included in this EDCR. The signal goes to Eagle 21 and the cable will be installed with EDCR 53301. (Note one of the signals functions is to provide an input into Common Q PAMS for the reactor vessel level calculation).

There is a redundancy requirement and an NRC commitment in that they can not be the same brand transmitter[1]. One will be a Cameron (or Barton Copy) model 763. The other is a Weed.

ASME

On the loops and head connections, there is a flow restrictor that changes the classification to TVA class B corresponding to ASME class 2. Downstream of the sensor bellows, the classification is "TVA Instrument Class" in accordance to N3E-934. This requires that the capillary system that penetrates primary containment shall be installed, fabricated, and inspected to TVA class B requirements (not procured).

There is an inconsistency between design criteria WB-DC-30-17 *Diaphragm and Bellows Seals and Capillary Systems* and Engineering Specification N3E-934 *Instrument and Instrument Line Installation and Inspection.*

The former states for capillary systems penetrating containment the "diaphragms shall be designed in compliance with ASME Section III, Paragraph ..." However, the latter lower tier document gives "special instructions... to account for material that cannot be supplied as ASME material". It states "diaphragm seal assemblies ... are considered outside ASME Section III Code requirements..." Unit 1's sensor bellows are not ASME code components.

It is the author's opinion that TVA should modify the overly restrictive Design Criteria. This is still under discussion with TVA.

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[1] This is for an RHR interlock to make certain during depressurization, the reactor coolant system is not opened up to the lower rated RHR system. See section 5.5.7.3.4 of the FSAR.

Ranges of Transmitters

Unit 1's level transmitters are all 4-20mA. This will be continued on unit 1.

Mounting of Equipment

The **hydraulic isolators** will come with a mount and no special plate needs to be utilized. This mount is mounted to Unistrut. See note 10 on 2-47W600-314.

The **sensor bellows** will be mounted in accordance three yet to be received drawings similar to

1552e77	Sensor bellows seal table mounting
1552e76	Sensor bellows head mounting
9559d76	Sensor bellows loop mounting

The **level transmitters** will be mounted with detail F274 on 2-47w600-274

The **Weed WR pressure transmitter** for train A will be mounted with detail C86 and J230. NEED TO CONFIRM THIS

The **Tobar WR pressure transmitter** for train B will be mounted with detail J89 from 2-47w600-89.

The **fill and vent assemblies** will be mounted with detail J274.

The Magnex **instrument valves** will be mounted according to detail D314 on the main RVLIS drawing.

Steel Containment Penetrations and Sleeves throughout Reactor Building

All SCV penetrations, Crane Wall sleeves, and concrete shield wall sleeves are installed in EDCR 52601.

Applicable DC/DS/TS/ES and Procedures and other requirements

- **WB-DC-30-16 rev 6** – Instrument Sense Lines – slope and separations. This is not for closed capillary systems. **This DC is mostly applicable to capillary before the sensor bellows,** however there are a few applicable requirements.
  - Minimum separation between trained capillary is 18"
  - Minimize line length due to increased potential of having sensing line configurations which can trap gas or air at high points in liquid filled lines.
  - If it is necessary to route a liquid filled sense line with an upward slope, a vent valve shall be placed at the high point in the line and have a loop seal at the root.
- **WB-DC-30-17 Rev 3** – *Diaphragm And Bellows Seals and Capillary Systems*
  - Volumetric displacement of the pressure sensing device shall be less than full span volumetric displacement of the diaphragm/bellows seal.
  - Section 3.7.1 states the diaphragms shall be designed in compliance with ASME section III paragraph NC-3649 → this seems contradictory to

  - N3E-934 and the ASME code. See a more detailed comment in the ASME section.
  - Armored capillary shall be used when available to reduce potential for physical damage to the capillary tube.
  - Minimum bend radius supplied by manufacturer. If no specification is provided, then assume the minimum bend radius shall be 3 times the outside diameter of the capillary tubing.
- **N3E-934** – Instrument line installation inspection – Engineering Specifications
  - States that capillary tubing which penetrate primary containment shall be installed, fabricated, and inspected to TVA class B (ASME class two) requirements.
  - See Appendix E for capillary lines exiting containment.
- **WB-DC-40-36** *The Classification of Piping Pumps, Valves, and Vessels*
- **WBNP-DS-1935-2618** – *ASME Section III, Nuclear Class 2 Piping System*
- **IMI-122.004** backfilling, venting, flushing and/or draining of instrument sensing lines and instruments
- **SI-68-81** - *Offline Channel Calibration Of RVLIS Transmitters And RCS Wide Range Pressure Transmitters Trains A And B*
- **MAI-4.4A** instrument line installation
- **TI-208** Design of supports for category I piping and instrument lines
- **47W600-0-4** – various mounting and routing requirements
  - Has requirement that 3/16" OD or less must be in UNISTRUT - see 47a051
- **WB-DC-40-34** – *Containment Isolation System* – Section 7.6.1 states RVLIS should not use any containment isolation valves because it would jeopardize the performance of the system.
- **WB-DC-30-7** – *Post Accident Monitoring Instrumentation* – establishes that reactor vessel level is a post accident monitoring needed parameter, see table A-1 variable 22.
- **WB-DC-40-31.9** - criteria for design of piping supports and supplemental steel in category I structures

Planned Open Items

See open items list

Note that NUREG section 0612 (see N3E-934 3.7.2.1) interaction area interference evaluation will be done separately. Any changes to RVLIS from this would be with the FCN process unless this program comes alive before the final package.

Unit Differences

- See Unit Differences Form

Required Calculations

Certification of panels

FSAR Impacts

- See attached PP-10 change packages

Expected DRAs in Final Package

I&C

2-47W600-314	Main RVLIS drawing
2-47W610-7	Control diagram
SSD-2-L-68-367	ICCM Train A RVLIS dynamic head
SSD-2-L-68-368	ICCM Train A RVLIS lower range
SSD-2-L-68-369	ICCM Train A RVLIS upper range
SSD-2-L-68-370	ICCM Train B RVLIS dynamic head
SSD-2-L-68-371	ICCM Train B RVLIS lower range
SSD-2-L-68-372	ICCM Train B RVLIS upper range

Plant Design

2-47W462-229	Isometric for head connection
2-47W600-723-1	Upper head isometric
2-47W600-723-2	loop 1 RVLIS isometric
2-47W600-941	seal table isometric
2-47W600-942	loop 3 RVLIS isometric
Unknown	Isometric for Unistrut routing

Civil

47w331-2	penetration assembly drawing (maybe no changes)

Expected MD Drawings

Unknown	Sensor bellows physical drawing
Unknown	Hydraulic isolators physical drawing
Unknown	Level transmitters physical drawing
Unknown	WR pressure transmitters
2654C65 (received)	wrap around RTDs
2656C12 (expected)	transmitter access assembly
2658C88 (expected)	Sensor bellows in line tee
Unknown	tee above the seal table
Unknown	capillary schematic
30-9480 (expected)	Magnex valves for local panel
1552E77 (expected)	Sensor bellows seal table mounting
1552E76 (expected)	Sensor bellows head mounting
9559D76 (expected)	Sensor bellows loop mounting

EDCR UNIT DIFFERENCE FORM

EDCR# 55385 **Rev.** A **Page No.**

Operations Difference is identified as follows:

RVLIS is being installed in the same fashion as unit 1 and there should be no operational difference. Note that RVLIS signals feed into ICCM-86 for unit 1and Common Q PAMS (EDCR 52351) for unit 2. This is a significant unit difference, but this change does not affect RVLIS operationally.

Unit 2 TVA Operations Acceptance (Mgr or Designee): **Date:**

Maintenance Difference is identified as follows:

The second WR PT in unit 1 is made by Tobar. The Tobar line is now owned by Weed Instruments. The model for unit 1 has been replaced with the model DTN2010. It is similar to unit 1's, but there may be maintenance differences. More information will be known once the installation manual is received.

In unit 1, the level transmitters, hydraulic isolators, sensor bellows, and the first WR pressure transmitter were manufactured by ITT Barton. Barton was bought by Cameron who will be making Barton copies. It is not known for certain whether there will be any maintenance differences until more documentation is received from Cameron via Westinghouse.

Unit 2 TVA Maintenance Acceptance (Mgr or Designee): **Date:**

Design Difference is identified as follows:

- The sensor bellows will have UNIDs (the lack of UNIDs for the sensor bellows for unit 1 ads confusion). The designator will be "SEN" for sensor.
- The procured range of the dynamic range transmitter will match what unit 1's transmitter should have been re-spanned to after plant testing. However the 5% span limit was reached first.

  Note that the change in Wincise from the top to the bottom of the core barrel has the possibility of changing internal differential pressures. The plan is that if there are any changes to internal differential pressure compared to unit 1, they should be minimal and could be changed with the allowable 5% re-span of the transmitters supplied by Westinghouse.
- Welded fittings will be used for the second Weed pressure transmitter, unlike the compression fittings on unit 1. This will lower the chance of any leakage which is vital in a filled system.

Unit 2 TVA Engineering Acceptance (Mgr or Designee): **Date:**

Mat Merten, PE **10/19/10**

Prepared By: **Date:**

Streamlined EDCR approved by TVA Oversight________________________________

SESG TO ROUTE A COPY OF THIS COMPLETED FORM TO TVA TRAINING MANAGER AND TO UNIT 2 LICENSING.

EDCR TECHNICAL EVALUATION

TECHNICAL EVALUATION CONSIDERATIONS

This attachment provides topics to be considered when evaluating the technical and safety aspect of changes. It is not intended to be an all inclusive list of items to be considered. It is to be used as an aid in determining attributes that should be addressed in a technical evaluation. Information is also provided to aid in determining coordination interfaces. These are minimum guidelines. It should be recognized that many topics and changes involve multiple disciplines and organizations and technical considerations must be coordinated accordingly. All parts of Attachment I must be considered for applicability for the associated EDCR.

Attachment I has been formatted to facilitate proposed modifications during the WB2CCP. If the proposed modification potentially impact WBN Unit 1 power generations, operability (as defined by the WBN Unit 1 Technical Specifications), or any licensing basis, then terminate the use of this procedure, and use TVA Procedure Standard Program & Processes SPP-9.3, *Plant Modification & Engineering Change Control.* EDCR(s) are permitted to modify selected WBN Unit 0 and/or Unit 1 SSC(s) via WBN procedure 0-TI-2. (Reference 0-TI-2.)

NOTE: If the change involves an ASME Section III component or boundary that has not been previously included on the Unit 1 N-5 report, an EDCR is required to meet the ASME Section III requirements. If it is determined that the change affects Unit 1/0 and that it cannot be done by an EDCR-2, coordinate with Mechanical EGS to determine the process needed to implement the modification.

EDCR Potential Impacts on Unit 0 and/or Unit 1 Systems, Structures and Components
NOTE: If the answer to the following question is "YES", reference WBN Technical Instruction 0-TI-2, "Criteria for Issuing Engineering Document Construction Releases (EDCR) Potentially Impacting WBN Unit 0 and/or Unit 1 Design" and do not complete this EDCR Technical Evaluation.
☐ YES ☒ NO 1. Does the EDCR activity involve Unit 2 modifications, changes, repairs, and/or refurbishments that interface physically with Unit 1 or Unit 0 and/or that affect drawings under Unit 1 control (CCDs)?

Refer to the electronic documents in TVA Business Support Library (BSL) for current revision.

EDCR TECHNICAL EVALUATION

INITIAL:

☐ YES ☒ NO 1. Is the Auxiliary Building Secondary Containment Enclosure (ABSCE), as defined in WBN2-30AB-4001, affected by this change? Is the work adjacent or in the proximity to an ABSCE component, such that the component's Structural Interface Boundary could be affected? Does this change modify any cable, cable tray, conduit, duct, pipe, or instrument tubing penetrating secondary containment? Consult 46W501 drawing series for the location of the ABSCE boundary, and discuss proposed changes with the Mechanical EGS. A justification for the "YES/NO" is required.

☐ YES ☒ NO 2. Does the modification have the potential to affect the Structural Interface Boundary of a Unit 1/Unit 2 Interface Point? A justification for the "YES/NO" is required.

☒ YES ☐ NO 3. Is a full Technical Evaluation required for the proposed modification?

If "NO," provide a detailed justification explaining why the evaluation is not required for this modification. Things to consider are any Unit Differences, Type of Difference, whether or not the modification was evaluated by some other means (e.g., Unit 1 DCN), etc. The remainder of Attachment I need not be completed or kept as part of the EDCR, page 1 and 2 must be maintained.

If "YES," then perform and maintain as a part of the EDCR the remainder of Attachment I, or 0-TI-2 Attachment 1 or 8, as applicable.

GENERAL:

☐ YES ☒ NO 1. Are the nuclear safety functions, protective safety functions, Class 1E requirements, or Seismic Category I or I(L) requirements of a design criteria, system description, FSAR, or Tech Spec affected?

<u>Design Criteria</u> – no - WB-DC-30.7 *Post Accident Monitoring Instrumentation* establishes the applicable PAM variable
22 – reactor vessel level
Note WR pressure are PAM variables and are installed in this EDCR

<u>System Description</u> – no - RVLIS is part of system 68 and is impacted by, but requires no changes to, N3-68-4001 *Reactor Coolant System*.

<u>FSAR</u> - yes - The overall RVLIS project (both EDCRs 52601 and 55385) requires changes to two different sections of the FSAR. These have to do with a change of a WR PT to a Weed brand. PP-10 change packages will be part of EDCR 55385.

<u>Tech Spec</u> – no - RVLIS is affected by, but requires no changes to the technical specifications.

☒ YES ☐ NO 2. Is there an operational/configuration change? Is a component being added to or removed from the plant? Is a component being disabled or abandoned in place? Is the normal or accident position of a valve changing? Is an electrical isolation device being added or deleted? Is a portion of the system being rerouted?

<u>Operational change</u> – yes – only in the sense that RVLIS is "read" by the Common Q system which is changing

<u>Configuration change</u> - no

<u>Component added</u> – yes – multiple components are being added to the plant. See the MEL package.

<u>Component disabled or abandoned</u> – no

<u>Valve normal position</u> – no – no valves

<u>Electrical isolation</u> – no –

<u>Portion being rerouted</u> - yes - the Unistrut is being field routed (EDCR 52601)

☒ YES ☐ NO 3. Could the change affect the basic function of a structure, system or component that performs or supports the performance of a safety function (deleting or changing logic interlocking, additional pumps, etc.)? Is the most limiting operating condition or design criteria imposed on the change or by the change, evaluated? Include effects by or on Safety Related or Non Safety Related systems in their various possible configurations. Does the change meet or exceed design criteria of other SSCs in similar applications?

The safety function is to measure reactor vessel level

Most limiting operating condition considered - yes - the most limiting condition is the post accident environment. All components meet this requirement

Effects by non safety systems considered - yes - the only postulated way RVLIS will be affected by non-safety systems is pipe whip or jet impingement. This will be evaluated by civil engineering after installation. Any additional supports or engineered shielding devices will be handled via FCRs. Note that since RVLIS is trained and trained components have separation requirements, this mitigates (but does not remove) this risk.

☐ YES ☒ NO 4. Could the change affect environmental conditions such as pressure, temperature, humidity, flooding, corrosiveness, site elevation, nuclear radiation (both rate and total integrated dose), and duration of exposure in either harsh or mild areas?

If "YES", the change shall be coordinated with the Lead Electrical/I&C Engineer, and if applicable, with ME/NE for potential revisions to the EQ/MEQ Binders.

☐ YES ☒ NO 5. Could the change involve relocating or reorienting a device or system which could impact location-specific dose calculation or shielding analyses or place the device or system in an area with different environmental conditions?

If YES, coordinate with the Mechanical EGS, MEQ, and EQ Program Engineers to revise the affected location specific dose calculation, environmental drawings, and EQ/ MEQ documentation.

☐ YES ☒ NO 6. Are Security Systems modified?

☐ YES ☒ NO 7. Does the modification add quantities of chemicals that may have an impact on control room habitability?

If YES, evaluate impact on control room habitability per NRC Reg. Guide 1.78.

☒ YES ☐ NO 8. Has the component being added or modified been evaluated for proper physical orientation? Components that require consideration are: capacitors, relays, check valves, steam traps, flow and level measuring devices, pressure switches, and solenoid valves. Other components may require consideration based on special applications, unique circumstances or vendor/manufacturer's recommendations. **All components being installed will be done so by the manufacturer's directions.**

The head sensor bellows on unit 1 had a problem with it allowing air in the system during low pressure operations. The solution was to flip the sensor itself. This will be done on unit 2.

EDCR TECHNICAL EVALUATION

GENERAL (Continued):

☒ YES ☐ NO 9. Have considerations for mounting, connecting, and positioning of components included an evaluation of the required robustness of associated elements? Has the evaluation for robustness considered the need for protection from bumping, jarring, vibration, etc.? **All associated equipment are safety related and are mounted with the approval of the ESQ team**

☐ YES ☒ NO 10. Is this modification subject to vibration, thermal movement, and/or leaks on trip sensitive equipment? (i.e., replace carbon steel piping with stainless steel piping, modify routing such that thermal flexibility is reduced, modify support or support locations to resist thermal expansion, process and/or pneumatic leaks.) If YES, create a WITEL action item to incorporate the device into monitoring plans. **The RVLIS system has no ability to trip the plant.**

EDCR TECHNICAL EVALUATION

CIVIL / PLANT DESIGN:
This section may be considered Not Applicable (N/A), if the Unit 2 modification requires no input from Civil or Plant Design. Civil and/or Plant Design Coversheet signatures will be "N/A" and these five questions need not be answered. If block #14 (Civil Engineer) and block #18 (Plant Design Engineer) of the EDCR Cover Sheet are "N/A," this section does not need to be included in the EDCR package.

☐ YES ☒ NO 1. Does the change potentially impact pipe break considerations, pipe whip, or jet impingement? Consideration should include changes to operating modes, the addition or rerouting of high energy pipe greater than 1 inch nominal diameter, or change or modify pipe rupture protection devices. Does the change relocate or add potential targets such as electrical components, equipment, conduits, instruments or air lines to compartments containing fluid systems? The change may be evaluated generically rather than on a case-by-case basis as described in Civil Design Guide DG-C1.2.10.

☒ YES ☐ NO 2. Does the change affect piping vibration or testing requirements? Was there a mass change? Were supports added/deleted? Was an orifice, valve, or other flow device added or deleted? Was there an operational or configuration change?

Piping vibration – no

Mass change – yes – multiple components are being added

Supports – yes

Orifice, valve, flow device – no

Operation change - no

Configuration change – yes – see unit difference form for detailed write-up.

☒ YES ☐ NO 3. Are Seismic Category I or I (L) components added, deleted, or modified? Are components in a Seismic Category I structure added, deleted, or modified? Does the change affect the seismic or dead weight analyses?

seismic components – yes there are multiple Seismic Cat I components being added.

Seismic structure – I don't know – need to verify aux building and reactor building are seismic structure

Seismic or dead weigh analysis – I don't know

☒ YES ☐ NO 4. Does the change involve an existing attachment on a Seismic Category I structure/civil feature (e.g., new loads generated, revise loads previously approved, physical modification required at interface points) or the addition of an attachment to and/or penetration of a Seismic Category I structure(s)? Does the change affect the attachment or add attachments of engineered features to masonry block walls in a Seismic Category I structure? Does the change impact the fire resistance rating of a fire barrier?

EDCR TECHNICAL EVALUATION

<u>Involve an attachment to Seismic Cat I structure</u> - yes - all components are located in the control building which is a CAT I structure

<u>Masonry block walls in CAT1 structure – I don't know</u>

<u>Fire barrier – no fire barriers are impacted.</u> All cabling is dealt with in separate bulk cabling EDCRs. See scope statement for explanation

☐ YES ☒ NO 5. Could the change affect WBN Probable Maximum Precipitation (PMP) site drainage (i.e. add or obstruct surface to water flow, divert or reroute a flow path, change ground surface contours, change from vegetation to concrete or pavement, etc?).

If YES is the response to any of these questions, consult Civil Engineering.

EDCR TECHNICAL EVALUATION

ELECTRICAL/INSTRUMENTATION & CONTROLS:
This section may be considered Not Applicable (N/A), if the Unit 2 modification requires no input from Electrical or I&C. Electrical and/or I&C Coversheet signatures will be "N/A" and items 1 through 20 need not be answered. If block #15 (I&C Engineer) and block #16 (Electrical Engineer) of the EDCR Cover Sheet are "N/A," this section does not need to be included in the EDCR package.

☐ YES ☒ NO 1. Does the change affect breaker alignment, electrical loads, or electrical separation/isolation?
No – all power comes from the Common Q racks. This question would be a "yes" on the Common Q EDCR 52351.

☐ YES ☒ NO 2. Is any low or medium voltage (V3, V4 or V5) electrical containment penetration protector(circuit breaker or fuse) involved?

☐ YES ☒ NO 3. Has any electrical load classification changed (non-1E to 1E)? Is the Class 1E classification for a fuse on the Fuse Tab changing?

☐ YES ☒ NO 4. Does the change involve instrument setpoints, instrument/relay settings or other instrument information found in EMPAC? Is the change consistent with N-specs (e.g., instrument line slopes and installation)? Has reset and deadband been evaluated?

☒ YES ☐ NO 5. Does the change alter, add, or delete Post Accident Monitoring (PAM) equipment or affect the type, category, or operating time of existing equipment? Reference Design Criteria for the list of PAM variables.

If YES, coordinate with Bechtel Licensing, Electrical, and U2 Operations to ensure continued Reg. Guide 1.97 compliance.
RVLIS is part of the post accident monitoring system. The final package will have to be reviewed to ensure U.S. NRC Regulatory Guide 1.97 compliance. According to WB-DC-30-7 *Post Accident Monitoring Instrumentation*, reactor vessel level falls under Regulation Guide 1.97. See Table A-1 variable 22.

☐ YES ☒ NO 6. Does the change involve instrument ratings? (Relay or solenoid coil ratings, contact ratings, duty cycles, etc.)

☐ YES ☒ NO 7. Does the change challenge the capacity of another system (Air conditioning system heat load, control air load, electrical load)?

☒ YES ☐ NO 8. Does the change affect the operating or accident environment of instrumentation? Is the electrical equipment or instrumentation required to operate in the affected environment? Have potential operating and accident environments of equipment been considered?
Changes to environment – no - there is no conceivable way RVLIS will affect the environment

Required to operate – yes – RVLIS is required to operate in any of the designed for post accident environments. It is built to seismic CAT1 standards. An additional mitigation is that Common Q is trained.

Potential environments considered – yes – RVLIS is located in a harsh environment. The largest concern is seismic design basis accidents and these are mitigated by having all safety components installed to CAT I standards.

EDCR TECHNICAL EVALUATION

☒ YES ☐ NO 9. Have the effects of EMI/RFI been considered?

All electronics from Weed and Westinghouse will have EMI reports generated and will be approved.

☒ YES ☐ NO 10. Is the logic of system operation changed? Are new or modified interfaces (physically or electrically) with safety related or important to safety equipment created?
<u>Logic</u> – no – RVLIS components are part system 68 control drawings and are being updated accordingly.

<u>Interface</u> – yes – there are "interfaces" with safety equipment

☐ YES ☒ NO 11. Does the change affect, add, or delete equipment within the scope of 10CFR 50.49 (EQ)? Review appropriate documents such as MEL, Essentially Mild Calculations, Category & Operating Times Calculations, and/or equipment in a harsh environment? Cable must be considered (e.g., mild to harsh environment).

If "YES", the change shall be coordinated with Program Engineers for potential revisions to EQ/MEQ Binders.
The pressure transmitters are part of the EQ program and will be evaluated. (The hydraulic isolators are <u>not</u>).
Note the RVLIS RTDs are EQ, but are installed under 52601.

The MEL package has these components as EQ.

EDCR TECHNICAL EVALUATION

ELECTRICAL/INSTRUMENTATION & CONTROLS:(Continued)

This section may be considered Not Applicable (N/A), if the Unit 2 modification requires no input from Electrical or I&C. Electrical and/or I&C Coversheet signatures will be "N/A" and items 1 through 20 need not be answered. If block #15 (I&C Engineer) and block #16 (Electrical Engineer) of the EDCR Cover Sheet are "N/A," this section does not need to be included in the EDCR package.

☐ YES ☒ NO 12. Could the change affect materials such as lubricants, seals and O-rings, which could impact Qualification Maintenance Data Sheet (QMDS) requirements and qualification analyses, and invalidate test data, or could the change affect special maintenance (QMDS) and/or administrative requirements and controls that might impact the qualification of an item?

If YES, coordinate with the responsible discipline on revisions to the QMDS.

☐ YES ☒ NO 13. Does the change involve a power, control, or instrumentation circuit for a 10CFR50.49 component either by direct connection or relay logic or involve a non-10CFR50.49 power control or instrumentation circuit which have a credible circuit interaction failure mode with 10CFR50.49 power control or instrumentation circuit? **No cabling in this EDCR.**

If YES, perform an analysis in accordance with SPP-9.2, Appendix I for any safety-related cables or components located in a harsh environment that are designated as Category C (i.e. not required to be addressed in the EQ program).

☐ YES ☒ NO 14. Does the change upgrade the function of an existing device/cable such that additional QA records and documentation are needed to support 10CFR50.49 Qualification in accordance with 10CFR50, Appendix B manufacturing, procurement, installation, etc.)?

If YES, provided additional documentation as required.

☐ YES ☒ NO 15. Does the modification affect components/equipment that require periodic testing of electrical test points

If YES, provide appropriate test jacks which are accessible to prevent accidental contact with adjacent electrical terminations during testing.

☐ YES ☒ NO 16 Does the modification change functional logic which has the potential of affecting design characteristics?

If YES, evaluate PER/NER history on the equipment being modified to determine if problems have previously been identified.

☐ YES ☒ NO 17. Does the modification involve a programmable or digital logic controller?

If YES, has the addition of uninterruptible power supplies been considered?

EDCR TECHNICAL EVALUATION

ELECTRICAL/INSTRUMENTATION & CONTROLS: (Continued)
This section may be considered Not Applicable (N/A), if the Unit 2 modification requires no input from Electrical or I&C. Electrical and/or I&C Coversheet signatures will be "N/A" and items 1 through 20 need not be answered. If block #15 (I&C Engineer) and block #16 (Electrical Engineer) of the EDCR Cover Sheet are "N/A," this section does not need to be included in the EDCR package.

☐ YES ☒ NO 18. Does the modification involve fault tolerant non safety-related equipment important to operation such that the need for redundant power sources should be considered (such as CERPI control room devices)?

☐ YES ☒ NO 19. Does the design or modification impact an Integrated Computer System (ICS) data point that is also an Emergency Response Data System (ERDS) data point?

If YES, coordination with Bechtel Licensing is required in accordance with 10CFR50 Appendix E.

☐ YES ☒ NO 20. Does the design or modification impact off site power capability or ability to meet 10CFR50 Appendix A Criterion-17 requirements?

If YES, coordinate with Electrical Lead Engineer.

EDCR TECHNICAL EVALUATION

MECHANICAL:
This section may be considered Not Applicable (N/A), if the Unit 2 modification requires no input from Mechanical. Mechanical Coversheet signatures will be "N/A" and items 1 through 17 need not be answered. If block #17 (Mechanical Engineer) of the EDCR Cover Sheet is "N/A," this section does not need to be included in the EDCR package.

Ensure EQ requirements addressed for ancillary subcomponents (e.g. Limit Switches on Mechanical only valves). Coordinate with Electrical EQ Engineer as necessary.

☐ YES ☒ NO 1. Does the change affect design conditions or requirements such as process pressure, temperature, chemistry or operating cycles? Is the change affected by operation of other systems, either Safety Related or Non Safety Related in any of their various operating configurations?

Affect design conditions – no

Affected by other systems – no - RVLIS needs no other systems to function to send its inputs into Common Q PAMS and Eagle 21.

If YES, ensure the evaluation encompasses all aspects of the affected system, including impacts on or by interfacing systems. Coordinate with MEQ Program Engineer for potential revisions to affected MEQ documentation.

☐ YES ☒ NO 2. Does the change affect ECCS, decay heat removal systems, or MPC cooling ancillary equipment? Ensure that any changes are consistent with the safety analyses for the plant including WBN SAR Chapter 15 NPSH minimum flow requirements, diesel loading sequencing, and ultimate heat sink limits.

☐ YES ☒ NO 3. Does the change involve potential heating, ventilation, and air conditioning (HVAC) system impacts resulting from adding heat loads, altering air flow or ductwork, etc.?

☐ YES ☒ NO 4. Does this change make any alterations or configuration changes to Motor Operated Valves (MOVs) or Air Operated Valves (AOVs)? Does this change impact any MOV or AOV Program documents? Impacts that should be considered include changes to instrumentation or control circuits, power supplies, or change system operating or design conditions such as pressure and flow rate.

☐ YES ☒ NO 5. Does this change involve replacement of a complete valve or valve internals which are located in a system that interfaces directly with the Reactor Coolant System (RCS)? Procurement requirements should evaluate valve and valve internals replacements that are located in or interfaces with the Reactor Coolant System (RCS) for hard faced components that are non-cobalt bearing. Hard facing alternatives include NOREM, Nitronic 60 and may include other non-cobalt materials as approved by Engineering. Cobalt bearing hard facing materials is a concern in fluid systems that contain radioactive materials.

☐ YES ☒ NO 6. Does the modification add a new check valve or impact an existing check valve? Ensure the valve is sized properly, proper type for required service, properly oriented, located suitable distance from upstream components that cause turbulent flow.

EDCR TECHNICAL EVALUATION

MECHANICAL: (Continued)
This section may be considered Not Applicable (N/A), if the Unit 2 modification requires no input from Mechanical. Mechanical Coversheet signatures will be "N/A" and items 1 through 17 need not be answered. If block #17 (Mechanical Engineer) of the EDCR Cover Sheet is "N/A," this section does not need to be included in the EDCR package.

☐ YES ☒ NO 7. Does the modification add, delete, or reroute components in a mechanical piping system? If Yes, will the added components come in contact with borated water or some other harsh environment area?

☒ YES ☐ NO 8 Does the modification affect ASME Section III Code (Class 1, 2, and/or 3) boundary?

If "YES," ensure that the materials and installations meet the applicable ASME code. **All components in this EDCR are instrument class according to N3E-934.**

☐ YES ☒ NO 9. Does this modification introduce material into the containment that could become dislodged during LOCA or other events and contribute to Emergency Core Cooling System (ECCS) sump screen or strainer blockage? Does this modification affect protective coatings inside the containment?

☐ YES ☒ NO 10. Does the modification increase the possibility of flooding from a Moderate Energy Line Break?
NOTE: Coordinate response with the MELB Program Engineer.

☐ YES ☒ NO 11. Are there NUREG-0612 impacts? Does the change add, delete, or alter a permanent handling system? Does the change move a heavy load path over safe shutdown equipment or move safe shutdown equipment into a heavy load path? **This EDCR does not modify any handling system, but the head sensor bellows are located within a NUREG-0612 interaction area as shown on 44W411 sheet 7. However this program has not come to fruition and no analysis can be done.**

☐ YES ☒ NO 12. Does the change affect barriers such as walls, doors, penetrations, relief panels, and ducts which could affect HVAC flow paths, fire barriers, or environmental conditions in either harsh or mild areas?

If the answer to any of the above questions is "YES", the change shall be coordinated with the Mechanical EGS.

☐ YES ☒ NO 13. Is a new material being added and does the change affect components susceptible to Flow Accelerated Corrosion (FAC) or Microbiologically Induced Corrosion (MIC)?

☐ YES ☒ NO 14. Does the modification increase the susceptibility for cavitation?

☐ YES ☒ NO 15. Could the change affect location or operation of high energy piping systems, location or operation of radioactive piping systems, operation of environmental control systems, or environmental barriers such as walls, doors, relief panels, piping/other thermal insulation, and ducts which could affect environmental conditions in either harsh or mild areas?

If YES, coordinate with Mechanical EGS for potential revision to the environmental drawings/design criteria and coordinate with Electrical EGS for potential impact to EQ of equipment.

This installs piping that is part of the reactor coolant system which is radioactive. The RCS boundary is the sensor bellows which are located within the reactor building.

EDCR TECHNICAL EVALUATION

MECHANICAL: (Continued)
This section may be considered Not Applicable (N/A), if the Unit 2 modification requires no input from Mechanical. Mechanical Coversheet signatures will be "N/A" and items 1 through 17 need not be answered. If block #17 (Mechanical Engineer) of the EDCR Cover Sheet is "N/A," this section does not need to be included in the EDCR package.

☐ YES ☒ NO 16. Does the modification change ventilation, cooling requirements for electronic equipment?

If YES, coordinate with Mechanical Engineering for determination of impact on HVAC coolant

☐ YES ☒ NO 17. Does the modification involve strainers for a raw water supply?

If YES, proper strainer selection should be based on industry guidelines (Fluid Controls Institute Std 89-1) and specific site criteria. Major consideration should be given to the following; type of strainer, redundant strainer capability, materials/housing, perforations number and arrangement, mesh size & free area, capacity and pressure loss, fluid type, particle weight & shape, macro fouling and aquatic debris potential, operating parameters, filtration versus separation, blow down line sizing, vendor recommendations, automatic back flushing and the necessity of a bypass line.

NOTE: Contact the appropriate program coordinator in the Mechanical Programs group (or in Plant Design for MOV questions), if any Engineering Design Program(s) are impacted by the proposed modification.

EDCR TECHNICAL EVALUATION

OPERATIONS/HUMAN FACTORS:

☐ YES ☒ NO 1. Does the change affect the main control room or the backup control areas (Environment, workspace, controls and displays)?

If YES, human factors must be addressed.

☐ YES ☒ NO 2. Are OSHA considerations included? Whenever replacement or major repair, renovation, or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment must be designed to accept a lockout device. This applies to mechanical and electrical devices.
The construction of RVLIS will not require the isolation of any high energy system. Therefore there would be no applicable OSHA considerations.

EDCR TECHNICAL EVALUATION

OTHER:
Note: This section is not required for Plant Design EDCRs.

☒ YES ☐ NO 1. Does the change affect equipment diversity, failure modes, single failure criteria (DS-E2.0.2, "Single Point Failure For Power Generation Reliability"), equipment redundancy, or equipment reliability?

☒ YES ☐ NO Does the modification install redundant equipment?

If YES, utilization of redundant attendant equipment (e.g., power from alternate sources) shall be considered and addressed.
Redundant equipment is being installed in the form of trained components.

☐ YES ☒ NO 2. Does the modification change System 18, 43, 77, or 90, or potentially impact the plant Chemistry Organization (i.e., sampling, procedures, training, spare parts, chemical treatments, etc.)?

☐ YES ☒ NO 3. Does the change involve environmental impacts? If ANY of the questions below are answered "YES," then question #3 must be answered "YES."

☐ YES ☒ NO Will the modification require new Chemicals (as defined in SPP-5.4) to be used anywhere onsite or result in a change in plant chemical storage or usage?

☐ YES ☒ NO Will the modification generate any new wastes (Solid, Liquid, Hazardous, Universal, Used Oil, Radioactive etc.) or result in the release of any new or different substances to the land, air, or water?

NOTE This does not include consumables used to facilitate the installation of the modification.

☐ YES ☒ NO Will the modification change the existing flow path or characteristics of any discharge to the land, air, or water?

☐ YES ☒ NO Will the modification involve any equipment containing PCBs, Mercury, or Asbestos?

☐ YES ☒ NO Will the modification involve storage or use of oil or hazardous substance in an amount equal to or greater than 55 gallons?

If Question #3 is answered "YES," contact Environmental Staff to ensure that the applicable Environmental Review (in accordance with SPP-5.5 and TVA National Environmental Policy Act (NEPA) Process) or chemical traffic control review are initiated/performed.

If Question #3 is answered "YES," Environmental shall be a Core Review group at the initial and final meeting. If the meetings are waived, then Environmental is required to review the EDCR and sign the Coversheet as an "Other Organization."

OTHER: (continued)
Note: This section is not required for Plant Design EDCRs.

☒ YES ☐ NO 4. Does this modification impact the fire protection system or equipment of an insured building?

See Appendix R section

If YES, coordinate with the 10CFR50 Appendix R Program Engineer to have the EDCR documents reviewed by the insurance carrier.

☐ YES ☒ NO 5. Does the modification change functional logic which has the potential of affecting design characteristics or change/impact an item listed in the Equipment Performance Information Exchange (EPIX) system?

If YES, evaluate PER/NER history and EPIX on the equipment being modified to determine if problems have previously been identified and are appropriately addressed in the EDCR Package. Ensure appropriate coordination with affected organizations is performed such as Operations, Maintenance, Environmental, Chemistry, and Emergency Preparedness.

Various searches were performed on EPIX concerning the current scope of work. The following was found

- **Wolf Creek - failure #74 - 1998**
  - **One of the RTDs on train A read 40°F different than B train. As a result train B was declared inoperable.**
  - **There is no maintenance that can effectively and economically detect or prevent the onset of failure.**
- **Oconee Unit 2 - failure #38 - 1997**
  - **Failure of RTD caused ICCM Trouble alarm. Replaced RTD**
- **Calvert cliffs - failure #625**
  - **Problem with heated junction T/C RVLIS system - not applicable.**
- **Wolf Creek - failure #359**
  - **One dynamic range transmitter was very different than the other due to a calibration issue**
- **Oconee Unit 3 - failure #714 - 2005**
  - **Leaking fitting on hydraulic isolator caused entire train to go down**
  - **Will be mitigated by using welded fittings when possible**
- **Vogtle U1 - failure #340 - 2005**
  - **Barton level transmitter developed a leak due to "aging". Replaced with a Rosemount.**
- **Vogtle U2 - failure #341 - 2003**
  - **One train's Barton transmitter started to drift low and would not re-calibrate**
  - **Replaced bad transmitter**
- **Robinson Unit 2 - failure #475 - 2007**
  - **Barton LT drifted out of calibration during a depressurization for refueling. Replaced transmitter.**
- **North Anna U1 - failure #2831**
  - **Barton LT failed due to the strain gage internal to transmitter.**

In conclusion, no action or design change will be taken as a result of the information found in EPIX.

EDCR TECHNICAL EVALUATION

☐ YES ☒ NO 6. Does the change substitute, change, add or modify materials, components or chemical treatments not previously evaluated to the system parameters or application?

10CFR50 APPENDIX R AND OTHER FIRE PROTECTION IMPACTS: Contact the Program Owner
Note: This section is not required for Plant Design EDCRs.

☒ YES ☐ NO a. Does the change directly or indirectly impact Mechanical or Electrical Appendix R equipment, or cables, required for safe-shutdown (This includes manual actions required for safe shutdown.)?
2-PT-68-63-D is on the safe equipment list. This is a wide range pressure transmitter.

☐ YES ☒ NO b. Does the change impact Appendix R component availability in any fire area/zone?

☐ YES ☒ NO c. Have any Appendix R equipment parameters (e.g., flow rate, pressure, setpoints, load limitations, electrical load, interface with other components) changed?

☐ YES ☒ NO d. Have Appendix R cable tag/UNID numbers or cable fire area/zone routings changed?

☐ YES ☒ NO e. Have Appendix R cables been added/deleted or Appendix R control circuit logics been changed?
The cables to be installed to 2-PT-68-63 will be done with EDCR 53301 which is the wiring EDCR for Eagle-21.

☐ YES ☒ NO f. Does the change involve a non-Appendix R circuit which interferes with an Appendix R Circuit (e.g., re-wiring to create associated circuits)?

☐ YES ☒ NO g. Does the change impact the use of Appendix R equipment in any fire area/zone?

☐ YES ☒ NO h. Has component been installed or relocated which obstructs the light pattern of an existing Appendix R emergency light?

☐ YES ☒ NO i. Has an Appendix R component been added, deleted or relocated which would affect Appendix R light placement, including ingress/egress lights?

☐ YES ☒ NO j. Has an Appendix R component been installed or relocated in the same fire area/zone as its functionally redundant safe shutdown train/system? (This includes instrument sensing lines.) (Note: The functionally redundant train is not necessarily the redundant divisional train.)

☐ YES ☒ NO k. Does the change affect in-plant communication systems?

☐ YES ☒ NO l. Does the change affect fire barriers, fire doors, fire dampers or fire wraps, or affect electrical or mechanical penetrations through fire rated walls, floors, ceilings or cable fire stops?

EDCR TECHNICAL EVALUATION

☐ YES ☒ NO m. Does the change affect structural steel, raceway supports or raceway fire-proofing material?

☐ YES ☒ NO n. Does the change result in the addition or deletion of in-situ combustibles in a fire area/zone (e.g., panels, new cable trays, components with oil sumps, grease, plastics)? (Note: Exclude cables routed entirely in conduits. Also exclude cables routed in existing trays without exceeding the tray fill capacity. Exclude combustibles less than 0.5 gallons oil, 4 lbs plastic, 4 lbs grease or equivalent amount of other combustible materials.) If yes, combustible loading calculation may be affected. Check with the 10CFR50 Appendix R Program Owner.

This EDCR is not adding any combustible components to the reactor building. The sensor bellows are all metal with o-rings. The RTDs have long pig-tails, some 70ft that do have cabling inside, but these are armored so they are treated like cabling in conduit. This means that it has no additional impact to the combustible loading calculations in the reactor building.

In the auxiliary building there would be limited combustible materials within the transmitters and hydraulic isolators consisting of minimal electrical connections. This would certainly be less than 4lbs total and will have no impact.

The capillary tubing within Unistrut and RTDs routed throughout the plant has no combustible materials and is installed in 52601.

☐ YES ☒ NO o. Does the change affect any of the fire protection systems (HPFP, AFFF, Halon, or CO_2) or affect any of the fire detection systems (e.g., smoke or heat)?

☐ YES ☒ NO p. Does the change impact the Fire Protection Reports?

If "YES", then a DCN must be issued.

☐ YES ☒ NO q. Does the change impact the property insurance carrier fire protection standards and/or associated commitments?

☐ YES ☒ NO r. Does the change involve the reactor coolant pump oil collection system?

☐ YES ☒ NO s. Does the modification introduce or remove combustible material or fire source in the area?

If ANY of the above questions are answered "YES," contact the 10CFR50 Appendix R Program Engineer.

EDCR TECHNICAL EVALUATION

SINGLE POINT FAILURE/FAILURE MODES AND EFFECTS/RELIABILITY:
Note: This section is not required for Plant Design EDCRs.

Checklist of questions to ask vendors of large scale systems, and our own designer(s) in regards to single point failures and margin to operation/trip/runback. The following questions should be considered when dealing with vendor supplied packaged solutions.

This section may be considered Not Applicable (N/A) if the Unit 2 change for the associated EDCR is the same as the Unit 1 installed design.

☐ If this section is NA, check this box.

Although this EDCR is splitting the RVLIS system, this analysis will cover the system as a whole.

☒ YES ☐ NO a. What are the system failure modes for the entire package (i.e., output fail-as-is, fail high or low, oscillate, trip system/plant, run back system plant, consider loss of motive power such as electric or control air, etc.)?

The most likely cause of failure for RVLIS is a leak in one of the fittings on the filled system side (any amount of leakage will cause failure). This will cause a change in pressure which will cause the hydraulic isolator to "switch" and send a signal to Common Q. A failure indication will appear on the main control room display. This will be mitigated by having welded fittings. This failure will lead to a limited condition for operation (LCO) according to the Technical Specification section 3.3.3.

Another cause of failure in the RVLIS system is a leak in the bellows assembly internal to the sensor bellows. This will cause no change of pressure downstream so the hydraulic isolator will not "switch". This will be realized at the next refueling outage during depressurization when surveillance SI-68-81 is performed or possibly Auxiliary building radiation surveys since primary coolant is mixing within the capillary.

Note that it is logically possible that the bellows within the hydraulic isolator could seize and not allow any hydraulic coupling to occur – perhaps as a result of an overpressurization. In this case measuring reactor vessel level would be impacted since the level transmitter would not see any change in pressure. This is mitigated by having a trained system so the operators would see the difference between the two trains.

☒ YES ☐ NO b. What are the failure modes of the individual components, which were considered, and what was their effect on the overall system (i.e., consider failures of the digital control systems related to the hardware and software, loss of CPU, loss of communication connection, loss of an entire I/O board, etc.)?

<u>Sensor bellows</u> – a breakage of the bellows is the most likely failure. See above for explanation.

<u>Hydraulic isolators</u> – if either the switch or internal bellows fails, RVLIS will still function properly since the purpose of the hydraulic isolators is to provide a signal if there is a leak in the filled capillary system.

<u>Level transmitters</u> - the likely failure is that no signal would be sent to Common Q. Common Q would pick this up and give a system trouble alarm.

The <u>RTD's</u> will fail open or short defaulting to a temperature of 50°F or 450°F. There is no associated alarm with this indication within ICCM-86, but there will be one within Common Q. Furthermore, the operator will realize this by having a difference in the two train's vessel levels in which they would troubleshoot and quickly find the failed RTD. However it is important to note that this error is highly dependent upon the height of the vertical run of capillary tubing the RTD is strapped to. In unit 1 there is a method of forcing a failed RTD to read a certain temperature within ICCM-86. Unit 2's Common Q is capable of doing the same.

In order to account for the failed RTD be either locking in a value or complete removal, some sort of justification must be done to allow the situation. This request has been passed to Westinghouse to do in a yet to be determined piece of documentation.

See *RVLIS Instrumentation Manual* page 2-12 for further failure analysis.

☒ YES ☐ NO c. Will these system and/or component failures directly or indirectly via transient cause a plant trip or runback?
RVLIS is an important system for post accident monitoring, but it has no ability to trip the plant. It is theoretically possible that RVLIS could rupture upstream of the sensor bellows, but there is a flow restrictor upstream of the isolation valve to minimize flow. Thus RVLIS has little ability to impact the plant, and certainly has no ability to trip the plant.
If YES,

1. What is the reliability of the individual components and system?
   The same components are being used from unit 1. All known PER conditions on unit 1 are being addressed.
2. How can testing be performed to detect failure modes, miss configurations, and precursors to imminent failures?
3. What alarms or indications provide timely precursor indication of impending component/system failure?
   System trouble alarm on the Common Q display along with the annunciator.
4. What redundancy is there in the alarms, indications, runback, or trip functions?
5. Which trips and runbacks are absolutely necessary? Which can be changed to alarms and what operator response is needed for the alarms?
6. Are digital systems developed in accordance with SPP-2.6 and SS-E18.15.01 software requirements for real time data acquisition and control computer systems?
   RVLIS is trained.
7. Are there any reasons why redundancy was not considered in alarm, trip, runback systems, and can redundancy be added?

EDCR TECHNICAL EVALUATION

DIGITAL SYSTEM UPGRADES/MODIFICATIONS:

Note: This section is not required for Plant Design EDCRs.

Does this change involve a digital system, component, or upgrade?

☐ YES ☒ NO If "NO," then leave Questions #1 through 6 below blank.

No digital upgrade is involved. The digital upgrade of Common Q PAMS will be addressed in EDCR 52351.

☐ YES ☐ NO 1. Have the requirements of SPP-2.6, SS-E18.15.01, and the guidelines of DG-E18.1.25 been considered?

☐ YES ☐ NO 2. Does the change involve any in-house modification? If so, implement in accordance with SPP-2.6. Doe the change involve a vendor-performed modification? If so, implement in accordance with SS-E18.15.01.

☐ YES ☐ NO 3. Is the digital modification associated with a Safety-Related Protection upgrade? Has the potential for common cause software failure been considered?

NOTE: For digital upgrades, refer to NRC RIS 2002-2 which endorses NEI 01-01, Rev 1.

☐ YES ☐ NO 4. Has the method and level of configuration control needed for the digital application been addressed?

NOTE: The configuration control method should be implemented using approved design control processes such as SPP-2.6 and/or an EDCR (i.e., design output). This may involve the need to maintain configuration control of both the software and hardware revision levels. The level of control needed shall be based upon the application function (i.e., Safety Related, Quality Related, Critical to Plant Operations), capability to modify software such as software versus firmware, software and hardware revision compatibility, etc. Safety Related system configuration control must ensure that V&V qualification remains valid so prescriptive configuration control methods would be required. For Non Safety Related software, the configuration control may be less restrictive with focus on plant reliability and day to day operation. Firmware/Software includes both the Operating/Platform System firmware/software and the application specific firmware/software along with any configuration parameters such as setpoints, constants, scaling, etc.

EDCR TECHNICAL EVALUATION

DIGITAL SYSTEM UPGRADES/MODIFICATIONS: (continued)

Note: This section is not required for Plant Design EDCRs.

Does this change involve a digital system, component, or upgrade?

☐ YES ☒ NO If "NO," then leave Questions #1 through 6 below blank.

☐ YES ☐ NO 5. Has a Cyber Security Assessment been completed to address NEI 04-04 requirements? Contact the Computer Engineering Group for instructions.

☐ YES ☐ NO 6. Is there a communication network interface such as an ICS interface?

If yes, implement design of this interface per the guidelines addressed in DG-E18.1.25.

Based on the Technical Evaluation Considerations responses listed above, the modifications described within this EDCR are considered safe from a nuclear safety standpoint.

Enclosure 2
TVA Letter Dated October 29, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

Attachment 5

Draft FSAR Section 7.6.8 COMS Changes

7.6.8 Interlocks for RCS Pressure Control During Low Temperature Operation

The basic function of the RCS overpressure mitigation system during low temperature operation is discussed in Section 5.2.2.4. As noted in Section 5.2.2.4, this pressure control system includes manually armed semi-automatic actuation logic for the two Pressurizer Power Operated Relief Valves (PORVs). The function of this actuation logic is to continuously monitor RCS temperature and pressure conditions~~,~~; the actuation logic is manually unblocked when plant operation is at a temperature below the arming setpoint. The monitored system temperature signals are processed to generate the reference pressure limit program which is compared to the actual measured system pressure. This comparison will provide an actuation signal to cause the PORV to automatically open if ~~-~~necessary to prevent pressure conditions from exceeding allowable limits. See Figure 7.6-5 for the block diagram showing the interlocks for RCS pressure control during low temperature operation.

Change 18

Change 18

~~As shown on this figure, the~~Two separate, independent sets of controls are provided for the interlocks, with the required process ~~station~~ variables ~~required for this interlock are channelized~~ being derived from redundant protection sets as follows:

Change 18

1. Protection Set I
    a. Wide Range RCS Temperature (TE-68-1, TE-68-18, TE-68-24, TE-68-41)
2. Protection Set II
    a. Wide Range RCS System Pressure (PT-68-68).
    b. Wide Range RCS Temperature (TE-68-43, TE-68-60, TE-68-65, TE-68-83)

3. Protection Set III

   a. Wide Range RCS System Pressure (PT-68-66).

The wide range temperature signals, as inputs to the Protection Sets I and II, continuously monitor RCS temperature conditions. In Protection Set I, the existing RCS wide range temperature channels on RCS loops I and 2 provide~~s~~ ~~an~~ inputs to the Eagle 21 digital process~~ing~~ protection system ~~instrumentation~~. ~~An isolation device in the~~ Eagle 21 ~~instrumentation~~ provides isolated ~~a continuous~~ analog signals to the digital process control system~~input to an auctioneering device, which is located in the Process Rack of Control Rack Group 1~~. ~~The~~ An auctioneer function selects the lowest temperature signal which ~~reading~~ is then used~~selected~~ to ~~input to a function generator which~~ calculate~~s~~ an acceptable reference pressure limit (PORV setpoint) ~~the reference pressure limit program~~ considering the plant's allowable pressure and temperature limits. ~~Also available from Protection Set III is the~~An isolated wide range RCS pressure signal is ~~which~~ also provided from ~~inputs to the~~ Eagle 21 Protection Set III~~digital processor and isolation device to Control Rack Group 1~~. The calculated reference pressure ~~from the function generator~~ is compared to the actual RCS ~~system~~ pressure monitored by the wide range pressure channel. The auctioneered temperature signal will annunciate a main control room (MCR) alarm whenever the measured temperature approaches, within a predetermined amount, the reference temperature for arming the system. Similarly, whenever the measured pressure approaches within a predetermined amount of the programmed setpoint, another MCR alarm will be generated. When the measured RCS pressure is equal to or above the programmed setpoint (nominal values), a PORV open signal is initiated and a MCR alarm is actuated. A manually armed permissive allows this actuation signal to control the Train A PORV (PCV-68-340A). The manually armed permissive also serves to block a spurious PORV opening due to potential instrument failure whenever the RCS temperature is above the arming reference temperature.

Change 18

Change 18

The monitored generating station variables that generate the actuation signal for the Train B PORV (PCV-68-334) are processed in a similar manner. ~~In the case of the Train B PORV, the reference temperature is generated in Control Rack Group 2 from the lowest auctioneered wide range RCS loop 3 and 4 temperature. The auctioneering device derives its inputs from~~ ~~t~~The RCS loops 3 and 4 wide range temperature signals ~~in Protection Set II~~ and the ~~actual measured~~RCS pressure signal ~~is available~~ are provided from Protection Set II. Therefore, the generating station variables used for the Train B PORV are derived from a protection set that is independent of the sets from which generating station variables used for the ~~t~~Train A PORV are derived. ~~The error signal derivation used for the actuation signals is available from Control RACK Group 2.~~The wide range temperature auctioneer function and the programmed pressure setpoint calculation for the Train B PORV are performed in a different group of the digital process control system than those for the Train A PORV. Each of these control groups has a fault-tolerant, redundant processor pair and redundant power supplies with different power sources.

Change 1

Upon receipt of the actuation signal, the actuation device will automatically cause the PORV to open when the manually armed permissive is present. Upon sufficient RCS inventory letdown, the operating RCS pressure will decrease, clearing the actuation signal. Removal of this signal causes the PORV to close.

Enclosure 2
TVA Letter Dated October 29, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

Attachment 6

TVA Design Criteria Document WB-DC-40-24, Radiation Monitoring (Unit 1/Unit 2), Revision 21, dated June 17, 2009

NPG Design Criteria Document

TITLE
RADIATION MONITORING -- (UNIT 1 / UNIT 2)

WB-DC-40-24
Rev. 0021
Page 1 of 86

Quality Related ☑ Yes ☐ No

Effective Date 06-17-2009

Prepared by: J. S. Robertson

Reviewed by:	J. F .Lund	06-15-2009 Date
Concurred by:	J. F. Lund	06-15-2009 Date
Approved by:	D. M. Viscusie Project Manager, Design Engineering	06-15-2009 Date

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
0	9-8-72		Initial issue.
1	3-31-89		General revision.
DCN S-11682-A			DCN RIMS No. B26 900730 844 Revised Table 9.0-1, Radiation Monitoring Classification," page 119 to add monitors 0-RE-90-217, 0-RE-90-218, and 0-RE-90-219.
2			Incorporated the following Design Input Memorandums (DIM): A. DIM-WB-DC-40-24-1 - D. W. Wilson to P. R. Mandava, July 15, 1989 (B26 890714 207). B. DIM-WB-DC-40-24-2 - D. W. Wilson to P. R. Mandava, September 15, 1989 (B26 890915 078). C. DIM-WB-DC-40-24-3 - D. W. Wilson to P. R. Mandava and F. A. Koontz, Jr., September 15, 1989 (B26 890915 078). D. DIM-WB-DC-40-24-4 - D. W. Wilson to P. R. Mandava, October 31, 1989 (B26 891031 076). E. DIM-WB-DC-40-24-6 - D. W. Wilson to P. R. Mandava, December 21, 1989 (B26 891221 076). F. DIM-WB-DC-40-24-5 - R. C. Weir to W. S. Raughley, April 23, 1990 (B26 900423 076). Revised Sections 3.1.1, 3.1.1.6, 3.1.1.7, 3.2.1.5, and 3.7.1.2.4 to reflect the design change for the Shield Building vent monitors. Delete Section 3.1.1.5 and renumber Sections 3.1.1.6 through 3.1.1.11. Revised Section 3.1.3 and added Sections 3.1.3.10, 3.2.3.10, and 3.7.3.2.10 to add CDWE Building particulate monitor requirements.

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
2 (cont'd)			Revised Section 3.1.6 to add the CDWE Building area monitors and correct the name of 1,2-RE-90-010 from Auxiliary Building access area monitors to CVCS board area monitors. Added Sections 3.1.6.21, 3.2.6.21, and 3.7.6.2.21 to add requirements for the CDWE Building area monitors. Revise Section 3.2.5.1b to correct the safety function from primary to secondary for the waste disposal system gaseous effluent monitor. Revised Sections 3.2.6.1 through 3.2.6.14 and 3.2.6.17 through 3.2.6.20, 3.7.6.2.1 through 3.7.6.2.14 and 3.7.6.2.17 through 3.7.6.2.20 to delete the requirements for a local alert and malfunction alarm for the area monitors. Revised Section 7.2 to add approved exceptions. Added references 8.2.1, 8.4.11, 8.4.12, and 8.6.1 through 8.6.33 (requirements calculations). Revised Tables 9.0-1, 9.0-2, 9.0-3, 9.0-4, and 9.0-5 to reflect design changes, CDWE Building monitor additions, to correct environmental and mechanical data, and to incorporate the results of the requirements (range and accuracy calculations. Revised Sections 3.1.1.11 (now 3.1.1.10), 3.2.1.8, and 3.7.1.2.7 to add the requirements for the portable airborne radioactivity monitors. Revised Sections 3.1.1.2, 3.1.4.1, 3.1.4.10 (now 3.1.4.9), 3.1.6.10, 3.2.1.2, 3.2.1.3, 3.2.1.4, 3.2.1.7, 3.2.2.2, 3.2.4.5, 3.2.4.10 (now 3.2.4.9), 3.7.1.2.8, 3.7.2.2.3, 3.7.3.1, 3.7.3.2.9, 3.7.4.1, 3.7.5.2.1, 3.7.7, 4.1.1.3, 4.1.2.1, and 4.1.3, and deleted 3.9, 4.0, 4.1.1.2, 3.7.6.2.20b and relettered paragraphs. Revised the Table of Contents as necessary. Made editorial changes for consistency in nomenclature and when required for clarity. This revision incorporated applicable commitments/requirements per WBEP-DB.02. Revised Sections 3.1.7.1 and 3.1.7.2 to allow use of a single monitor if one monitor that satisfies the required range and accuracy is obtainable.

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
2 (cont'd)			Make clear requirements that containment lower and upper compartment monitors provide real-time detection of radioiodine. Section 3.2.4 - Clarified minimum sample flow requirements for the off-line liquid monitors. Clarified requirements for remote indication of several area monitors. Section 3.7.1.2.2 - Changed sample flow rate requirements for the Service Building vent monitor. Section 3.12 - Changed a requirement for low point taps in sampling systems to a recommendation. In Sections 3.1.3.2, 3.1.3.7, in subsequent sections, and in the tables, the two area monitors previously both identified as "Waste Packaging Area Monitor" are differentiated by renaming one of them the "Second Waste Packaging Area Monitor." Section 3.1.7 - The letdown monitor, RE-90-104, is reclassified from an offline liquid monitor to an online monitor. The changes in the criteria that result from this reclassification are made. Sections 3.2.6.15 and 3.2.6.16 - A requirement to provide indication of exposure rates measured by the Reactor Building post-accident monitors in the MCR is added. Section 3.7.1.2.5 - The requirement to provide output from the condenser vacuum pump normal range monitors to the plant computer data logger is deleted. Section 3.9 - The requirement for sample pumps to have remote on/off controls is deleted. Section 3.8 - Revised to state thermal overload bypass of thermal overload protection devices for safety-related motor-operated valves and torque switches is not required. Clarified Note 1 to Table 9.0-1. Deleted unused notes in the tables

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
2 (cont'd)			Section 3.7.1.2.4 - Deleted requirement that the SBV Noble gas monitor provide means for local display of the latest averaged measured data, and means for local actuation of the check source for channels that have check sources. Deleted requirement that the SBV particulate and iodine monitor include a radiation detector near the particulate/iodine grab sample filters.
DCN M-21861-A			Revise Table of Contents to delete existing Section 3.10.1.1 and re-number Section 3.10.1.2 as new Section 3.10.1.1. Delete the automatic control functions of the Auxiliary Building Vent Monitor as specified in Sections 3.1.1.1, 3.2.1.1, and 3.7.1.2.1. Delete existing Section 3.10.1.1 for the Auxiliary Building Vent Monitor automatic control functions. Re-number Section 3.10.1.2 as new Section 3.10.1.1. Delete Auxiliary Building Ventilation Monitor from table 9.0-4.
DCN S-17772-A	06/18/93		RIMS No. T56 930618 881 Revise Table of Contents to delete Sections 3.1.1.10, 3.1.6.13, 3.2.1.8, 3.2.6.13, 3.7.1.2.7 and 3.7.6.2.13, 3.10.1 and 3.10.1.1 and renumber Sections 3.1.6.14 thru 3.1.6.21 as 3.1.6.13 thru 3.1.6.20, Section 3.2.1.9 as 3.2.1.8, Sections 3.2.6.14 thru 3.2.6.21 as 3.2.6.13 thru 3.7.6.20, Section 3.7.1.2.8 as 3.7.1.2.7, and Sections 3.7.6.2.14 thru 3.7.6.2.21 ad 3.7.6.2.13 thru 3.7.6.2.20. Revise Sections 3.1.1, 3.1.1.5, 3.1.1.6, 3.2.1.5, 3.6 and 3.7.1.2.4 to address changes related to the Shield Building Vent Monitors. Revise Sections 3.1.1.3, 3.1.1.4, 3.2.1.3, 3.2.1.4, 3.7.1.2.3, 3.10.1.1 and Table 9.0-4 to address changes to the Containment Lower and Upper Compartment Monitors. Delete Section 3.1.1.10.

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
DCN S-17772-A (cont'd)			In Section 3.1.6 delete line for Laundry Room Monitor 0-RE-90-063. Delete Section 3.1.6.13 and renumber succeeding Sections 3.1.6.14 through 3.1.6.21 as 3.1.6.13 through 3.1.6.20. Delete Section 3.2.1.8 and renumber paragraph 3.2.1.9 as 3.2.1.8. Delete Section 3.2.6.13 and renumber succeeding Sections 3.2.6.14 through 3.2.6.21 as 3.2.6.13 through 3.2.6.20. Revised Section 3.5 to add pressure and temperature effects. Revised Section 3.2.7.1 to revise the Safety Classification and Safety Function for the Main Steam Line Monitors from primary to secondary safety function. Delete Section 3.7.1.2.7 and renumber Section 3.7.1.2.8 as 3.7.1.2.7. Delete Section 3.7.6.2.13 and renumber succeeding Sections 3.7.6.2.14 through 3.7.6.2.21 as 3.7.6.2.13 through 3.7.6.2.20. Revise reference list to update and add References. Revised Table 9.0-1 to revise the Electrical Safety Class, Seismic Category of Detector Assembly, and WB-DC-30-7 Category/Type for 1, 2-RE-90-421 thru 1, 2-RE-90-424 to reflect non IE, Seismic I(L) and 2/C, E respectively, to delete 0-RE-90-063, to add note 39 for 1, 2-RE-90-400 and 402, to delete Portable Monitors 0-RE-90-217, 218, 219 and to delete Monitor 1-RE-90-104. Revised Table 9.0-2 to revise the source of sample description for 1, 2-RE-90-106 and 112, and to delete Portable Monitors 1, 2-RE-90-217, 218 and 219. Revise Table 9.0-3 to delete Laundry Room Monitor 0-RE-90-063 and Portable Monitors 0-RE-90-217, 218, and 219.

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
DCN S-17772-A (cont'd)			Revised Table 9.0-4 to delete Cnmt Bldg. Lower and Upper Compartment Monitors. Revised Table 9.0-5 to revise the Primary Safety Function, and Secondary Safety Function for 1, 2-RE-90-421 thru 1, 2-RE-90-424 to reflect No and Yes respectively, to delete 0-RE-90-063 and to delete Portable Monitors 0-RE-90-217, 218 and 219. These revisions reflect the changes implemented by DCNs M-09964-A, M-3450-A, M-3451-A, F-24447-A, M-13516, and M-11823. Pages Added: Revision Log (2 pages) Pages Changes: i, ii, iii, iv, vi, 6, 8, 9, 18, 21, 22, 27-32, 49-54, 56, 57, 61-64, 77-80, 86, 87, 106, 108, 109, 111-114, 116, 117, 120, 128-130, 132, 133, 138-140. Pages Replaced: None
3	07-30-93		Revision 3 is performed as part of the Corrective Action to SCAR WBE890178901SCA, Revision 3. This is a general revision based on a review in accordance with the guidelines of Appendix B to EAI-3.08 and included comments from SERT Program, thus revision bars are omitted on editorial comments. This revision incorporates EX-WB-DC-40-24-3 and EX-WB-DC-40-24-4 of Revision 2 of this Design Criteria.
DCN S-29571-A	02/25/94		DCN RIMS NO. T56 940226 909 Revised Section 3.2.4.5 to correct the seismic category of the detection assembly of monitors 0, 1, 2-RE-90-123 from I to I(L). Revised Pages: va and 41

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
DCN S-30248-A	04/14/94		DCN RIMS NO. T56 940415 844 Revised to update references to new revision of 10CFR20, correct minor documentation discrepancies, provide clarifying statements for functional requirements. Revised Pages: va, 11, 12, 13, 14, 23, 27, 28, 30, 31, 41, 44, 54, 55, 59, 67, 83, 84, 89, 96, 97, 104, 105, 106, 107, 108, 109, 111, 112, 113, 115, 116, 117, 123, 124, 125, 131, 133, 134, and 136 Pages Added: 55a
DCN S-29903-A	05/02/94		DCN RIMS NO. T56 940503 928 Revised to state that SGBD radiation monitor 1-RE-90-124 is not used for Unit 1 operation. Revised Pages: va, 14, 15, 112, 121, and 133
DCN S-30248-B	06/03/94		DCN RIMS NO. T56 940603 850 Revised Table 9.0-1 for clarification of the power requirements for RE-90-133/134/140/141 and to revise the range of RE-90-002 from MR/hr to R/hr. Revised to add revision bar to table 9.0-3. Change was performed by DCN S-30248-A which omitted the revision bar. Revised Pages: va, 112, and 123
DCN S-32560-A	09/10/94		DCN RIMS NO. T56 940910 810 Revised Section 3.1.4.3, Table 9.0-1, 9.0-3, and 9.0-4 to indicate the boric acid evaporator condensate monitor (1-RE-90-170) is not used for Unit 1 operation. Revised Section 3.2.7.2.a, 3.2.7.3.a, and 3.2.7.4.a to delete the requirement for visual alarm locally on channel malfunction. Revised Section 3.7.1.1 (Page 60) to clarify that instruments to measure flow rate and system pressure are required to correct particulate and iodine measurements.

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
DCN S-32560-A (cont'd)			Revised Section 3.7.6.2.21.c to correct mR/m to mR/Hr. Revised Section 4.1.1.2 to refer to Reference 8.6.31 for guidance on probe isokinetic design and to delete "Later" for minimum probe nozzle diameter. Revised References to add Reference 8.6.31. Revised Table 9.0-5 to indicate monitor, 1,2-RE-90-129 has no post accident monitoring function and that monitor 1,2-RE-90-421 does not perform a primary safety function. Pages Revised: 15, 54, 55, 60, 80, 95, 109, 112, 121, 129, 131, 133 Pages Added: vb Total Pages: 154 (Including i - xiv, va, vb, 55a, 104a)
DCN S-31881-A			DCN RIMS Number T56 940926 882 Revised to add Source Notes CATD 22911-WBN-01. Revised Pages vb, xiv Added Pages: 137 Deleted Pages: None
DCN S-32575-A	10/07/94		DCN RIMS NO. T56 941008 900 Revised Index, Page xiv, to reflect renumbered pages. Revised Section 3.1.4 to add "*" to 1-RE-90-170. Revised Section 3.7.1.2.3 to correct typographical error. Revised Section 3.7.4.1, Paragraph 10, to change reference from Section 3.10.4 to Table 9.0-5. Revised Section 4.1.1.1.2, Paragraph 6, to delete "Reference Later." Revised Calculation Section 8.6 to add RIMS number for Reference 8.6.13.

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
DCN S-32575-A (cont'd)			Revised Table 9.0-1 to delete 1E electrical safety class for 1,2-RE-90-404 and to delete 1E from Note 14. Revised Table 9.0-3, Page 121, to delete transmission factor and Page 126 to revised Note 10 and add Note 10.1. Consolidated Pages 127 and 128 and renumbered Pages 129 through 137 to 129 through 136. Revised Table 9.0-5, Page 132, to add "*" to 1-RE-90-170. Pages Added: vc Pages Deleted: 137 Pages Revised: xiv, 14, 61, 69, 94, 108, 111, 115, 121, 126 through 136 Total Pages: 156 (Including cover sheet, i, xiv, va, vb, vc, 55a, 104a)
DCN S-34674-A			DCN RIMS NO. T56 950204 831 Revised Index, Sections 3.1.4, 3.1.4.8, 3.2.4.8, 3.7.4.2.8, Table 9.0-1, Table 9.0-3, and 9.0-5 to delete plant liquid discharge monitor 0-RE-90-211. This monitor is not required since all radioactive liquid sources making up the plant liquid discharge stream are monitored separately. DCN W-34481-A deleted the monitor from the drawings. Pages revised: vc, viii, ix, xi, 14, 17, 42, 43, 112, 121, 132 Total Pages: 156 (Including cover sheet i, xiv, va, vb, vc, 55a, 104a)
4	4/28/95		This is a complete revision of the entire design criteria. This revision is being performed as part of the corrective action to WBPER940423 and WBPER940601. Since this revision constitutes a total rewrite of the design criteria, revision bars have been omitted. Total Pages: 73

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
DCN S-36274-A	5/19/95		RIMS No. T56 950519 958 Section 3.1.6.1 - Revised Table number reference. Section 3.1.6.5 - Clarify function of monitors 1-RE-90-291 and -293. Table 9.0-2 - Revise this table to delete local visual and audio alarm for monitors 1-RE-90-291 and -293. Pages added: 27a Pages replaced: 2i, 25, 27, 55 and 56 Total pages: 74 (including cover sheet, 2a thru 2i and 27a)
5			Revision 5 is performed to implement user comments subsequent to issue of Revision 4. Section 2.0 - Revised definition of sample line. Section 3.0 - Revised to clarify seismic requirements. Section 3.1.1.2 - Revised Auxiliary Building exhaust flow rate. Section 3.1.4.2, 3.1.4.4, 3.1.4.5 - Revised to clarify 10CFR20 requirements. Section 3.1.6 & 3.1.6.3 - Revised to exclude requirement for local displays for the spent fuel pool monitors. Section 3.6.3.1 - Revised to clarify sample line requirements. Section 7.1 - Clarified that all exceptions have been incorporated or cancelled by revision 4. Section 8 - Updated references. Table 9.0-2 - Deleted requirement for low range detector for main steam line monitors. Pages Added: 32a Pages Replaced: 2i, 8, 9, 13, 21, 22, 25, 27a, 32, 35, 41, 42, 45, 46, 56 and 60. Total Pages: 75

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
DCN S-37549-A	07/22/95		DCN RIMS NO. T56 950722 948 Revised Table 9.0-1 to allow seismic class I(L) for components within the instrument class boundary for monitors RE-90-16, 101, 400 and 402. Revised Tables 9.0-2 and 9.0-4 to correct typographical errors. Pages Added: 2j, 50a Pages Deleted: None Page Total: 77
DCN S-37195-A	07/23/95		DCN RIMS NO. T56 950723 981 Added 50.55(e) 390/86-49 and 391/86-46 as a Source Note to Source Note Log Page 65. Pages Revised: 2j, 65 Pages Added: None Pages Deleted: None Page Total: 77
DCN S-37610-A	07/27/95		DCN RIMS NO. T56 950727 907 Revised Sections 3.1.4.1 and 3.1.6.1 to make minor clarification. Pages Revised: 2i, 2j, 20, 25 Total Pages: 77
DCN S-37718-A	08/07/95		DCN RIMS NO. T56 950807 861 Revised Section 3.1.3 and tables 9.01, 9.02, and 9.04 to allow the use of portable monitors in lieu of 0-RE-90-105 and 2-RE-90-014. Pages added: 18a Pages deleted: None Pages changed: 2j, 18, 48, 50a, 53, 54, 58, 61, 64 Total of pages: 78

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
DCN S-37648-A	09/01/95		DCN RIMS NO. T56 950901 942 Revised Section 3.1.5.1 to delete the requirement that areas monitors alarm locally upon malfunction or loss of power. Pages added: 2k Pages deleted: None Pages changed: 2j, 24 Total of pages: 79
DCN S-38098-A			DCN RIMS NO. T56 950909 916 Revised Section 3.1.3 and Tables 9.01, 9.02, and 9.04 to delete the Unit 2 Hot Sample Room continuous Air Monitor (2-RE-90-14) and the Main Control Room Continuous Air Monitor (0-RE-90-105); included a statement that the Unit 2 Hot Sample Room and the Main Control Room will be monitored by portable continuous air monitors supplied and administered by Site Radcon. Pages Added: None Pages Deleted: None Pages Changed: 2k, 18, 48, 50a, 53, 54, 58, 61, 64 Total Pages: 79
6	09/22/95		Revised Section 3.1.6.1 to delete the requirement for a loss of signal malfunction alarm for monitors 1-RE-90-421, 422, 423, and 424. Reprinted all pages. Total Pages: 79
DCN S-38273-A	10/04/95		DCN RIMS NO. T56 951004 800 Revised Table 9.0-2 to document 1-RE-90-002 as an ion chamber. This detector is an RD-2A ion chamber detector. Pages Added: None Pages Deleted: None Pages Changed: 2k, 56 Total Pages: 79

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
DCN S-38339-A	10/13/95		DCN RIMS NO. T56 951013 864 Revised Table 9.0-2 to delete beta detector for 1-RE-90-421, 422, 423, 424. Pages added: None Pages deleted: None Pages changed: 2k, 56 Total Pages: 79
DCN M-38887-A	11/07/96		DCN RIMS NO. T56 961108 817 Revised Section 3.1.1.4, Service Building Vent Monitor (0-RE-90-132), to reflect deletion of isokinetic sample pump and associated instrumentation. Pages added: 2k Pages deleted: None Pages revised: 14, 46 Total Pages: 79
DCN M-39372-A	05/02/97		DCN RIMS NO. T56 970505 803 Deleted background detector for 1-RE-90-404 from Section 3.1.1.7. Pages added: 21 Pages deleted: None Pages changed: 15 Total of pages: 80
DCN S-39417-A	06/25/97		DCN RIMS NO. T56 970626 800 Revised Sections 3.1.6 and 3.1.1.7 to provide a method of detecting and monitoring steam generator tube leak/rupture when condenser vacuum exhaust monitors are not operating prior to achieving a vacuum in the main condenser. Pages added: 15a Pages deleted: None Pages changed: 2(k), 2(l), and 15 Total of pages: 81

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
7	2/18/99		DCN M-39854-B (T56 980714 802) revised Table 9.0-2 to delete listing of Service Building Vent monitor particulate channel 0-RE-90-132A. Incorporates DCNs S-38273-A, S-38339-A, M-38887-A, M-39372-A, S-39417-A, and M-39854-B. Reformatted entire document, which made it necessary to renumber pages. Changed page numbers on the Table of Contents (pages xv through xvi). Pages Revised: All Total Pages: 84 (which includes i through xvi and pages 1-68)
8	5/27/99		Incorporates DCNs as follows: DCN M-39911-A (T56 981215 803) replaces the obsolete Unit 1 Westinghouse P2500 Plant Process Computer with a new Plant Integrated Computer System. This Plant Computer System provides an operator friendly, state of the art, real time process computer system for the WBN plant operators. After this modification, the new Plant Computer will be operational and performing all the functions of the existing Plant Computer (WB-DC-30-29) and Emergency Response Facilities Data System (ERFDS) (WB-DC-30-8). Therefore, Design Criteria's WB-DC-30-8 and WB-DC-30-29 have been combined into one Design Criteria WB-DC-30-29 "Plant Integrated Computer System." Design Criteria WB-DC-40-24 has been revised to incorporate this change by removing references to the Emergency Response Facilities Data System (ERFDS), Technical Support Center (TSC) Computer or P2500 and replacing them with Plant Computer references. DCN D-50122-A (T56 990218 802) revised normal vent monitor flow in Section 3.1.1.2. Deleted Coordination Log which is not required per NEDP-10, which required renumbering of pages i-xv and changed Table of Contents). Pages Revised: All Total Pages: 83 (includes pages i-xv and 1-68)

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
9	4/10/2000		Incorporates DCN as indicated below: DCN D-50502-A (T56 000309 801) revised Section 3.1.4.2 to clarify an additional function for the radiation monitors and revised calculation reference 8.5.9. Reformatted and renumbered pages i-xiii, which changed page numbers on the Table of Contents (pages xii-xiii). Total Pages: 81 (includes pages i-xiii and 1-68)
10	10-23-2000		Screening Review WBPLMN-00-063-0 (T25 000816 906) evaluated this revision to Section 3.1.4.1 to include a reference for minimum flow requirements for 1-RE-90-120, -121, 0-RE-90-122, -225. Added Reference 8.5.33. Revised calculation Reference 8.5.9. Incorporates DCN D-50483-A (T56 000523 801) - Revised Section 3.1.3 and Tables 9.0-1, 9.0-2, and 9.0-4 to delete the Decontamination Room Continuous Air Monitor (0-RE-90-016), Waste Packaging Room Continuous Air Monitor (0-RE-90-138), Unit 1 Sample Room Continuous Air Monitors (1-RE-90-14), and Reactor Building Lower Compartment Instrument Room Continuous Air Monitor (1-RE-90-062); includes a statement that the Waste Packaging Room and Unit 1 Sample Room will be monitored by portable continuous air monitors supplied and administered by Site RADCON. Renumbered pages i-xiv, which changed page numbers on the Table of Contents (pages xiii-xiv). Total Pages: 82 (includes pages i-xiv and 1-68)

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
11	4-16-2001		Incorporates DCN as follows: DCN D-50482-A (T56 000815 800) deleted area monitors 1-RE-90-280, 275-278 and 290-293. Deleted iodine channels 0-RE-90-132C and 1-RE-90-106C. Revised Sections 3.1.1, 3.1.1.3, 3.1.1.6, 3.1.5, 3.1.6, 3.1.6.1; deleted Sections 3.1.6.5, 3.1.6.6, and 3.1.6.7; revised Section 3.6.3.4.1; revised Tables 9.0-1, 9.0-2, 9.0-3, and 9.0-4. Section 3.1.1 was revised to delete the normal range particulate and iodine sampler 1-RE-90-129 for consistency with DCN D-50482-A. Renumbered pages 1-67, which changed page numbers on the Table of Contents (pages xiii-xiv). Total Pages: 81 (includes pages i-xiv and 1-67)
12	3-6-2003		Incorporates EDC as follows: EDC-51385-A revised Section 3.1.1.6 to add a means of maintaining the operability of 1-RE-90-119 after a turbine trip. Total Pages: 81 (includes pages i-xiv and 1-67)

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
13	5-14-2003		Incorporates EDC as follows: EDC E-51278-A revised Sections 3.1.1.6 and 3.1.1.7 to remove the requirement for a portable monitor to be placed at the CVE exhaust once each hour if CVE and steam generator blow down radiation monitors are not in service and corrected EPIP-16 to EPIP-13. Also revised Section 3.1.1.6 to state that sampling in accordance with the ODCM will be used to assess radioactivity in the CVE in the event the CVE is operating and the CVE normal range monitor is inoperable. Section 3.1.1.7 was revised to delete the requirement for a portable monitor to be placed at the CVE exhaust once each hour and use of the steam generator blowdown monitors to identify and assess a steam generator tube leak when the accident range monitor is inoperable since the function of the accident range monitor is to monitor accidents and not normal operations. The accident effluents are monitored and assessed by the main steam monitors and EPIP-13 as stated in Section 3.1.1.7. This EDC partially implements the corrective action plan of PER 01-17357-000. Total Pages: 81 (includes pages i-xiv and 1-67)

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
14	1-28-2004		Incorporates DCN as follows: DCN D51229-A - Installs tritium samplers 0-SMPL-90-800, 1-SMPL-90-801 and 2-SMPL-90-801 in the Auxiliary and Shield Buildings. -Section 3.1.1.2 was revised to add a tritium sampler to monitor the quantity of tritium exiting the Auxiliary Building Stack. -Section 3.1.1.4 was revised to justify the potential release of tritium in the Service Building is negligible and therefore no tritium monitoring is required. -Section 3.1.1.5 was revised to add a tritium sampler to monitor the quantity of tritium exiting the Shield Building Stack. -Section 3.1.1.6 was revised to state WBN will monitor the condenser vacuum pump exhaust for tritium if tritium bars are present in the reactor core, and a SG tube leak is detected. -Section 8.6 was added to add Reference 8.6.1 to document TVA commitment to continuously monitor Tritium. -Revised Table 9.0.1 Radiation Monitoring Classification to add tritium samplers 0-SMPL-90-800, 1-SMPL-90-801, and 2-SMPL-90-801. -Revised Tables 9.0-4 Radiation Monitoring Functions, and 9.0-2 Radiation Monitoring Characteristics to add tritium samplers 0-SMPL-90-800, 1-SMPL-90-801, and 2-SMPL-90-801. Renumbered pages i-xv due to adding a page to the Revision Log, which changed page numbers on page xiv of the Table of Contents. Total Pages: 82 (includes pages i-xv and 1-67)

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
15	5-23-2005		Incorporates DCN as follows: DCN 51426-A revised Sections 3.1.3, 3.6.3.4.1, 3.6.3.5.2, and 8.5.7, Table 9.0-1, Table 9.0-2, and Table 9.0-4 to delete the Spent Fuel Pool Area Continuous Air Monitor (0-RE-90-012), Shipping Bay Area Continuous Air Monitor (0-RE-90-013), Holdup Valve Gallery Area Continuous Air Monitor (0-RE-90-015), and the SI Pump Area Continuous Air Monitor (0-RE-90-017); and to include a statement that the Spent Fuel Pool Area, Shipping Bay Area, Holdup Valve Gallery Area, and SI Pump Area will be monitored by portable continuous air monitors applied and administered by Site Radcon. Renumbered pages 1-66, which changed page numbers on the Table of Contents (pages xiv-xv). Total Pages: 81 (includes i-xv and 1-66)
16	05-04-2007	All	This design criteria was converted from Word 95 to Word 2003 using Rev. 15. Section 3.1.6A, 4th paragraph, changed 3.1.6.7 (Word 95 format) to 3.1.6D. Sections 3.1.6.5 through 3.1.6.7 were deleted by Revision 11. Section 3.6.3E.1, 3rd paragraph, changed "Section 8.6.3.5.3" to "Sections 3.6.3E.3 and 3.6.3E.6. There is not a Section 8.6.3.5.3. Incorporates DCN 51786 which modified the turbine building sump radiation monitor 0-RE-90-212 to eliminate the sample flow line problem. Section 3.1.4F (Section 3.1.4.6 in Word 95 version) was deleted and Section 3.1.6E added. Tables 9.0-1, 9.0-2, and 9.0-4 were revised to reflect the change to 0-RE-90-212 from an off-line monitor to an on-line monitor.

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
17	03-13-2008	1, 21, 38, 48, 79, 80	DCN 52220: Revised Sections 3.1.2, 3.1.6, and Table 9.0-3 to reflect the design change to permit initiation of a CVI from a high radiation signal from the spent fuel pool radiation monitors and to permit initiation of that portion of an ABI signal (normally initiated by the spent fuel pool radiation monitors) by a CVI signal during movement of irradiated fuel when the Containment is open to the Auxiliary Building. This change will allow operation of the containment purge system during movement of irradiated fuel in the Auxiliary Building with the containment open to the Auxiliary Building ABSCE spaces.
18	04-21-2008	1, 21, 48, 70	Incorporates DCN 52211-A (PIC 52299-A) as follows: Section 3.1.6C - added notation to section to include mention of the areas being monitored not previously included in the section. Also added reference to the system description section which notes the special ventilation interface requirements associated with the Fuel Handling Exhaust (FHE) System during irradiated fuel movement in the Fuel Transfer Canal to support the proper operation of the radiation monitor function (Ref. 96939). Section 8.5 - added new reference 8.5.34 calculation, WBNTSR-009, which specifies the special requirements associated with the FH exhaust ventilation system.
19	08-26-2008	1, 21, 24	This revision was issued by WB2CCP to address the Radiation Monitoring System applicability to Unit 2 in Section 1.0 of this DCD. An outstanding WITEL Punchlist item applicable to Unit 2 is listed as follows: -- PL-08-1094, see Section 1.0 New and upgraded radiation monitoring detectors are being supplied thru WB2CCP purchase requisitions 25402-011-MRA-HARA-00001 and 25402-011-MRA-HARA-00002.

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
20	01-21-2009	1, 22, 84	Administrative change to add Notes to Table 9.0-4, that were lost during issue of Revision 17. Reference PER 158904
21	06-17-2009	1, 22, 44, 45, 50, 71, 72	Incorporates EDC as follows: EDC E-53382: Document the stroke time credited for closure of valves 0-FCV-77-119, 0-RCV-77-43, 0-FCV-14-451. Add associated references in conjunction with change. Revised Section 3.1.4.C to specify the stroke time for 0-RCV-77-43. Revised Section 3.1.4.E to specify the stroke time for 0-FCV-14-451. Revised Section 3.1.6.B to specify the stroke time for 0-FCV-77-119. Added References 7.5.35 and 7.5.36. Updated revision level of References 8.5.10, 8.5.17, and 8.5.21.

Table of Contents

Table of Contents (continued)

1.0 SCOPE

This document establishes the design requirements of the Radiation Monitoring System (RMS) for the operation of Watts Bar Unit 1 [Source Note 7]. The RMS provides continuous monitoring of radiation levels, provides the results of the monitoring to the operator and in some instances produces signals to initiate automatic control actions. In addition, the RMS includes equipment for off-line particulate and iodine sample collection with no real-time detection. The RMS consists of process, airborne, area, and effluent radioactivity monitors. The outdoor radiological monitoring instrumentation, laboratory radiation measurement equipment, criticality monitoring equipment, and portable survey instrumentation is outside the scope of this criteria. If a discrepancy exists between this design criteria and any other Nuclear Engineering (NE) design criteria, the appropriate Engineering Manager should be notified by a memorandum. If a discrepancy exists between this design criteria and any other document where the other document is not a NE design criteria, this design criteria shall govern.

Radiation monitoring detectors are being upgraded to support the Watts Bar Unit 2 Construction Completion (WB2CCP) Project. Supporting vendor and engineering analyses shall be completed and incorporated into this design criteria document prior to the Unit 2 Radiation Monitoring System being declared operational. [PL-08-1094]

2.0 DEFINITIONS

Accuracy - The degree of agreement with the true value of the quantity being measured.

Accessible Area - An area which is designed to be entered without special radiological controls (i.e., is not a high radiation area or airborne radioactivity area), dismantling of installed equipment or the introduction of support equipment such as staging, ladders, etc.

Anticipated Operational Occurrences - Those conditions of normal operation which are expected to occur one or more times during the life of the nuclear power unit and include but are not limited to the loss of power to all reactor coolant recirculation pumps, a trip of the turbine generator set, isolation of the main condenser and a loss of all off-site power.

Categories 1, 2, and 3 - References to Categories 1, 2, and 3 are as stated in RG 1.97 (Reference 8.1.11).

Channel - A channel includes all of the instrumentation necessary to provide the monitoring function. A channel includes associated sample lines, skid assemblies, and local readout and alarm devices. A channel also includes equipment in the control room for recording, readout, and alarm and includes the electrical cable that connects monitor components.

Check Source - A test source supplied as an integral part of the monitor channel for use in determining if the channel is functional. This may be a radioactive source, or when a check of the channel exclusive of the detector scintillator is appropriate (i.e., where increased background cannot be tolerated), a pulsed light source or other similar device appropriate for the type of detector.

Class 1E - The safety-related classification of the electrical equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling and containment and reactor heat removal, or otherwise are essential in preventing significant release of radioactive material to the environment.

2.0 DEFINITIONS (continued)

Grab Sample - A volume removed from a process or effluent for laboratory analysis.

Gross beta or gamma radioactivity - The combined radioactivity from the mix of nuclides without distinction as to energy levels of the emissions.

In-Line Monitor - A monitor with no sample line where the detector or the detector well is immersed in the source fluid to be measured.

Isokinetic - A condition which prevails when the velocity of air entering a sample probe or the collector when held in the airstream is identical to the velocity of the airstream being sampled within a specific accuracy.

May - Denotes permission, neither a requirement nor a recommendation.

Minimum Detectable Level - The smallest amount of a quantity, e.g., radioactivity, which can be consistently detected by an instrument.

Off-line Monitor - A monitor where a representative sample is withdrawn from the source fluid stream and conveyed by a sample line to the detector assembly.

On-Line Monitor - A monitor where the detector is adjacent to or near the pipe, tubing, or tank containing the source fluid. Sometimes referred to as "shine" monitor.

Plate Out - A thermal, electrical, chemical, or mechanical action that results in a loss of sample material by deposition on surfaces between sample intake and sample collector.

Primary Calibration - The determination of the response of a monitor channel when the channel detector is exposed to radiation from multiple sources of known energies and activity levels traceable to the National Institute of Standards and Technology (formerly known as the National Bureau of Standards) and having the same physical state as the medium to be measured.

Primary Safety Function - The function of a structure, system, or component which must remain functional to assure: (1) integrity of the reactor coolant pressure boundary, (2) capability to shut down the reactor and maintain it in a safe shutdown condition, or (3) capability to prevent or mitigate the consequences of accidents which could result in potential off-site exposures comparable to the guideline exposures of 10 CFR Part 100 (Reference 8.1.4) and limit radiation exposure in the control room to the requirements defined in 10 CFR 50, Appendix A, General Design Criteria 19 (Reference 8.1.1).

Radiation Monitor - A device composed of one or more channels that measures radiation or a device composed of one or more channels that share an off-line sample intake to obtain a sample for measurement of its radioactivity.

Radiation Sampler - A radiation monitor which only collects samples for subsequent analysis.

Real-Time - Refers to measurements that are current and from continuously operating instruments that provide detection capability when a sample is presented.

2.0 DEFINITIONS (continued)

Response Time - The time interval from the appearance of the input concentration corresponding to the high alarm setpoint level at the sample line intake for off-line monitors, or opposite the detector for on-line or in-line monitors, to completion of required control action.

Representative Sample - A sample which has a specific activity similar to the entire volume from which the sample is drawn.

Safe Shutdown Earthquake (SSE) - That earthquake which produces the maximum vibratory ground motion for which structures, systems, and components important to safety are designed to remain functional.

Sample Line - A pipe or tube which conveys fluid from and back to a vent, duct, pipe, or an open area for the purpose of providing a sample for assessment of its radioactivity content. For the purposes of this design criteria, the sample line is defined to include the line through which the sample normally flows from and back to the source fluid or process line, to the instrument isolation valves (including the valves) or to the manufacturer's instrument connections if there are no isolation valves. For liquid monitors the sample line originates at the monitor side of the root valve if the process line is equal to or less than 36 inches from the root valve and at the process tap if the process line is greater than 36 inches from the root valve. The root valve and 36 inch line segment not defined as a sample line shall meet code and seismic requirements of the process line. For gas monitors the sample line originates at the probe or the end of the sample line.

Secondary Calibration - The determination of the response of a system with an applicable source whose effect on the system was established at the time of a primary calibration or whose effect on the system is otherwise known.

Secondary Safety Function - The function of a structure, system, or component which must either: (1) retain limited structural integrity because its failure could jeopardize to an unacceptable extent the achievement of a primary safety function or because it forms an interface between Seismic Category I and Non-seismic Category I plant features, or (2) performs a mechanical motion which is not required in the performance of a primary safety function but whose failure to act could jeopardize to an unacceptable extent the achievement of a primary safety function.

Seismic Category I - Those structures, systems, or components which perform primary safety functions are designated as Seismic Category I and are designed and constructed so as to assure achievement of their primary safety functions during and after a safe shutdown earthquake (SSE).

2.0 DEFINITIONS (continued)

Seismic Category I(L) - Those portions of structures, systems, or components which are designed and constructed so as to assure achievement of their pressure boundary and/or limited structural integrity at all times including a concurrent safe shutdown earthquake (SSE) because their failure could jeopardize to an unacceptable extent the achievement of a primary safety function or because it forms an interface between Seismic Category I and Non-seismic Category I plant features. This may be accomplished without meeting the full extent of the design, construction, quality assurance, and other regulatory requirements normally specified for Seismic Category I structures, systems, or components wherein a primary safety function must be assured. These are designated (by TVA) as Seismic Category I(L) (i.e., limited seismic requirements) and are considered to serve a secondary safety function.

Shall - Denotes a requirement.

Should - Denotes a recommendation.

Source Fluid - A liquid or gaseous fluid from which a measure of radioactivity is obtained by real time monitoring or by sampling and analysis. The source fluid may denote a volume, process, effluent, or airborne stream as appropriate.

3.0 DESIGN REQUIREMENTS

The primary function of the RMS is to detect ionizing radiation at selected places or in selected processes and effluents throughout the plant. The RMS may be used in conjunction with analysis of samples collected to determine the quantity of radioactive material released to the environment. The RMS shall have, (a) monitors which provide real-time monitoring of selected source fluids and initiate required automatic control functions, (b) monitors which provide real-time monitoring without an automatic control function and (c) monitors which provide for the collection of samples for analysis. The RMS should also provide, by means of audible and visual alarm devices, warning to the plant operator of (1) potential malfunction of systems which contain radioactive material, (2) excessive radioactive releases to the environment and/or (3) selected plant areas which exceed the radiation zone design limits.

Radiation monitors that perform a function to mitigate the dose consequences off-site or for control room habitability requirements for design basis events as described in WB-DC-40-64 (Reference 8.3.17), shall be considered to perform a primary safety function. Radiation detectors which monitor Category 1 post-accident key variables, as described in WB-DC-30-7 (Reference 8.3.5) shall be considered to perform a primary safety function.

RMS equipment (excluding sample lines) located in Seismic Category I structures that do not perform a primary safety function shall be qualified to Seismic Category I(L) except for that equipment, in these structures, that is located in areas which are designated as not requiring seismic qualification. The qualification to Seismic Category I(L) is required to retain pressure boundary and/or limited structural integrity because the equipment's failure could jeopardize to an unacceptable extent the achievement of a primary safety function or because it forms an interface between Seismic Category I and Non-Seismic Category I plant features. Seismic Qualification of sample lines shall be per Section 3.6.3C.

3.0 DESIGN REQUIREMENTS (continued)

Purge lines, instrument sensing lines, and instrument air lines connected to sample lines shall have safety class requirements similar to that of the sample lines as described in Table 9.0-1 of this document, or incorporate a class break between the sample and the purge line, instrument sensing line, or instrument air line. Instrument sensing lines shall be designed in accordance with WB-DC-30-16 (Reference 8.3.18). Interfaces with process and effluent piping and ductwork shall be designed in accordance with WB-DC-40-36 (Reference 8.3.10).

This design criteria satisfies the requirements of:

10 CFR 50 Appendix A (Reference 8.1.1)
10 CFR 50 Appendix I (Reference 8.1.2)
10 CFR 20 Appendix B and Numbered Sections (Reference 8.1.3)
10 CFR 100 (Reference 8.1.4)
40 CFR 60 Appendix A (Reference 8.1.5)

The requirements of this design criteria meet the intent of the recommendations and guidance provided in the pertinent sections of the following documents:

ANSI N42.18-1974 (Reference 8.2.7)
ANSI A59.1 (Reference 8.2.1)
ANSI/ISA-S67.10 (Reference 8.2.4)
ANSI N18.2 (Reference 8.2.6)
ANSI/ANS-HPSSC-6.8.1-1981 (Reference 8.2.3)
ANSI B40.1-1980 (Reference 8.2.2)
ANSI N13.1 (Reference 8.2.5)
ANSI N320-1979 (Reference 8.2.8)
IEEE 344-1971 (Reference 8.2.10)
IEEE 344-1975 (Reference 8.2.11)
IEEE 279-1971 (Reference 8.2.9)

NRC NUREG-0133 (Reference 8.1.12)
-0737 (Reference 8.1.14)
-0800 (Reference 8.1.15)
IE Notice 82-49 (Reference 8.1.16)
ISA 57.3 (Reference 8.2.12)

NRC RG 1.21 (Reference 8.1.7)
1.97 (Reference 8.1.11)
1.53 (Reference 8.1.9)
1.76 (Reference 8.1.10)
1.45 (Reference 8.1.8)
8.8 (Reference 8.1.6)

3.1 Functional Requirements

In the following subsections, the monitors of the RMS are assigned to the following groups:

Off-line Particulate, Iodine, and Noble Gas Monitoring
Off-Line Gas Monitors
Continuous Air Monitors (Airborne Particulate Monitoring)
Off-Line Liquid Monitors
Area Type Monitor
On/In-Line Monitors

Under the subsection for each of the above groups, general requirements and features are provided and specific features and functions for each monitor of the group are described.

3.1.1 Off-Line Particulate, Iodine and Noble Gas Monitors

The design of the following monitors shall include off-line channels to provide continuous real-time detection of particulate, iodine (except 1-RE-90-106), and noble gas (PIG) radioactivity (including collection of particulate and radiohalogens for on-site analysis):

Auxiliary Building Vent Monitor	0-RE-90-101
Containment Lower Compartment Monitor	1-RE-90-106
Containment Upper Compartment Monitor	1-RE-90-112

The design of the monitors listed below shall include off-line channels to provide for a combination of real-time detection of noble gas radioactivity and for the collection of particulates and iodine without real-time detection:

Service Building Vent Monitor	0-RE-90-132 (Iodine channel deleted)
Shield Building Vent Wide Range Gas Monitor Sample Detection Skid	1,2-RE-90-400
Shield Building Vent Wide Range Gas Monitor Sample Conditioning Skid	1,2-RE-90-402
Condenser Vacuum Pump Exhaust Monitors: Normal Range Noble Gas	1-RE-90-119
Accident (Mid- and High-Range) Noble Gas	1-RE-90-404

A. General Requirements

PIG monitors shall withdraw, by means of a pump, a representative gaseous sample with entrained particulates from a source fluid volume. Samples taken from a remote volume, duct, pipe or stack shall be transported to the detector skid assembly via a sample line. For particulate monitoring or collection only, if the source fluid is flowing in a duct, pipe or stack, then measures shall be taken either to ensure the sample is taken under isokinetic conditions, or that the effects of non-isokinetic sampling are analyzed and properly accounted for. The sample that is provided to the monitor particulate filter may be a subsample (see Section 3.6.1) of that taken from the process or effluent source fluid. Other gas sample lines do not require isokinetic conditions.

Various flow path arrangements are acceptable. For channels in series, the sample should sequentially pass through a particulate filter for particle collection, a charcoal adsorption medium for iodine (a radiohalogen) vapor removal and finally through a gas chamber. Alternatively, a system in which the particulate filter and the gas chamber (in series) are installed in parallel with the charcoal absorber (radiohalogen) is acceptable. It is also acceptable for gas monitoring and for particulate and radiohalogen (iodine) collection to have a completely separate sample points and flow paths from the same source fluid. The radiohalogen adsorption medium flow path should be provided with particulate filtering prior to the sample flow passing through the adsorption medium. If the design includes real-time detection of particulates, a moving filter with either automatic step advance or continuous advance should be provided. Filters for collection of particulates for subsequent laboratory analysis should use a fixed filter design.

3.1.1 Off-Line Particulate, Iodine and Noble Gas Monitors (continued)

The channels with real-time monitoring capabilities shall have sufficient range to measure the anticipated quantity or concentration of radioactivity in the sample considering the ambient background radiation conditions at the detector's location. The real-time radiation detectors shall be shielded from background radiation to attain the required minimum detectable activity level during background radiation conditions. It should be assumed that the background radiation level is from a high energy gamma emitting source such as Cobalt 60 or Cesium 137. Where multiple detectors are required to cover the anticipated range, the range of the detectors shall overlap. Overlap should be at least one decade. The monitor's minimum detectable activity level shall be less than or equal to the lower end of the required radioactivity concentration range identified in Table 9.0-2.

A normal range monitors' design shall ensure retaining a full-scale reading for a radiation field of up to two decades above the full-scale radiation field.

Those monitors which include real-time detection shall include the appropriate circuitry to produce audible and visible alarms in the control room and at additional locations as prescribed in the individual monitor's description section when the radiation level exceeds high alarm set points (see Table 9.0-4) or there is a system malfunction (as a minimum, a malfunction alarm condition shall be initiated for loss of detector signal, power or flow). Each type of alarm condition i.e., high radiation or system malfunction shall be readily identifiable on the appropriate radiation monitor panel.

Channels which include real-time detection shall have devices to display measured cpm values for each channel in the control room and allow for retrieval of historical data. Accomplishing these functions by the use of computer terminals or numerical displays common to more than one channel is acceptable as long as the display credited with satisfying the required functions meets the same safety classification requirements as the channel. Care must be exercised to provide proper isolation or analysis performed to demonstrate no impact where primary safety related components of the loop are interfaced with non-essential components of the loop (see Section 3.5). Selected monitors shall transmit measured cpm data to the Plant Computer System for display in the Technical Support Center (TSC) in accordance with Section 2.9 of NUREG-0696 (Reference 8.1.13).

Process monitors which include real-time detection shall have provisions to allow for periodic on-line testing of the channel's response by actuation of an installed check source of sufficient intensity to provide an upscale reading of the ratemeter when the detector is subjected to normally expected background radiation levels. The check source may be radioactive, a photon source such as an LED, or other similar device appropriate for the type of detector. The check source should verify, to the extent possible, operability of the entire channel from the point that radiation is incident on the detector to the output device. The check source may be remotely activated from the control room or locally. Radioactive check sources should be shielded from the detector while in the stored position to preclude misleading radiation contributions while sample measurements are made.

3.1.1 Off-Line Particulate, Iodine and Noble Gas Monitors (continued)

The monitors shall have the capability to either measure or monitor the flow rate of the sample. If necessary to provide more accurate measurements, the sample pressure and/or temperature should also be measured to allow corrections to be made to sample flow rates and noble gas channel cpm or activity measurements. This satisfies the recommendations in IE Information Notice 82-49 (Reference 8.1.16).

The monitors' sampling system shall provide means by which grab samples may be withdrawn for laboratory analysis. Where multiple monitors are used to monitor a single process or source fluid, grab sample capability is not required on every monitor. The sample line shall include inlet and outlet flow taps from which grab samples may be taken. The grab sample inlet and outlet flow taps should be isolated from the normal sampling flow path. The taps should be located to best utilize the components of the installed system, e.g., sample pump, flow meter. Where subsampling is utilized, the grab sample may be taken from either the sample extracted from the source fluid or from the subsample.

Acceptable methods of detection of particulates, iodines and gases are described in this paragraph. For the normal range channels, beta radiation detection shall be used for gross real-time analysis of the radioactivity in the gas collection chamber. A beta radiation detector should be provided for particulate radioactivity. A gamma scintillation detector may be provided for determination of the iodine-131 radioactivity, by utilizing both lower and upper energy discriminators for observing the I-131 energy peak.

For accident conditions, energy compensated GM tubes or Cd-Te detectors may be provided for mid-range and high-range noble gas detection.

The sampling system shall have provisions for purging the gas sample chamber for the purposes of determining background count rate without damaging the particulate and iodine collection media (when applicable). Care should be taken in the design to preclude potential damage to sample line instrumentation from the purging operation.

B. Auxiliary Building Vent Monitor (0-RE-90-101)

The Auxiliary Building Vent Monitor is an effluent monitor which shall continuously monitor the Auxiliary Building effluent discharge to the environment and perform real-time detection of the noble gas radioactivity as required by 10 CFR 50, Appendix A, GDC 60 and 64 (Reference 8.1.1), 10 CFR 50, Appendix I (Reference 8.1.2), and meet the intent of the guidance of RG 1.21 (Reference 8.1.7) and RG 1.97 (Reference 8.1.11) [Source Note 8].

The particulate and iodine real-time monitoring shall be used to support the requirements of 10 CFR 20 Section 20.1101(b) (Reference 8.1.2) and 10 CFR 50 Appendix A, GDC 19 (Reference 8.1.1). These channels shall monitor the normal Auxiliary Building Exhaust path and should detect airborne radioactivity from particulates and iodine in excess of 10 DAC/hr from any area of the Auxiliary Building which normally may be occupied by personnel, taking into account dilution in the ventilation system (see Reference 8.5.23).

3.1.1 Off-Line Particulate, Iodine and Noble Gas Monitors (continued)

The monitor should provide a means for collection of iodines and particulates for on-site analysis.

The monitor shall provide isokinetic sampling of the vent at normal vent flow rates (160,000-229,000 CFM). It shall include sample line flow rate measurements and flow controls necessary to allow manual or automatic adjustments to maintain isokinetic sampling conditions or an analysis shall be performed to justify flow adjustments are not necessary to obtain a representative sample.

The measured volumetric flow rate of the source fluid in the Auxiliary Building vent ductwork should be provided to the TSC and plant computer data logger. Real time activity should be provided to the plant computer data logger.

A tritium sampler shall be installed to assure accurate monitoring of the Auxiliary Building stack. This sampler shall utilize a pump and integrator to ensure accurate data is utilized to determine the quantity of tritium exiting the Auxiliary Building Stack. This is per TVA commitment in Section 2.11.4 (Gaseous Waste Management Systems Evaluation) of Reference 8.6.1.

C. Containment Upper (1-RE-90-112 and Lower (1-RE-90-106) Compartment Monitors

These monitors shall detect and measure the airborne radioactivity concentration in the Containment Building upper and lower compartments and perform real-time detection of the particulate and noble gas radioactivity in compliance with 10 CFR 50 Appendix A, GDC 30 and 64 (Reference 8.1.1) These monitors are used to satisfy the guidance in RG 1.45 (Reference 8.1.8). The upper containment monitor 1-RE-90-112 should also perform real-time detection of radioiodine.

The monitors shall have the capability to take a sample from either or both of two separate locations in containment in order to provide assistance in locating the general area of abnormal leakage.

The upper compartment monitor shall have the backup capability to monitor the radioactivity in the containment lower compartment atmosphere and the lower compartment monitor shall have the backup capability to monitor the radioactivity in the containment upper compartment atmosphere.

The monitors shall be capable of continued operation after loss of off-site power. This satisfies the guidance in Section 12.3-12.4 of NUREG-0800 (Reference 8.1.15).

The monitors shall provide for local display of measured noble gas channel cpm values and local audible and visible alarms for high radioactivity from the noble gas channel which meets the intent of the guidance in Section 2.7 of RG 8.8 (Reference 8.1.6). Local alarms for the Containment Lower and Upper Compartment Monitors should be in proximity to the Containment Lower and Upper Containment access hatch, respectively. This meets the intent of the guidance in Section 2.7 of RG 8.8 (Reference 8.1.6).

3.1.1 Off-Line Particulate, Iodine and Noble Gas Monitors (continued)

The Containment Upper and Lower Compartment Airborne Monitors do not perform a primary safety function but do perform a secondary safety function and they shall be qualified to Seismic Category I. The monitors are being maintained as a 1E, Seismic Category I component (as noted in the Q-List) in order to meet the guidance in RG 1.45 (Reference 8.1.8) which states that the gaseous and particulate radiation monitoring channels should remain functional for a SSE (See Table 9.0-1). Real-time activity levels for particulate, iodine and gas channels should be provided to the Plant Computer System for display in the TSC.

D. Service Building Vent Monitor (0-RE-90-132)

The Service Building Vent Monitor shall continuously monitor the radioactivity release from the Service Building vent and perform real-time detection of noble gas radioactivity as required in 10 CFR 50 Appendix A GDC 64 (Reference 8.1.1), 10 CFR 50 Appendix I (Reference 8.1.2), and meet the intent of the guidance in Appendix A of RG 1.21 (Reference 8.1.7) [Source Note 8].

The monitor shall provide a means for collection of iodines and particulates. Real-time iodine and particulate channels may be provided, but are not required.

The monitor shall provide sampling of the vent at a sample flow rate not greater than that necessary for isokinetic sampling at the maximum normal vent flow rate. Isokinetic sampling over the range of normal flow rates is not required since the Service Building vent is not a principle radioactivity discharge path. For non-isokinetic sampling, calculations must be completed (Ref. 8.5.24, 8.5.32) to determine partical loss such that estimates of effluent release can be made based on particulate samples obtained.

The measured volumetric flow rate of the source fluid in the Service Building vent ductwork should be provided to the plant computer data logger. Real-time gaseous activity should be provided to the plant computer data logger.

The only credible path for Tritium into the Service Building is through the Chem. Lab (from samples). The potential amount of Tritium release from this source is negligible, therefore Tritium monitoring of the Service Building exhaust vent is not required.

3.1.1 Off-Line Particulate, Iodine and Noble Gas Monitors (continued)

E. Shield Building Vent Wide Range Radiation Monitor (1,2-RE-90-400 & -402)

The monitors' Sample Detection Skid shall perform real-time detection of gaseous radioactivity in the Shield Building effluent discharge to the environment during normal operation and subsequent to a design basis accident. This conforms to the requirements in 10 CFR 50 Appendix A, GDC 64 (Reference 8.1.1) and the guidance in Appendix A of RG 1.21 (Reference 8.1.7) and RG 1.97 (Reference 8.1.11) [Source Note 8]. If multiple detectors are required to cover the full range, channels whose ranges overlap shall be used. This complies with the requirements of Section II.F.1 of NUREG-0737 (Reference 8.1.14). The flow paths to the low range radiation detectors shall be automatically isolated whenever the counting rate exceeds their range. Local audible and visible alarms for activity levels which exceed the radiation alarm setpoint and a local visible alarm for channel malfunction should be provided. The capability for real-time background radiation measurements for automatic or manual background subtraction from noble gas channel measurements should be provided.

The monitors' Sample Conditioning Skid shall collect particulates and iodine in the Shield Building effluent discharge to the environment during normal operation and subsequent to a design basis accident. This conforms to the requirements in 10 CFR 50, Appendix A, GDC 64 (Reference 8.1.1) and RG 1.97 (Reference 8.1.11). The monitor sampling system design and location shall allow plant personnel to remove samples, replace sampling media, and transport the sample to the on-site analysis facility without exceeding the dose of 5 rem whole body or 75 rem to the extremities as described in Section II.F.1 of NUREG-0737 (Reference 8.1.14).

The monitors shall have automatic isokinetic sampling capabilities for Shield Building exhaust flows from 7,200 to 14,000 cubic feet per minute (cfm). This meets the requirements of RG 1.97 (Reference 8.1.11). The automatic control requirements apply from sample intake from the shield building vent to the particulate collector. The flow elements are Category 2 components located in a harsh environment and shall be qualified in accordance with the requirements of WB-DC-30-7 and WB-DC-40-54 (References 8.3.5 and 8.3.9, respectively).

The vent flow rate and noble gas activity level shall be transmitted to the Plant Computer System for display in the TSC.

A tritium sampler shall be installed to assure accurate monitoring of the Shield Building stack. This sampler shall utilize a pump and integrator to ensure accurate data is utilized to determine the quantity of tritium exiting the Shield Building Stack. This is per TVA commitment in Section 2.11.4 (Gaseous Waste Management Systems Evaluation) of Reference 8.6.1.

3.1.1 Off-Line Particulate, Iodine and Noble Gas Monitors (continued)

F. Condenser Vacuum Pump Exhaust Normal Range Noble Gas Monitor (1-RE-90-119)

The Condenser Vacuum Pump Exhaust Normal Range Monitor is an effluent monitor consisting of a low range noble gas channel which shall continuously (except as noted below) make real-time measurements of the condenser vacuum pump exhaust discharge to the environment during normal operations (except as noted below) as required in 10 CFR 50 Appendix A, GDC 64 (Reference 8.1.1), 10 CFR 50 Appendix I (Reference 8.1.2), and meet the intent of the guidance in Appendix A of RG 1.21 (Reference 8.1.7) and RG 1.45 (Reference 8.1.8) [Source Note 8]. Subsequent to a design basis accident, the noble gas monitors shall monitor the low range of radioactivity in the Condenser Vacuum Pump Exhaust effluent discharge to the environment as required in 10 CFR 50 Appendix A, GDC 64 (Reference 8.1.1) and WB-DC-30-7 (Reference 8.3.5). Upon increased noble gas activity, a portable sampler could be put in place to provide means to quantify any particulate or iodine effluent. If there is a steam generator tube rupture, alternate means, such as recent primary and secondary system lab analysis, can be used to conservatively estimate particulate and iodine releases through the Condenser Vacuum Exhaust.

Prior to achieving a vacuum in the Main Condenser (6.5 inches Hg absolute), the high condenser vacuum exhaust (CVE) flow drives water into the CVE Radiation Monitors. Since the CVE Radiation Monitors contain components sensitive to water (i.e., carbon pump vanes), the monitors cannot be operated until a vacuum is achieved in the condenser. As a compensatory measure to identify and assess steam generator tube leaks, Steam Generator Blowdown Monitor 1-RE-90-120 or 1-RE-90-121 shall be used. If these monitors indicate a steam generator tube leak, the radioactive effluent through the condenser vacuum exhaust shall be assessed under the provisions of the Offsite Dose Calculation Manual (ODCM). In addition, if the normal range CVE radiation monitor is not operable prior to and after a vacuum is established in the main condenser, the radioactive effluent through the condenser vacuum exhaust shall also be assessed under the provisions of the ODCM.

In the unlikely event of a steam generator tube rupture during the time the CVE Monitors are not operating, the tube rupture will be identified by the Main Steam Radiation Monitors 1-RE-90-421, 422, 423 & 424, and radioactive effluents through the CVE shall be determined by sampling per the requirements of EPIP-13. In addition, the steam activity, as determined by the Main Steam Radiation Monitors may be used in conjunction with the quantity of steam entering the condenser to determine the amount of radioactivity released through the condenser vacuum exhaust.

When the Condenser Vacuum system is still in service after a turbine trip, condenser in-leakage increases, initiating a spurious low flow alarm in the CVE radiation monitor, 1-RE-90-119. Manual valves at the radiation monitor can be adjusted to reset the flow switch and enable the monitor to detect a low flow condition. Upon return to full power, the valves are again adjusted to reset the flow switch for the normal flow condition.

The applicable Operations procedures shall be revised to reflect the above operational requirements, which are a result of the corrective actions for PER 01-017357-000.

The measured noble gas activity level shall be transmitted to the Plant Computer System for display in the TSC.

3.1.1 Off-Line Particulate, Iodine and Noble Gas Monitors (continued)

G. Condenser Vacuum Pump Exhaust Accident Range Noble Gas Monitor (1-RE-90-404)

The Condenser Vacuum Pump Exhaust Accident Range Noble Gas Monitor is a dual-channel effluent monitor with mid- and high-range radiation detection capability which shall continuously (except as noted below) make real-time measurements of the activity of the noble gases in the condenser vacuum pump exhaust subsequent to a design basis accident. This conforms to the requirements in 10 CFR 50, Appendix A, GDC 64 (Reference 8.1.1) and WB-DC-30-7 (Reference 8.3.5). Since two channels are required to cover the full range, channels whose ranges overlap shall be used. This complies with the requirements of Section II.F.1 of NUREG-0737 (Reference 8.1.14) [Source Note 8]. This monitor is intended to measure radioactivity in the condenser vacuum pump exhaust effluent after an accident and therefore, has no function during normal operation.

Prior to achieving a vacuum in the Main Condenser (6.5 inches Hg absolute), the high condenser vacuum exhaust (CVE) flow drives water into the CVE Radiation Monitors. Since the CVE Radiation Monitors contain components sensitive to water (i.e., carbon pump vanes), the monitors cannot be operated until a vacuum is achieved in the condenser.

In the unlikely event of a steam generator tube rupture during the time the CVE Monitor is not operating, the tube rupture will be identified by the Main Steam Radiation Monitors 1-RE-90-421,422,423 & 424, and radioactive effluents through the CVE shall be determined by sampling per the requirements of EPIP-13. In addition, the steam activity, as determined by the Main Steam Radiation Monitors may be used in conjunction with the quantity of steam entering the condenser to determine the amount of radioactivity released through the condenser vacuum exhaust.

The applicable Operations procedures shall be revised to reflect the above operational requirements, which are a result of the corrective actions for PER 01-017357-000.

The measured noble gas activity level shall be transmitted to the Plant Computer System for display in the TSC.

When TPBARs (Tritium Producing Burnable Absorber Rods) are present in the reactor core, and a steam generator tube leak is detected, the condensor vacuum pump exhaust will be monitored for Tritium.

3.1.2 Off-Line Gas Monitors

The design of these monitors shall include an off-line sampling channel to provide real-time detection of noble gas radioactivity:

Main Control Room Normal Air Intake Monitors O-RE-90-125 & -126
Main Control Room Emergency Air Intake Monitors O-RE-90-205 & -206
Containment Purge Air Exhaust Monitors 1-RE-90-130 & -131

3.1.2 Off-Line Gas Monitors (continued)

A. General Requirements

The gas monitors shall withdraw, by means of a vacuum pump, a gaseous sample from a source fluid volume. Samples taken from a duct, pipe or stack shall be transported to the RMS skid assembly via a sample line.

The channels with real-time monitoring capabilities shall have sufficient range to measure the anticipated quantity of radioactivity in the sample considering the ambient background radiation conditions at the detector's location. The sensing elements shall be shielded from background radiation to attain the required minimum detectable activity level during background radiation conditions. It should be assumed that the background radiation level is from a high energy gamma emitting source such as Cobalt 60 or Cesium 137. Where multiple detectors are required to cover the anticipated range, the range of the detectors shall overlap. Overlap should be at least one decade. The monitor's minimum detectable activity level shall be less than or equal to the lower end of the required radioactivity concentration range identified in Table 9.0-2.

The normal range monitors' design shall ensure retaining a full-scale reading for a radiation field of up to two decades above the full-scale radiation field.

Those monitors which include real-time detection shall include the appropriate circuitry to produce audible and visible alarms in the control room and at additional locations as prescribed in the individual monitor's description section when the radiation level exceeds high alarm set points (see Table 9.0-4) or there is a system malfunction (as a minimum, a malfunction alarm condition shall be initiated for loss of detector signal, power or flow). Each type of alarm conditions i.e., high radiation or system malfunction shall be readily identifiable on the appropriate radiation monitor panel.

Those monitors which include real-time detection shall have devices to display measured cpm values for each channel in the control room and allow for retrieval of historical data, except for the containment purge air exhaust monitoring channels which have local display and no provisions for retrieval of historical data. Accomplishing these functions by the use of computer terminals or numerical displays common to more than one channel is acceptable as long as the output device credited with satisfying the required functions has the same safety classification as the channel. Care shall be exercised to provide proper isolation or analysis performed to demonstrate no impact where primary safety related components of the loop are interfaced with non-essential components of the loop (see Section 3.5). Selected monitors shall transmit measured cpm data to the Plant Computer System for display in the Technical Support Center (TSC) in accordance with Section 2.9 of NUREG-0696 (Reference 8.1.13).

3.1.2 Off-Line Gas Monitors (continued)

Process monitors shall have provisions to allow for periodic on-line testing of the channel's response by actuation of an installed check source of sufficient intensity to provide an upscale reading of the ratemeter when the detector is subjected to normally expected background radiation levels. The check source may be radioactive, a photon source such as an LED, or other similar device appropriate for the type of detector. The check source should verify, to the extent possible, operability of the entire channel from the point that radiation is incident on the detector to the output device. The check source may be remotely activated from the control room or locally. Radioactive check sources should be shielded from the detector while in the stored position to preclude misleading radiation contributions while sample measurements are made. The monitor should be provided with appropriate circuitry to avoid control actuation during check source operation.

The monitors shall have the capability to either measure or monitor the flow rate of the sample. If necessary to provide more accurate measurements, the sample pressure and/or temperature should also be measured to allow corrections to be made to the gas channel cpm or activity measurements. This satisfies the recommendations in IE Information Notice 82-49 (Reference 8.1.16).

The monitors' sampling system shall provide means by which grab samples may be withdrawn for laboratory analysis. The sample line shall include inlet and outlet flow taps from which grab samples may be taken. The grab sample inlet and outlet taps should be isolated from the normal sampling flow path. The taps should be located to best utilize the components of the installed system, e.g., sample pump, flow meter.

For normal range channels, beta radiation detection shall be provided for gross real-time analysis of the radioactivity in the gas collection chamber.

The sampling system shall have provisions for purging the sample chamber for the purposes of determining background count rate. The design should provide for local actuation of the purge system. The clean air used for purging normal range channels may be filtered ambient air.

B. Main Control Room Normal Air Intake Monitors (0-RE-90-125 & -126)

Two redundant, safety-related monitors that perform a primary safety function shall be provided. Their actions permit occupancy of the Control Room during design basis events without personnel exceeding the exposure limits described in 10 CFR 50 Appendix A, GDC 19 (Reference 8.1.1) and Section II.B.2 of NUREG 0737 (Reference 8.1.14). The monitors shall perform real-time detection of the radioactivity in the inlet air to meet the intent of the guidance in Section 2.4 of RG 8.8 (Reference 8.1.6) [Source Note 3].

Upon receipt of a high radiation alarm signal from either of the noble gas monitors, the monitor shall automatically generate a Control Room Isolation Signal which in turn will interface with the Control Room HVAC and Air Cleanup System to a) reduce the intake air flow and divert it through HEPA and charcoal filters, b) pressurize the Control Room, and c) clean up the air recirculated to the Control Room. The specific control actions initiated by these monitors are described in system description No. N3-30CB-4002 (Reference 8.4.2).

3.1.2 Off-Line Gas Monitors (continued)

The measured noble gas activity level shall be transmitted to the Plant Computer System for display in the TSC.

C. Main Control Room Emergency Air Intake Monitor (0-RE-90-205,-206)

Two redundant, safety-related monitors that perform a primary safety function shall be provided. The safety function will limit the exposure of personnel in the Control Room to satisfy the dose limit requirements defined in 10 CFR 50, Appendix A, GDC 19 (Reference 8.1.1).

The monitors shall not perform an automatic function. Upon manual actuation by the control room operator, these channels shall continuously monitor the radioactivity in the ventilation air flow entering the control room habitability zone through the emergency air intake [Source Note 3].

Upon a high alarm, the operator may make an appraisal of the existing conditions for possible manual action to switch control room air intake location. The safety classification of the monitor is described in Table 9.0-1.

The measured noble gas activity level shall be transmitted to the Plant Computer System for display in the TSC.

D. Containment Purge Air Exhaust Monitors (1-RE-90-130 & -131)

These are gaseous effluent monitors which shall continuously monitor the radioactivity in the exhaust air from the containment atmosphere as required in 10 CFR 50, Appendix A, GDC 60 and 64 (Reference 8.1.1) and meet the intent of the guidance in Section C.2 of RG 1.21, (Reference 8.1.7) [Source Note 8]. The monitors shall incorporate provisions to display measured data locally. Two redundant, safety-related monitors that perform primary safety functions shall be provided. The primary safety function is the mitigation of the off-site dose consequences for the small loss of coolant accident.

A high radiation alarm signal from either noble gas monitor shall automatically generate a Containment Ventilation Isolation Signal which in turn will interface with the Reactor Building Ventilation System to isolate the containment purge. During movement of irradiated fuel inside containment when the containment and/or the annulus is open to the Auxiliary Building Secondary Containment Enclosure (ABSCE) spaces, the noble gas monitors shall generate that portion of an ABI signal normally initiated by the spent fuel pool accident radiation monitors. This requirement is to ensure radioactive material released from a fuel handling accident in containment will be filtered by the Auxiliary Building Gas Treatment System (ABGTS) if such releases migrate into the Auxiliary Building. The specific control actions initiated by either of these monitors are described in system description No.N3-30RB-4002 (Reference 8.4.3). The automatic control function of these monitors' is a primary safety function, since it mitigates the potential release of radioactive material to the environment following a postulated design basis event which satisfies the requirements described in 10 CFR 100 (Reference 8.1.4).

The measured noble gas activity level shall be transmitted to the Plant Computer System for display in the TSC.

3.1.3 Continuous Air Monitors (Airborne Particulate Monitors)

The following continuous air (particulate) monitors shall be provided for plant areas where airborne particulate radioactivity may potentially exist and where normal occupancy is required either on a continuous basis or on an infrequent but routine basis:

* Spent Fuel Pool Monitor
* Shipping Bay Monitor
* Holdup Valve Gallery Monitor
* SI Pump Area Monitor
* Main Control Room Monitor
* Waste Packaging Room Monitor
* Sample Rooms Monitors

* Monitoring of the above listed plant areas are accomplished using portable continuous air monitors supplied and administered by Site Radcon. The requirements of this Design Criteria do not apply to these monitors.

3.1.4 Off-Line Liquid Monitors

The monitors that come under this category are:

Steam Generator Blowdown Liquid Monitor	1-RE-90-120 & -121
Waste Disposal System Liquid Monitor	0-RE-90-122
Component Cooling System Monitor	0,1,2-RE-90-123
Condensate Demineralizer Regenerant Waste Discharge Monitor	0-RE-90-225
Essential Raw Cooling Water Effluent Monitors	0-RE-90-134,-140 & -141

These monitors provide real-time monitoring of the gross gamma radioactivity in liquid samples. Selected off-line liquid monitor channels shall initiate an automatic control function to terminate releases either to the unrestricted area or to the plant environs as described in the following subsections.

A. General Requirements

The monitors shall have pumps or the process connection points shall provide sufficient differential pressure to ensure that an adequate flow rate from the process streams can be predictably delivered to the sample chamber.

The monitors shall have detectors with sufficient range to measure the anticipated quantity of radioactivity in the sample considering the ambient background radiation conditions at the detectors' location. The sensing elements shall be shielded from background radiation to attain the required minimum detectable level during background radiation conditions. Where multiple detectors are required to cover the anticipated range, the range of the detectors shall overlap. Overlap should be at least one decade. The detectors shall be able to detect a minimum activity level equal to or less than the lower end of the radioactivity concentration range identified in Table 9.0-2.

3.1.4 Off-Line Liquid Monitors (continued)

The normal range monitors' design shall ensure retaining a full-scale reading for a radiation field of up to two decades above the full-scale radiation field.

The monitor channels which include real-time detection shall include the appropriate circuitry to produce audible and visible alarms in the control room and at additional locations as prescribed in the individual monitor's description section when the radiation level measured by a detector exceeds high alarm set points (see Table 9.0-4) or there is a system malfunction (as a minimum, a malfunction alarm condition shall be initiated for loss of detector signal, power or flow). Each of the alarm conditions, i.e., high radiation or system malfunction shall be readily identifiable on the appropriate radiation monitor panel. To the extent described in the individual monitor sections, the monitors shall have (1) devices to display measured cpm values for each channel in the control room or locally and allow for retrieval of historical data and (2) transmit measured cpm data to the Plant Computer System for display in the Technical Support Center (TSC) in accordance with Section 2.9 of NUREG-0696 (Reference 8.1.13).

Process monitors shall have provisions to allow for periodic on-line testing of the channel's response by actuation of an installed check source of sufficient intensity to provide an upscale reading of the ratemeter when the detector is subjected to normally expected background radiation levels. The check source may be radioactive, a photon source such as an LED, or other similar device appropriate for the type of detector. The check source should verify, to the extent possible, operability of the entire channel from the point that radiation is incident on the detector to the output device. The check source may be remotely activated from the control room or locally.

Radioactive check sources should be shielded from the detector while in the stored position to preclude misleading radiation contributions while sample measurements are made. The monitor should be provided with appropriate circuitry to avoid control actuation during check source operation.

The monitors shall have the capability to either measure or monitor the flow rate of the sample and the means to initiate alarms for low flow conditions. Minimum flow requirements for 1-RE-90-120, -121, 0-RE-90-122, -225 are specified in Reference 8.5.33. A low flow alarm in the main control room is not required for monitors on batch release paths.

The monitors' sampling system shall provide means by which grab samples may be withdrawn for laboratory analysis. Where multiple monitors are used to monitor a process, grab sample capability is not required on every monitor. The sample lines shall include flow taps from which grab samples may be taken and are normally isolated from the sampling flow path. The flush valves may be used to obtain a grab sample. The taps should be located to best utilize the components of the installed system, e.g., sample pump, flow meter.

The sampling system should have provisions to allow flushing of the sample chamber with clean water or decontamination solution for purposes of background determination or removal of surface contamination. The design may provide for local or remote actuation of the purge system. The design should preclude potential damage to sample line instrumentation from the flushing operation.

3.1.4 Off-Line Liquid Monitors (continued)

B. Steam Generator Blowdown Liquid Monitor (1-RE-90-120 & -121)

This monitor is a liquid effluent monitor which shall continuously make real-time measurements of the gross gamma radioactivity in the blowdown liquid from the steam generators to the cooling tower blowdown and shall be capable of detecting the radioactivity resulting from primary to secondary side leakage in compliance with 10 CFR 50 Appendix A, GDC 30, 60 and 64, (Reference 8.1.1); 10 CFR 50, Appendix I (Reference 8.1.2), RG 1.21 (Reference 8.1.7) and RG 1.45 (Reference 8.1.8).

During periods when there is no indication of a primary to secondary leak, these liquid effluent monitors have an additional function to isolate the Steam Generator Blowdown when activity is > 5 E-7 μCi/cc (Ref. 8.5.9).

The monitor shall have two channels of detection capability. Each channel shall have the capability to monitor samples taken either downstream of the steam generator blowdown heat exchangers or from the discharge line of the steam generator blowdown flash tank.

Upon receipt of a high radiation alarm signal from either channel (1-RE-90-120 or 1-RE-90-121) the monitor shall generate a signal to terminate steam generator blowdown flow directly to the cooling tower blowdown line and divert the flow through the Condensate Demineralizer System [Source Note 2]. The specific control actions initiated by this monitor are described in system description No. N3-15-4002 (Reference 8.4.4). The automatic control function of this monitor is not a primary safety function since it is not required for the mitigation of any design basis events. The purpose of the automatic isolation of the effluent release path to the environment during normal operations is to prevent radioactivity release in excess of limits prescribed in Table 2 of 10 CFR 20, Appendix B (Reference 8.1.3) as determined by ODCM methodology.

The monitor shall provide measured cpm data and historical data to the main control room and shall transmit the data to the Plant Computer System for display in the TSC.

C. Waste Disposal System Liquid Monitor (0-RE-90-122)

This monitor is a single channel liquid effluent monitor which shall continuously make real-time measurements of the gross gamma radioactivity in the liquid waste disposal effluent discharge to the cooling tower blowdown in compliance with 10 CFR 50 Appendix A, GDC 60 and 64 (Reference 8.1.1), 10 CFR 50, Appendix I (Reference 8.1.2). This satisfies the guidance of RG 1.21 (Reference 8.1.7). This monitor is on a batch release path.

3.1.4 Off-Line Liquid Monitors (continued)

Upon receipt of a high radiation alarm signal or a malfunction alarm signal from the monitor channel, the monitor shall generate a signal to terminate flow to the cooling tower blowdown [Source Note 2]. Valve 0-RCV-77-43 performs the isolation function and is credited with a 5 second stroke time in the required response time and demonstrated accuracy calculations (References 8.5.10 and 8.5.35). The specific control actions initiated by the monitor are described in system description No. N3-77C-4001 (Reference 8.4.5). The automatic control function of this monitor is not a primary safety function since its action is not required for the mitigation of any design basis event. The purpose of the automatic isolation of the effluent release path to the environment during normal operations is to prevent radioactivity release in excess of limits prescribed in Table 2 of 10 CFR 20, Appendix B (Reference 8.1.3) as determined by ODCM methodology.

The monitor shall provide measured cpm data and historical data to the main control room and shall transmit the data to the Plant Computer System for display in the TSC. Additionally, this monitor provides local display and high radiation alarm on panel 0-L-2.

D. Component Cooling System Monitors (0,1,2-RE-90-123)

These monitors are single channel liquid process monitors which shall continuously perform real-time measurements of the gross gamma radioactivity in the Component Cooling System water. This conforms to the requirements in 10 CFR 50 Appendix A, GDC 30 (Reference 8.1.1) and satisfies the guidance in RG 1.45 (Reference 8.1.8).

Any of the three component cooling system monitors shall generate, upon receipt of a high radiation alarm, a signal to isolate the component cooling surge tank vent for both Unit 1 and Unit 2. The specific control actions initiated by this monitor are described in system description No. N3-70-4002 (Reference 8.4.6). The automatic control function of these monitors is not a primary safety function since its action is not required to mitigate any design basis event. These monitors assist other methods of RCS intersystem leak detection recommended by R.G. 1.45 (Reference 8.1.8).

The monitor shall provide measured cpm data and historical data to the main control room.

E. Condensate Demineralizer Regenerant Waste Discharge Monitor (0-RE-90-225)

This monitor is a single channel liquid effluent monitor which shall continuously perform real-time measurements of the gross gamma radioactivity in the fluids coming from condensate demineralizer regeneration process (waste fluid from the Nonreclaimable Waste Tank, fluids from the Neutralization Tank and the discharge fluid from the High Crud Filter) for discharge to the environment via the cooling tower blowdown in compliance with 10 CFR 50, Appendix A, GDC 60 and 64 (Reference 8.1.1), 10 CFR 50 Appendix I, (Reference 8.1.2) and meet the intent of the guidance of RG 1.21 (Reference 8.1.7).

3.1.4 Off-Line Liquid Monitors (continued)

Upon receipt of a high radiation alarm signal, the monitor shall generate a signal to terminate flow to the cooling tower blowdown (Condenser Circulating Water System) and the Turbine Building Sump [Source Note 2]. Valve 0-FCV-14-451 performs the isolation function and is credited with a 5 second stroke time in the required response time and demonstrated accuracy calculations (References 8.5.17 and 8.5.35). The specific control actions initiated by the monitor are described in system description No. N3-14-4002 (Reference 8.4.7). The automatic control function of this monitor is not a primary safety function since its action is not required to mitigate any design basis event. The purpose of the automatic isolation of the effluent release path to the environment during normal operations is to prevent radioactivity release in excess of limits prescribed in Table 2 of 10 CFR 20, Appendix B (Reference 8.1.3) as determined by ODCM methodology.

The monitor shall provide measured cpm data and historical data to the main control room and shall transmit the data to the Plant Computer System for display in the TSC.

F. DELETED

G. Essential Raw Cooling Water Effluent Monitors (0-RE-90-133,-134, -140 & -141)

The Essential Raw Cooling Water (ERCW) Effluent Monitors shall continuously perform real-time measurements of the gross gamma radioactivity in the ERCW discharge to the cooling tower basins or to the yard holding pond during normal operations and post-accident as required in 10 CFR 50, Appendix A, GDC 64 (Reference 8.1.1) and WB-DC-30-7 (Reference 8.3.5). An ERCW monitor shall be provided for each ERCW effluent line. Each monitor shall have two channels.

The monitors shall be provided to detect leakage from the containment spray heat exchangers post-accident. In the event of a high radiation signal, the operator may initiate isolation of the leaking heat exchanger.

These monitors shall provide measured cpm data and historical data to the main control room and shall transmit the data to the Plant Computer System for display in the TSC.

The monitors do not perform a primary safety function. These monitors are being maintained as 1E Seismic Category I, safety-related components (as noted in the Q-List) which is acceptable since it exceeds the functional requirements of the monitors. However, the sample pumps included in the monitor assemblies are only required to meet Seismic I(L) pressure boundary retention requirements (Also see Table 9.0-1).

3.1.5 Area Radiation Monitors

The following monitors shall continuously monitor ambient radiation levels in the plant buildings to assure that work areas designed for short-term accessibility or normal occupancy have exposure rates which do not exceed the prescribed radiation zone limits, and to provide early warning of abnormal process system operations.

3.1.5 Area Radiation Monitors (continued)

Spent Fuel Pool Area Monitors	1,2-RE-90-001
Personnel Lock Monitor	1-RE-90-002
Waste Packaging Area Monitor	0-RE-90-003
Decontamination Room Monitor	0-RE-90-004
Spent Fuel Pool Pumps Area Monitor	0-RE-90-005
Component Cooling Heat Exchanger Area Monitors	1,2-RE-90-006
Sample Rooms Monitors	1,2-RE-90-007
Auxiliary Feedwater Pump Area Monitors	1,2-RE-90-008
Waste Evaporator Condensate Tank Area Monitor	0-RE-90-009
CVCS Board Area Monitors	1,2-RE-90-010
Containment Spray RHR Pump Area Monitor	0-RE-90-011
RB Upper Compartment Refueling Floor Area Monitor	1-RE-90-059
RB Upper Compartment Area Monitor	1-RE-90-060
RB Lower Compartment Instrument Room Monitor	1-RE-90-061
Main Control Room Monitor	0-RE-90-135
Condensate Demineralizer Area Monitor	0-RE-90-230
Condensate Demineralizer Area Monitor	0-RE-90-231
RB Upper Compartment Post Accident Monitors	1-RE-90-271 & -272
RB Lower Compartment Post Accident Monitors	1-RE-90-273 & -274

A. General Requirements

The monitors shall provide real-time measurement of gross gamma ambient radiation exposure rates in plant areas. These instruments shall be installed in locations which satisfy the guidelines in RG 8.8 (Reference 8.1.6) and ANSI/ANS-HPSSC-6.8.1-1981 (Reference 8.2.3).

The monitors shall have detectors with sufficient range to encompass the minimum and maximum exposure rate expected during normal and anticipated operational occurrences (considering the ambient background radiation conditions at the detectors' location). The monitors should have a minimum of five decades of range as described in ANSI/ANS-HPSSC-6.8.1-1981 (Reference 8.2.3). Certain locations may require a range in excess of five decades. Where multiple detectors are required to cover the anticipated range, the range of the detectors shall overlap. Overlap should be at least one decade. Extended ranges are discussed in the individual monitor sections below.

The normal range monitors' design shall ensure retaining a full-scale reading for a radiation field of up to two decades above the full-scale radiation field.

3.1.5 Area Radiation Monitors (continued)

The monitors shall include the appropriate circuitry to produce audible and visible alarms in the control room when the radiation level measured by a detector exceeds high alarm set points (see Table 9.0-4) or there is a system malfunction (as a minimum, a malfunction alarm condition shall be initiated for loss of detector signal or power). High radiation shall be visibly and audibly alarmed at the local station (except 0-RE-90-135 and 1-RE-90-271, -272, -273 & -274). Each type of alarm conditions i.e., high radiation or system malfunction shall be readily identifiable on the appropriate radiation monitor panel.

The monitors shall have devices to display measured exposure rate of mR/hr or R/hr in the control room and locally (except 0-RE-90-135 and 1-RE-90-271, -272, -273 & -274) and allow for retrieval of historical data.

The monitors shall have provisions to allow for periodic on-line testing of the channel's response by actuation of an installed check source of sufficient intensity to provide an upscale reading of the ratemeter when the detector is subjected to normally expected background radiation levels. The check source may be radioactive, a photon source such as an LED, or other similar device appropriate for the type of detector. The check source should verify, to the extent possible, operability of the entire channel from the point that radiation is incident on the detector to the output device. The check source may be remotely activated from the control room or locally. Radioactive check sources should be shielded from the detector while in the stored position to preclude misleading radiation contributions while sample measurements are made.

Only those monitors having specific requirements in addition to the above general requirements are discussed in the following subsections.

B. Personnel Lock Monitor (1-RE-90-002)

This monitor shall be located to indirectly measure the airborne radioactivity in the primary containment under accident conditions. The monitor shall include devices to transmit measured radiation exposure rate data to the Plant Computer System for display in the Technical Support Center. This satisfies the guidance in Section 2.9 of NUREG-0696 (Reference 8.1.13)

C. Reactor Building Upper Containment & Refueling Floor Area Monitor (1-RE-90-59 & -60)

These monitors shall include devices to transmit measured radiation exposure rate data to the Plant Computer System for display in the Technical Support Center. This satisfies the guidance in Section 2.9 of NUREG-0696 (Reference 8.1.13)

D. Reactor Building Upper and Lower Compartment Post-accident Monitors (1-RE-90-271, -272, -273 & -274)

These redundant area type monitors shall be used to measure the radiation from airborne radioactivity and shall be installed in locations which satisfy the guidelines in RG 1.97 (Reference 8.1.11) and NUREG-0737 (Reference 8.1.14).

3.1.5 Area Radiation Monitors (continued)

These redundant monitors shall continuously monitor the radiation exposure rate in the Reactor Building Upper and Lower Compartments during and after an accident. This conforms to the requirements in WB-DC-30-7 (Reference 8.3.5) [Source Notes 4, 5 & 6]. The measured exposure rates shall be provided in the MCR in accordance with the requirements of reference 8.3.5. Exposure rates shall be transmitted to the Plant Computer System for display in the Technical Support Center. These monitors perform a primary safety function as described in WB-DC-30-7 (Reference 8.3.5).

3.1.6 On/In-Line Monitors

The monitors which shall provide continuous surveillance of the radioactive fluid in the respective system flow paths or volumes are:

Waste Disposal System Gas Effluent Monitor	0-RE-90-118
Spent Fuel Pool Accident Monitors	0-RE-90-102 & -103
Main Steam Line Monitors	1-RE-90-421, -422, -423 & -424
Turbine Building Sump Discharge Monitor	0-RE-90-212

These monitors shall be capable of providing continuous detection and measurement of the gross gamma radioactivity in selected process and effluent lines. Only the Waste Disposal System Gas Effluent Monitor is an in-line monitor; all the others are on-line monitors. On-line monitors may also be called shine monitors.

A. General Requirements

The monitors shall have detectors with sufficient range to measure the anticipated quantity of radioactivity in the sample considering the ambient background radiation conditions at the detectors' location. The sensing elements shall be shielded from background radiation (unless it is known that the background radiation at the point of measurement is not significant when compared to the process measurement of the unshielded sensing element) to attain the required minimum detectable level during background radiation conditions. Where multiple detectors are required to cover the anticipated range, the range of the detectors shall overlap. Overlap should be at least one decade. The detectors shall be able to detect a minimum activity level equal to or less than lower end of the radioactivity concentration range identified in Table 9.0-2. The monitor design for a required detection range should take into account the background radiation level assuming a high energy gamma emitting source such as Cobalt 60 or Cesium 137.

The normal range monitors' design shall ensure retaining a full-scale reading for a radiation field of up to two decades above the full-scale radiation field.

These monitor channels shall include the appropriate circuitry to produce audible and visible alarm annunciation in the control room and/or locally when the radiation level measured by a detector exceeds high alarm set points (see Table 9.0-2) or there is a system malfunction (as a minimum, a malfunction alarm condition shall be initiated for loss of detector signal with exception of 1-RE-90-421, 422, 423, 424, or power). Each type of alarm conditions i.e., high radiation or system malfunction shall be readily identifiable on the appropriate radiation monitor panel.

3.1.6 On/In-Line Monitors (continued)

Those monitor channels which include real-time detection, except as noted in the following subsections, shall have devices to display measured activity levels for each channel locally (as specified in Sections 3.1.6B through 3.1.6D) and in the control room and allow for retrieval of historical data. The monitors shall transmit measured cpm data to the Plant Computer System for display in the Technical Support Center (TSC) in accordance with Section 2.9 of NUREG-0696 (Reference 8.1.13).

The monitors shall have provisions to allow for periodic on-line testing of the channel's response by actuation of an installed check source of sufficient intensity to provide an upscale reading of the ratemeter when the detector is subjected to normally expected background radiation levels. The check source may be radioactive, a photon source such as an LED, or other similar device appropriate for the type of detector. The check source should verify, to the extent possible, operability of the entire channel from the point that radiation is incident on the detector to the output device. The check source may be remotely activated from the control room or locally. Radioactive check sources should be shielded from the detector while in the stored position to preclude misleading radiation contributions while sample measurements are made. The monitor should be provided with appropriate circuitry to avoid control actuation during check source operation.

Shine monitors should incorporate GM detectors or ion chambers for on-line monitoring of radioactive fluids contained in system pipes. For the in-line monitor (O-RE-90-118), beta radiation detection shall be provided for gross real-time analysis of the radioactivity in the gas stream.

With the exception of 0-RE-90-102 & -103, none of these monitors perform a primary safety function.

Some of the monitors perform automatic functions to terminate flow and isolate the flow path of fluid lines transporting fluid with excessive levels of radioactivity. With the exception of 0-RE-90-102 & -103, there are no automatic control actions that are safety related associated with these monitors. Monitor channels that initiate automatic control actions are identified in Table 9.0-3.

B. Waste Disposal System Gas Effluent Monitor (0-RE-90-118)

This monitor shall continuously provide real-time measurements of the noble gas radioactivity of the waste gas releases to the environment. This conforms to the requirements of 10 CFR 50, Appendix A, GDCs 60 and 64 (Reference 8.1.1) and satisfies the guidance in regulatory Guide 1.21 (Reference 8.1.7) [Source Note 8].

The design shall include an in-line, single channel assembly for detection of the gross noble gas radioactivity within the discharge line. The channel shall have recording, alarm, and display instrumentation in the main control room. Local indication and high radiation alarm shall be provided on panel 0-L-2 and measured cpm data shall be transmitted to the plant computer for display in the TSC.

3.1.6 On/In-Line Monitors (continued)

Upon receipt of a high radiation signal or an instrument malfunction signal, this monitor shall initiate the isolation of the gaseous waste disposal system vent to atmosphere via the Shield Building Vent. Valve 0-FCV-77-119 performs the isolation function and is credited with a 4.5 second stroke time in the required response time and demonstrated accuracy calculations (References 8.5.21 and 8.5.36). The specific control actions initiated by the monitor are described in the Gaseous Waste Disposal System description No. N3-77A-4001 (Reference 8.4.8). The automatic control function performed by this monitor is not required for the mitigation of any design basis event. The purpose of the automatic isolation of the effluent release path to the environment during normal operations is to restrict radioactivity releases and prevent off-site exposures in excess of the limits prescribed in Section 20.1301 of 10 CFR 20 (Reference 8.1.3).

C. Spent Fuel Pool Accident Monitors (0-RE-90-102 & -103)

These redundant monitors shall be installed in proximity to the surface of the water of the spent fuel pool and continuously monitor the radiation exposure rate above the spent fuel pool water surface [Source Note 9], fuel transfer canal, and cask loading area. Refer to system description no. N3-30AB-4001 (Sections 4.27 and 4.28) for special ventilation requirements during movement of irradiated fuel in either the fuel transfer canal or cask loading areas. A high radiation signal from either of the Spent Fuel Pool Accident Monitors shall generate a signal to initiate the isolation of the Auxiliary Building normal ventilation system, to start the Auxiliary Building Gas Treatment Subsystem as defined in System Description document No. N3-30AB-4001 (Reference 8.4.1). Also, during movement of irradiated fuel in the Auxiliary Building during times when the containment and/or the annulus is open to the Auxiliary Building Secondary Containment Enclosure (ABSCE) spaces, a high radiation signal from either of the Spent Fuel Pool Accident Monitors shall generate a Containment Ventilation Isolation (CVI) signal. This requirement is to ensure the ABSCE can be established in the event of a fuel handling accident in the Auxiliary Building when the containment is open to the Auxiliary Building ABSCE spaces and the containment purge system is operating. Local display of activity is not required for these monitors.

These instruments shall transmit measured exposure rate data to the Plant Computer System for display in the TSC. This satisfies the guidance in Section 2.9 of NUREG-0696 (Reference 8.1.13).

These monitors perform a primary safety function as described in WB-DC-40-64 (Reference 8.3.17) and are required to be Seismic Category I and to receive Class 1E power.

D. Main Steam Line Monitors (1-RE-90-421, -422, -423 & -424)

These monitors shall continuously provide real-time measurement of the gross gamma radioactivity of the steam in the Main Steam Lines. This conforms to the requirements in 10 CFR 50, Appendix A, GDC 60 and 64 (Reference 8.1.1) and WB-DC-30-7 (Reference 8.3.5). Each Main Steam Line shall be provided with a single channel to cover the full range of expected radioactivity unless two channels are required to satisfy the required range and accuracy.

3.1.6 On/In-Line Monitors (continued)

These monitors shall provide activity level indication, alarm and historical data to the main control room and measured activity level shall be transmitted to the Plant Computer System for display in the TSC.

E. Turbine Building Sump Discharge Monitor (0-RE-90-212)

The Turbine Building Sump Discharge Monitor is a single channel effluent monitor which shall continuously perform real-time detection of the radioactivity in the Turbine Building sump liquid effluent discharge to the environment as required in 10 CFR 50, Appendix A, GDC 60 and 64 (Reference 8.1.1), 10 CFR 50, Appendix I (Reference 8.1.2), and satisfies with the guidance of RG 1.21 (Reference 8.1.7).

This monitor does not perform an automatic function.

The monitor shall provide measured cpm data locally and shall transmit the data to the Plant Computer System for display in the TSC historical data recording.

3.2 Design Basis Events

The Radiation Monitoring System shall include monitors which, on high radiation alarm, shall generate signals to actuate responses from safety-related systems as described in Section 3.1 of this document, to mitigate potential radioactivity releases and to reduce the dose to control room operators from postulated design basis accidents in accordance with 10 CFR 50, Appendix A, GDC 19 (Reference 8.1.1).

3.3 Environmental Requirements

The Radiation Monitoring System shall be designed to operate in an environment associated with normal conditions, including anticipated operational occurrences.

Design and procurement of radiation monitoring system equipment that perform primary safety functions shall satisfy the ambient conditions described in WB-DC-40-42 (Reference 8.3.8) for the pressure, temperature, and humidity environment. The radiation dose values for normal operating conditions shall be the maximum 40-year integrated dose for the respective location in the plant. Those components located in a harsh environment shall be environmentally qualified for the applicable design basis events in accordance with WB-DC-40-54 (Reference 8.3.9) to the environmental conditions of pressure, temperature, humidity, and radiation dose at the specific monitor location. Radiation monitor channels provided for RG 1.97 (Reference 8.1.11) post-accident monitoring functions shall be designed to meet the requirements of WB-DC-30-7 (Reference 8.3.5).

Non-safety related monitors should be procured to reasonable industry standards. Qualified life determinations are not required. Procurement specifications should include the design environmental requirements.

3.4 External Events

Radiation monitor channels that perform a primary safety function as identified in Table 9.0-4 and defined in this document shall be designed to withstand or be protected from the phenomena described in Sections 3.4.1 through 3.4.4 for design basis accident conditions without loss of capability to perform their design function.

3.4.1 Loss of Off-site Power

Radiation monitors which perform a primary safety function shall be designed to remain functional following a loss of off-site power, shall be powered from redundant on-site electrical power systems in accordance with the criteria of Section 3.5 of this document and shall be automatically loaded onto the standby bus.

3.4.2 Safe Shutdown Earthquake

Radiation monitors which serve a primary safety function shall be qualified to Seismic Category I requirements. If the primary safety function is attributable only to sample line requirements, the Seismic I requirement is applicable only to the monitor sample lines up to and including a suitable class break. Radiation Monitors which serve a secondary safety function as defined in this document and described in Table 9.0-1, shall be qualified to Seismic Category I(L) as described in Section 3.0 of this document.

3.4.3 Wind and Tornado Loadings

Radiation monitors which serve either a primary or secondary safety function shall be protected from the effects of a design basis wind or design basis tornado in accordance with the requirements of 10 CFR 50 Appendix A, GDC 2, (Reference 8.1.1). This protection may be afforded by locating components within plant structures designed to withstand design basis winds, and design basis tornado winds in accordance with WB-DC-30-1 (Reference 8.3.15).

3.4.4 Flooding

Components of the Radiation Monitoring System (RMS) necessary for operation in the Design Basis Flood (DBF) mode shall be installed in accordance with paragraph 4.6.6 of WB-DC-40-29 (Reference 8.3.16). Components of the RMS necessary for operation during non-DBF conditions shall be installed at elevations higher than the relevant internal flood water level for specific plant areas or be designed to operate submerged.

Monitors that should be operational during design basis flood conditions, with the plant in safe shutdown conditions, are those which provide the Control Room operator information regarding the ambient in-plant airborne radioactivity and radiation exposure rates in areas which are not flooded and may require access, and the Spent Fuel Pool Area Accident Monitors. Monitors which provide surveillance of airborne radioactivity levels and exposure rate levels in areas which are not flooded and where access may be required are:

Off-Line Particulate Monitors	0-RE-90-012
	0-RE-90-105
Area Monitors	1,2-RE-90-001
	1-RE-90-059
	0-RE-90-135

3.5 Electrical Requirements

All components of Radiation Monitoring System (RMS) requiring electrical power, including electric heat tracing, shall be energized from electrical sources which are commensurate with the component's safety classification and electrical category as described in Table 9.0-1.

Safety and nonsafety-related electrical components of the RMS shall be capable of performing their design function when supplied with the following power as appropriate:

117 V ac (±10 percent), single phase, 60 ±1 Hz (safety and nonsafety)

Vital (uninterruptable power supply) 120 V ac, (±2 percent), single phase, 60 Hz, ±0.6 Hz

480V ac (±10 percent), three phase, 60 ±1 Hz (safety and nonsafety)

The components of Radiation Monitoring channels classified as Category 1 variables, as defined in Regulatory Position 1.3 of NRC RG 1.97 (Reference 8.1.11), as well as the components of Radiation Monitoring channels performing primary safety functions, shall be supplied from Class 1E electric systems. Redundancy, signal isolation, and control power for Radiation Monitoring channels functioning as Category 1 variables shall be designed in accordance with Section 3.5.1 of WB-DC-30-7 (Reference 8.3.5).

Power systems and associated components for the Class 1E portion of the RMS shall be designed in accordance with WB-DC-30-27 (Reference 8.3.11) and WB-DC-30-28 (Reference 8.3.12). Electric equipment, cable, and raceways for the Class 1E portion of the RMS shall have separation and redundancy in accordance with WB-DC-30-4 (Reference 8.3.6).

Electrical requirements for Radiation Monitoring channels classified as Category 2 variables, as defined in Regulatory Position 1.3 of NRC RG 1.97 (Reference 8.1.11), shall be in accordance with Sections 3.5.2 or 3.5.3 of WB-DC-30-7 (Reference 8.3.5).

Thermal overload bypass protection devices for safety-related motor-operated valves and torque switches are not required (reference 8.5.8).

Care should be taken in the design of the RMS so that low level signal circuits are not adversely affected by electro-magnetic or radio frequency interference (RFI) noise. Circuits should be protected from these interferences by proper attention to equipment design, cable selection, avoidance of multiple grounds (i.e., ground loops) in accordance with Section 2.2.3.3 of WB-DC-30-32 (Reference 8.3.13) and cable routing to provide adequate separation of detector and signal circuits from power circuits and from circuits subject to inductive switching surges. The selection of cables for equipment interconnection (i.e., of coaxial, triaxial, mineral insulated, or shielded construction) should be made to the manufacturer's recommendations. Cable selection shall also be in accordance with WB-DC-30-5 (Reference 8.3.7).

3.6 Mechanical Requirements

3.6.1 General Requirements

For monitors which collect or monitor particulates and iodines, the monitor sample flow paths should either be sized to provide flow rates such that off-line particulate and iodine filter efficiencies and loading capabilities are not impaired (Reference 8.1.14) or a study shall be performed to show these effects are negligible (Reference 8.2.5). In cases where required response times have been determined, the sampling process shall be designed such that required response times for terminating effluent releases can be achieved.

Sample line connections to systems expected to be contaminated in the course of normal plant operation shall be welded, threaded, or flareless as described in this paragraph, which is based on Section 5.6 of ANSI/ISA S67.10 (reference 8.2.4). Welded lines less than or equal to 1 inch shall be socket welded in accordance with the guidance of Section 5.6.2 of ANSI/ISA S67.10 (Reference 8.2.4). Welded lines greater than 1 inch should be butt welded where socket weld fittings could create radioactive particle (crud) traps. Liquid sample lines of the RMS which transport reactor coolant samples and which are greater than 1 inch nominal diameter, shall be butt welded. Flareless fittings may be used in lieu of welded fittings in those sample lines fabricated using tubing subject to the following restrictions. Flareless fittings shall not be used where sample lines must be protected against inadvertent disassembly. Threaded pipe or tubing fittings should not be used in the normal sample flow path of those monitors connected to systems expected to be contaminated, or in the inlet flow path of gaseous particulate/non-volatile iodine samplers up to the particulate/iodine collection medium, unless an in-line device is manufactured with threaded connections. Threaded pipe or tubing fittings may be used as necessary in conjunction with off-line instruments or components supplied with threaded fittings, or in those monitors connected to systems with a low potential for becoming contaminated.

Components of the sample lines and monitors which are exposed to the sample fluid shall be designed to the pressure and temperature of the process system at the point the sample is drawn unless design features are provided to change the sample fluid characteristics, the monitor is isolated during periods of high pressure or temperature in the source fluid, or an analysis is performed to demonstrate that the sample is within the pressure and temperature capability of the monitor when the sample reaches the monitor.

Pumps used for drawing representative air samples from a process duct shall be sized to take into account the pressure drops due to the intake nozzles/manifold and sample line configuration, as well as the required volumetric flow rate. Where the number of intake nozzles and the required nozzle diameter result in a sample flow which exceeds those allowable for the particulate and iodine channels, the final sample shall be obtained through a secondary air sampling system which uses the sample line from the process duct as its source duct. This technique may be referred to as subsampling.

For gas monitoring applications, positive displacement piston type vacuum pumps should be provided with a bleed line or other design feature to allow the sample pump to operate at design flow rate capacity when sample flow rate requirements are less than the pump design capacity. Radiation Monitor skids which incorporate rotary type vacuum pumps shall provide indication of a degraded flow condition in the Main Control Room to allow the pump to be turned off prior to experiencing damage. Sample monitors may alarm locally since these monitors have no real-time display in the main control room and protable sampling can be substituted in the event of monitor failure.

3.6.2 Seismic Qualification of Instrumentation and Electrical Equipment

For those functional safety related Seismic Category I instrumentation and equipment (as specified by the Q-list in EMS), the seismic qualification shall be in accordance with WB-DC-40-31.2 and WB-DC-40-31.12 (references 8.3.1 and 8.3.22, respectively).

For those non-safety related Seismic Category I(L) instrumentation and equipment (as specified by the Q-list in EMS), the seismic qualification shall be in accordance with WB-DC-40-31.13 (reference 8.3.2).

3.6.3 RMS Sample Line Design Criteria

The purpose of this section is to establish the general design criteria for RMS sample lines used with gaseous and liquid off-line monitors listed in Table 9.0-2.

Criteria that apply to both gaseous and liquid sample lines are given in Sections 3.6.3A through 3.6.3D. Criteria specific to gaseous or liquid sample lines are given in Sections 3.6.3E and 3.6.3F, respectively.

A. General Criteria for Sample Lines

Sample tubing runs should normally be as short as practical with the number of fittings and direction changes minimized. Sample lines shall be routed to avoid contact interferences caused by relative motion between the line and adjacent equipment or the configuration shall be evaluated for acceptability (reference 8.3.21). Sources of relative motion that shall be considered are thermal expansion and seismic motion. Sample lines should be routed so as to minimize changes in the sample fluid temperature. Sample lines should also be routed so as not to interfere with doorways, accessways, stairways, ladders, or equipment which require frequent maintenance. Sample lines should be routed and protected so that physical damage during construction and plant operation is improbable. When required for a specific monitor, sample lines shall be routed and supported to allow sufficient clearance for installation of heat tracing and/or insulation.

Where changes in direction of the inlet tubing run for gaseous monitors with a particulate collection function are required, large radius bends should be utilized. Sample line bend radii in these cases should be a minimum of 5 times the tube O.D. to minimize line losses and, in general, to be consistent with current practices of the nuclear industry for sample line design for collection of particulates. For cases where this bend radius requirement cannot be met, an analysis shall be performed to properly account for adverse effect in obtaining a representative particulate sample. The above requirements shall not apply to purge and/or test connections, bypass lines, control valve feed back lines, and portions of the sample line downstream of the point at which the particulates are collected or filtered. The particle loss calculation of Reference 8.5.24 determines the transmission efficiency for monitors: 0-RE-90-101, -106, & 112 and 1,2-RE-90-402.

3.6.3 RMS Sample Line Design Criteria (continued)

Sample line valves should be ball valves, or similar nonrestrictive type, in lines where the build up of radioactive contaminants could result when flow path discontinuities are present, or in the portion of particulate sample lines prior to the particulate filters. Examples of such lines include the liquid waste disposal and containment atmosphere sample lines. Valves should be accessible for maintenance. Restriction orifices should be avoided. For cases where other types of valves are used in particulate sample lines, an analysis shall be performed to confirm that there is no adverse effect on obtaining a representative particulate sample. Valves in sample lines for particulate monitors have been evaluated in the particle loss calculation of Reference 8.5.24.

Where root valves are used in addition to isolation valves, the root valves should be installed as close as practical to process connections. Where root valves must be located in an inaccessible area an isolation valve (i.e., a valve in addition to the root valve at the sample connection) should be installed at a point where the sample line becomes accessible.

Off-line liquid sample systems shall have isolation valves in addition to process root valves on both the sample intake and sample return tubing to isolate the monitor from the process pipe.

B. Line Classification Criteria

The sample line portion of off-line monitors shall be seismically classified in accordance with Section 3.5 of WB-DC-40-36 (Reference 8.3.10) for those monitors connected to piping, or WB-DC-40-36 & -36.1 (References 8.3.10 and 8.3.19, respectively) for those monitors connected to ductwork, and designed in accordance with that classification subject to the following clarifications. The skid-mounted portions of the monitor shall be designed to the requirements which satisfy its safety function or to the requirements imposed by virtue of its location in a Seismic Category I building area, which ever is greater.

In-line components of RMS sample lines such as heat exchangers, valves, fittings, or other in-line mechanical components are subject to TVA code class requirements as described in WB-DC-40-36 (Reference 8.3.10) for those monitors connected to piping, or WB-DC-40-36 & -36.1 (References 8.3.10 and 8.3.19, respectively) for those monitors connected to ductwork. Other off line mechanical components such as pressure or flow measurement devices are instruments and shall comply with interfacing requirements described in Section 3.5 of WB-DC-40-36 (Reference 8.3.10). As defined in Section 3.5 of WB-DC-40-36 (Reference 8.3.10), the RMS monitor skid constitutes an instrument and is subject to the interfacing requirements of that section.

Sample lines connected to ANS Safety Class 2.b ductwork (TVA Class Q or S) shall be designed in accordance with the code requirements of TVA Class C piping. Sample lines for the Shield Building Vent monitors shall be designed and installed to the requirements of TVA Class C, Seismic I including the portions located in the non-Seismic Additional Equipment Building.

Sample lines attached to non-ASME piping shall be designed to TVA Class G requirements within seismic structures and Class H requirements in non-seismic structures.

3.6.3 RMS Sample Line Design Criteria (continued)

Sample lines for monitors that are required for post-accident monitoring and are not attached to either ASME piping or TVA Class Q or S duct work and that are not located in seismically qualified buildings should be designed to the requirements of TVA Class H piping.

Sample lines for the containment airborne radioactivity monitors shall be Class C except that those parts of the sample lines, including the containment isolation valves, which form a part of the primary containment isolation boundary shall be Class B.

Sample lines which may be subjected to severe vibration shall be pre-engineered and analyzed based on their code classifications. Sample lines that are connected to process piping, vessels or line-mounted equipment, which are subject to thermal and seismic movement, shall be routed and analyzed to insure sufficient flexibility between the root valve and the first support of the sample lines. See Section 3.6.3C, Seismic Criteria for Sample Lines, for thermal expansion requirements that apply to Seismic I and I(L) sample tubing.

Inlet sample lines shall be fabricated of stainless steel tubing or piping. Internal surfaces of associated in-line components which come in contact with the sample fluid prior to its reaching the detector(s) should also be stainless steel in order to minimize potential changes to the sample characteristics due to corrosion products. The internal surfaces of liquid sample heat exchangers may also be of material other than stainless steel provided the selection of the materials used considers the corrosion properties of the fluid being transported and the material characteristics of interfacing systems and if the sample fluid is drawn from a piping system that is not stainless steel such as the steam generator blowdown liquid monitor. Discharge sample lines and other in-line components downstream of the detector(s) may be fabricated of materials other than stainless steel provided the selection of the materials used considers the corrosion properties of the fluid being transported and the material characteristics of interfacing systems.

Flexible stainless steel metal hose may be used for short distances on filter holders, where the filters must be removed frequently. The hose shall only be used on the downstream side of the filter holder.

C. Seismic Criteria for Sample Lines

1. Seismic Category I and I(L) Instrumentation Sample Lines

Requirements for the seismic design and analysis of Category I and I(L) instrumentation sample line tubing and tubing supports are given in WB-DC-40-31.7 (Reference 8.3.3) and WB-DC-40-31.9 (Reference 8.3.4).

Sample lines routed across seismic zones shall be analyzed to include consideration of the building movement in accordance with WB-DC-40-31.7 (Reference 8.3.3).

3.6.3 RMS Sample Line Design Criteria (continued)

2. Seismic Category I and I(L) Instrumentation Sample Line Supports

Sample line supports shall meet seismic requirements not less than that required of the piping system from which the sample is being drawn until such point that the sample line incorporates a class break. Support design shall consider the effects of seismic events and thermal expansion which the source piping or sample line may be subjected to during normal and accident conditions in accordance with ISA-S67.10, Section 5.10 (Reference 8.2.4).

Requirements for design of tubing supports can be found in Design Criteria No. WB-DC-40-31.9 (Reference 8.3.4).

Sample line support structures such as channels, struts, etc., shall be supported independently of equipment supports such as cabinets, racks, stands, brackets, etc., and shall have no direct connection to them or contact with them. Where independent support is not possible, equipment qualification approval is required.

D. Heat Tracing Criteria for Sample Lines:

Monitors whose sample lines transport gaseous or liquid samples subject to the physical changes described below and which do not meet the requirements of Section 3.6.3E.2 shall be heat traced, chilled, and/or insulated as appropriate to provide a representative sample at the channel detector.

1. Gaseous Sample Line Heat Tracing or Insulation Requirements (Particulate and Non-particulate)

Sample lines for gaseous fluids that have the potential for condensation during transit to the RMS sample skid should be insulated or heat traced to maintain the fluid at a temperature which prevents condensation. Minimum slope requirements may be used to protect gas (non-particulate) monitors from condensation in sample lines. Insulation should be considered for those cases where condensation is possible due to short term variations in the surrounding air temperature. For those cases where it has been determined that insulation alone cannot maintain the fluid temperature above the dew point, heat tracing should be considered to maintain the temperature at a level which precludes condensation. The addition of heat tracing shall not produce a sample which exceeds the maximum temperature capability of either the detector or sample collection media.

Evaluation or analysis were performed for the gas and PIG monitors to determine the potential for condensation. Based on the potential for condensation and sample line routing, monitors 1-RE-90-106, -112, -400 & -402, and condenser vacuum exhaust sampling point shall be insulated and heat traced, or shall be analyzed to show such condensation will have a negligible affect on the proper operation of the monitors (references 8.5.25, 8.5.27 and 8.5.28).
Monitor 0-RE-90-101 shall be insulated and heat traced on the section of the sample line external to the auxiliary building (reference 8.5.26).

3.6.3 RMS Sample Line Design Criteria (continued)

Portions of gas sample lines which are subject to temperatures which could cause freezing of the sample line shall be insulated. In instances where it has been determined that insulation alone cannot prevent freezing or precipitation, heat tracing and insulation shall be required.

The decon room monitor, 0-RE-90-016, does not require heat trace or insulation since the same environment exists in the decon room as in the general area on elevation 713'.

2. Liquid Sample Line Heat Tracing or Insulation Requirements

Liquid sample lines which are subject to temperatures which could cause freezing of the sample fluid or precipitation of a solute shall be insulated. In instances where it has been determined that insulation alone cannot prevent freezing or precipitation, heat tracing and insulation shall be required.

E. Gaseous Sample Line Criteria

This section provides the design criteria for gaseous RMS sample lines which are divided up into those that sample gas only (non-particulate), those that also include an iodine and particulate collection or monitoring functions (particulate), and those that sample open areas.

1. General Criteria for Gaseous Sample Lines (Particulate and Non-particulate)

For gaseous monitors that utilize a single sample probe, the sample may be taken from either a vertical or horizontal pipe or duct run. Sample probes, when used with intake sample lines, shall be installed with nozzle openings facing upstream into the direction of flow.

Sample connections on horizontal rectangular ducts should be on the side or on the top of the duct. Sample connections on horizontal round ducts should be located above the horizontal midplane of the duct. Sample connections may be on the bottom of horizontal rectangular ducts or below the horizontal midplane of horizontal round ducts as long as the probe design internal to the duct does not allow condensate that may form in the duct to enter the sample line. These restrictions do not apply to vertical ducts (rectangular or round).

The discharge flow from sample skids should be returned to the duct sufficiently downstream of the sample withdrawal location to preclude creating disturbances at the sample withdrawal location (see Sections 3.6.3E.3 and 3.6.3E.6 for additional criteria).

2. Routing of Gaseous Sample Lines (Particulate and Non- particulate)

Horizontal runs for monitors with a particulate collection function and laminar flow conditions in the sample lines should be avoided to minimize particulate gravitational deposition in accordance with the guidance of ANSI N13.1, Section 4.2.2.1 and B2 (Reference 8.2.5). Per ANSI N13.1, Appendix B, this restriction applies to sample lines with laminar flow conditions only (Reference 8.2.5).

3.6.3 RMS Sample Line Design Criteria (continued)

It is good engineering practice for sample lines, except for short horizontal sections such as those at the sample intake, wall penetrations, and the final isolation valve at the RMS skid assembly, to have a continuous upward slope from the source sample withdrawal point toward the RMS assembly to promote keeping the line free of liquids due to condensation. Sample lines should have a continuous slope of one-inch, or more, per foot and shall have a minimum continuous slope of 1/4-inch per foot in accordance with the guidance of Section 5.5 of ANSI/ISA S67.10 (Reference 8.2.4) if condensation is possible in the sample lines. If condensation is not a design concern or if other measures, such as heat tracing, are employed, then minimum and/or continuous slope requirements shall not be required. See Section 3.6.3D.1 for monitors which have been analyzed for heat tracing and/or insulation requirements.

The sample line requirements of this Section are not required to be met for the sample lines of the Service Building Vent Monitor, 0-RE-90-132 since the temperature of the air exhausted through the service building vent is nearly the same temperature as at the monitor's location. This precludes the possibility of condensation formation in the sample lines since the temperature of the sample cannot decrease significantly.

3. Non-particulate Sampling

This subsection provides design criteria for sample lines from ducts when monitoring of particulates is not required. The criteria are applicable to ducts of any size in which the sample can be expected to be uniform over the duct cross section containing the sample withdrawal point (with the exception of the area near the duct wall). The criteria are based on Sections 3.1.1, 3.1.2, and 3.2 of 40 CFR 60 Appendix B, Specification 2 (Reference 8.1.5). The use of fewer sample nozzles than are required for particulate sampling in Section 3.6.3E.5 is allowed for non-particulate sampling.

Sample withdrawal points shall be from an area that is well mixed and should be located at least two diameters or equivalent diameters downstream of flow disturbances and 1/2 diameter or equivalent diameters upstream of flow disturbances. For rectangular ducts an equivalent diameter (ED) is determined from the following (Reference 8.1.5):

$$\mathrm{ED} = \frac{2*(\mathrm{HW})}{(\mathrm{H}+\mathrm{W})}$$

where: H = height of the duct and
W = width of the duct.

Regardless of duct size, a single withdrawal point may be used and shall be located in the duct outside the stagnant wall film (reference 8.2.4).

3.6.3 RMS Sample Line Design Criteria (continued)

4. Particulate Sample Line Sizing

For gaseous monitors which include a particulate collection function and employ more than one sample nozzle, the total cross sectional area of the nozzles should be approximately equal to the cross sectional area of the sample nozzle manifold. The cross sectional area of the connecting tubing should be approximately equal to the cross sectional area of the sample nozzle manifold. For gaseous monitors which include a particulate collection function and have one sample intake nozzle, the cross sectional area of the nozzle and the connecting tubing should be approximately equal.

5. Sample Nozzle Requirements for Particulate Sampling

This subsection provides design criteria in accordance with the guidance of ANSI N13.1, Section A.3.2 (Reference 8.2.5).

For circular ducts the minimum number of sample nozzles shall be as follows:

Duct Diameter in Inches	Minimum Number of Nozzles
2 - 6	1
8 - 12	2
14 - 18	3
20 - 28	4
30 - 48	5
50 and larger	6

For rectangular ducts the number of sample nozzles shall be as follows:

Duct Area	Number of Nozzles
Less than 0.5 sq. ft.	1
1 - 2 sq. ft.	4
2 - 25 sq. ft.	6 - 12
> 25 sq. ft.	20

Sample withdrawal points should be selected to obtain a representative sample. In general, withdrawal points should be spaced to obtain samples from the total duct cross section.

The Decontamination Room Continuous Air Monitor, 0-RE-90-016, samples the air in the Decontamination Room by sample withdrawal from the room's exhaust duct. Withdrawing a sample from the exhaust duct allows the monitor to sample air more representative of the entire room than possible with the standard single point configuration for continuous air monitors. Since the sample configuration for the monitor is superior to the standard configuration, the sample connection to the duct is not required to meet the criteria of this Section.

3.6.3 RMS Sample Line Design Criteria (continued)

6. Location of Particulate Sample Withdrawal Point in the Duct

   Sample withdrawal points should be located at least 5 duct diameters downstream of flow disturbances such as bends or transitions as described in ANSI N13.1 Appendix A, Section A3 (Reference 8.2.5). For rectangular ducts use the major dimension of the duct as the diameter. For configurations where this recommendation is not met, other engineering features, such as flow straightners, additional nozzles, etc., may be used to ensure a representative sample.

7. Particulate Sampling Probe and Probe Manifold Design Requirements

   Air sampling for particulate monitoring shall be considered isokinetic when the difference between the air velocity in the duct and the air velocity entering the sample nozzle is plus or minus 20 percent of the duct velocity (Reference 8.1.14).

   Probes for isokinetic sampling may be specified to be designed in accordance with the guidance of ANSI N13.1 Appendix A Figures A2 or A5 (Reference 8.2.5). The selected location of the sample sites within the duct shall be accessible for easy removal of the sample probe for cleaning, inspection and replacement as recommended in ANSI N13.1, Section A3.4 (Reference 8.2.5).

8. Gaseous Sampling From Open Areas

   The sample collection point (inlet nozzle(s), if nozzles are used) should be located in an area where the air is well mixed by natural or forced circulation. Isokinetic sampling requirements have no meaning and thus are not applicable when sampling from open areas

   For single inlet nozzle installations, the sample collection point location may be in proximity to a location, such as an air exhaust outlet, where the airborne radioactivity would be expected to make a rapid appearance albeit diluted.

   When it is desirable to have a monitor sample more than one location in an open volume, multiple sample points may be installed and connected to one monitor. Multiple intake nozzles may provide a capability to determine the relative location of a system leak from measured radioactivity by manipulation of the sample line valves, if present. This can be useful in volumes such as containment.

F. Liquid Sample Lines

This section provides the general design criteria for liquid radiation monitoring sample lines.

3.6.3 RMS Sample Line Design Criteria (continued)

1. Selection of Liquid Sample Points

   Liquid samples should be taken at only one point in the cross section. Sample points shall be located where the fluid is well mixed and should be located where there is a minimum disturbance of the flow pattern due to fittings and other physical characteristics of the piping or in-line components in accordance with Regulatory Guide 1.21, Section C6 (Reference 8.1.7). To meet this requirement the return point should be a sufficient distance downstream of the intake point to minimize disturbance of the inlet sample.

   Liquid sample connections shall not be located on the bottom and should be located on the side of horizontal pipe runs. Liquid sample connections which must be located on vertical piping runs may be located at any azimuth. Batch release samples shall be well mixed prior to determining its isotopic content.

2. Routing of Liquid Sample Lines

   Liquid-filled sample lines that connect to normally radioactive process systems should not be routed with dead legs or low points that cannot be flushed and drained.

3.7 Instrumentation Requirements

Sample flow measuring instrumentation should be accurate to within ±10 percent of full scale between 10% and 100% of scale reading. Current pressure measuring instrumentation has an accuracy of ±5% which is accounted for in the instrument accuracy calculations.

3.8 Safety Limits

Safety limits or references to documents governing the determination of safety limits for monitor channels which provide an automatic control function are provided in Table 9.0-4. References to documents governing the determination of maximum allowable response times corresponding to these safety limits are shown in Table 9.0-3.

3.9 Maintenance

Off-line gaseous monitoring systems shall have appropriate connections to allow for purging the gas sample chamber with clean air as needed to remove loose contamination prior to opening the system for component maintenance or replacement. Liquid monitoring systems, except those that monitor systems designed to be clean such as the CCW and ERCW, shall be provided with taps and sampler isolation to allow the sampler chamber to be flushed with clean water for removal of loose contamination prior to opening the system. Low point taps should be provided to allow for drainage of the gaseous and liquid sampling systems.

4.0 LAYOUT AND ARRANGEMENT

Radiation monitoring detection systems should be located in areas where the effects of background radiation levels and sources of EMI are minimized. The location of a sampling skid should also take into account the design requirements of the sample line. Monitors that are located in areas where potentially adverse conditions may exist, e.g., water spray, airborne dust, should include design features such as appropriate NEMA graded enclosures or spray shields that will adequately protect the sensitive components of the system. The monitoring system should be readily accessible for purposes of periodic system testing, maintenance, and calibration. Monitor components that require frequent maintenance or calibration should be located in the lowest practical radiation fields.

Off-line air-sampling systems and in-containment leak detection should include an installed spare pump with appropriate flow control and isolation capabilities to allow for continued sampling in the event of primary pump failure.

Monitors identified in Table 9.0-1 under WB-DC-30-7 (Reference 8.3.5) as Category 1 shall have a redundant monitor installed and powered from the opposite train such that the combination of the two monitors shall be capable of providing the monitoring function in the presence of any single component failure or design basis event.

The separation requirements of this section are established to meet the intent of the single failure criteria of IEEE-279-1971 (Reference 8.2.9). Sample lines for redundant monitors which perform a primary safety function as identified in Table 9.0-4 shall be routed with sufficient separation such that no single event can prevent more than one redundant channel from performing its safety function.

Minimum required separation for sample lines for redundant primary safety function monitors shall be achieved in as short a distance as possible after their sample intakes. The minimum required separation between sample lines attached to redundant monitors shall be at least 18 inches in air.

Redundant monitors that perform a primary safety function as identified in Table 9.0-4 and whose sample lines do not meet the 18 inch minimum separation stated above or whose sample lines are located in a common area subject to possible missiles, jets and pipe-whip, shall have analysis or calculations performed as necessary to document that the existing separation protects the redundant sample lines from failure due to common cause.

As an alternative a suitable steel or concrete barrier may be used. When a barrier is used, it shall extend at least one inch beyond the line of sight between redundant lines and shall be designed and mounted to Seismic Category I requirements.

The sample lines for the containment purge radiation monitors (1-RE-90-130 & -131) originate from the same duct and run approximately 6 inches apart for a distance of approximately 6 feet. These lines are inaccessible to personnel and there is no potential for sample line damage due to high or moderate energy line breaks, pipe whip or postulated missiles. Therefore, the sample line separation criteria of this section for the area where there is less than 18 inches separation between the sample lines of these monitors is not required to be met since the sample lines are not threatened by any credible failure that would compromise the safety function of these monitors.

5.0 TESTS AND INSPECTIONS

5.1 Vendor Testing

The vendor shall by test or other means as set forth in the procurement specification, comply with the specified functions as described in the procurement specification.

5.2 Site Testing

At completion of installation of each of the monitors, an integrated system test shall then be undertaken to test system functions such as (a) the communication links with the control room for operation of the recorder, actuation of the visual and audible alarm(s) annunciators, response of measurements readout and (b) the communications to the Technical Support Center. The communication test shall also test the capability of remote operation of the check sources, purge valve(s), and filter advance as applicable. Operability tests of the sample pump(s) and flow control valves shall be completed locally for the appropriate monitors. The monitoring systems interaction with other plant systems shall also be demonstrated by introduction of input signals at the appropriate locations on RMS equipment to initiate the automatic control functions described in Section 3.1. Where practical, interactive systems such as the HVAC duct flow velocity detection system shall be tested to observe changes in sample system flow rate resulting from input signals originating from the duct flow velocity detection systems.

5.3 Monitor Calibrations (Vendor or Site Testing)

Primary and secondary calibrations shall be performed for each monitor system. The Upper and Lower Compartment Reactor Building Post-accident Monitors shall be calibrated in accordance with the requirements of NUREG-0737 (Reference 8.1.14).

6.0 QUALITY ASSURANCE

A description of the Quality Assurance Program for equipment to be seismically or environmentally qualified is given in TVA Topical Report TVA-TR75-1A, "Quality Assurance Program Description for Design, Construction, and Operation of TVA Nuclear Power Plants."

Components of the radiation monitoring system shall meet the mechanical and electrical QA requirements applicable to the qualification classification and safety function described in Table 9.0-4.

7.0 EXCEPTIONS

Consideration shall be given where exceptions to these criteria are necessary due to, for example, incompatibility of plant structural configuration and location of radiation monitoring systems, and it can be shown that the criteria is overly conservative and/or the proposed exception does not jeopardize the safety-related or effective performance of the affected system. Any approved or disapproved request for an exception shall be technically supported and adequately documented.

7.1 Approved Exceptions

All exceptions approved prior to Revision 4 are incorporated or canceled by Revision 4.

8.0 REFERENCES

8.1 NRC Documents

8.1.1 10 CFR 50 Appendix A, General Design Criteria (GDC) for Nuclear Power Plants:

GDC 2:	Design Basis for Protection Against Natural Phenomena
GDC 19:	Control Room
GDC 30:	Quality of Reactor Coolant Pressure Boundary
GDC 60:	Control of Releases of Radioactive Materials to the Environment
GDC 63:	Monitoring of Fuel and Waste Storage
GDC 64:	Monitoring Radioactivity Releases

8.1.2 10 CFR 50 Appendix I, Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion As Low As Practicable for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents

8.1.3 10 CFR 20:

Paragraph 20.1101(b):	ALARA
Paragraph 20.1204:	Determination of Internal Exposure
Paragraph 20.1301:	Dose Limits for Individual Members of the Public
Paragraph 20.1302:	Compliance With Dose Limits for Individual Members of the Public
Paragraph 20.1601,	Control of Access to High Radiation Areas
Table 2 of Appendix B to 20.1001-20.2401:	Annual Limits on Intake (ALIs) and derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage

8.1.4 10 CFR 100, Reactor Site Criteria

8.1.5 40 CFR 60:

Method 1 of Appendix A:	Sample and Velocity Traverses for Stationary Sources
Method 5 of Appendix A:	Determination of Particulate Emissions from Stationary Sources
Spec. 2 of Appendix B:	Performance Specification 2 - Specification and Test Procedures for SO_2 and NO_x Continuous Emission Monitoring Systems in Stationary Sources

8.1 NRC Documents (continued)

8.1.6 NRC Regulatory Guide (RG) 8.8, Second Proposed Revision 4, Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable (ALARA)

8.1.7 NRC RG 1.21, Revision 1, Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light Water Reactors.

8.1.8 NRC RG 1.45, Reactor Coolant Pressure Boundary Leakage Detection Systems

8.1.9 NRC RG 1.53, Application of the Single Failure Criterion to Nuclear Power Generation Station Protection Systems

8.1.10 NRC RG 1.76, Design Basis Tornado For Nuclear Power Plants

8.1.11 NRC RG 1.97, Rev. 2, Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident

8.1.12 NRC NUREG 0133, Preparation of Radiological Technical Specification for Nuclear Power Plant

8.1.13 NRC NUREG 0696, Functional Criteria For Emergency Response Facilities

8.1.14 NRC NUREG 0737, RO, Clarification of TMI Action Plan Requirements

8.1.15 NRC NUREG-0800, Standard Review Plan

8.1.16 IE Information Notice 82-49, Correction for Sample Conditions For Air and Gas Monitoring.

8.2 Industry Standards

8.2.1 ANSI A59.1, Nuclear Safety Related Cooling Water Systems for Nuclear Reactors

8.2.2 ANSI B40.1-1980, Gauges - Pressure Indicating Dial Type Elastic Element

8.2.3 ANSI/ANS-HPSSC-6.8.1-1981, Location and Design Criteria for Area Radiation Monitoring Systems for Light Water Nuclear Plants

8.2.4 ANSI/ISA-S67.10, Sample-Line Piping and Tubing Standard for Use in Nuclear Power Plants

8.2.5 ANSI N13.1:

Section 4:	Sampling From a Duct or Exhaust Stack
Appendix A:	Guides for Sampling from Ducts and Stacks
Appendix B:	Particle Deposition in Sample Lines

8.2 Industry Standards (continued)

8.2.6 ANSI N18.2, Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants

8.2.7 ANSI N42.18-1974, American National Standard Specification and Performance of On-site Instrumentation for Continuously Monitoring Radioactivity in Effluents

8.2.8 ANSI N320-1979, Performance Specification for Reactor Emergency Radiological Monitoring Instrumentation

8.2.9 IEEE 279-1971, Criteria for Protection Systems for Nuclear Power Generating Stations

8.2.10 IEEE 344-1971, Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations

8.2.11 IEEE 344-1975, Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations

8.2.12 ISA 57.3, Quality Standard for Instrument Air.

8.3 Design Criteria

8.3.1 TVA WB-DC-40-31.2, Seismic Qualification of Category I Fluid System Components and Electrical or Mechanical Equipment

8.3.2 TVA WB-DC-40-31.13, Seismic Qualification of Category I (L) Fluid System Components and Electrical or Mechanical Equipment

8.3.3 TVA WB-DC-40-31.7, Analysis of Category I and I (L) Piping Systems

8.3.4 TVA WB-DC-40-31.9, Criteria for Design of Piping Supports and Supplemental Steel in Category I Structures

8.3.5 TVA WB-DC-30-7, Post Accident Monitoring Instrumentation

8.3.6 TVA WB-DC-30-4, Separation of Electric Equipment and Wiring

8.3.7 TVA WB-DC-30-5, Power, Control, and Signal Cables for Use in Category I Structures

8.3.8 TVA WB-DC-40-42, Environmental Design - October 28, 1982

8.3.9 TVA WB-DC-40-54, Environmental Qualification to 10 CFR 50.49

8.3.10 TVA WB-DC-40-36, The Classification of Piping, Pumps, Valves, and Vessels

8.3.11 TVA WB-DC-30-27, AC and DC Control Power System

8.3.12 TVA WB-DC-30-28, Low and Medium Voltage Power System

8.3 Design Criteria (continued)

8.3.13 TVA WB-DC-30-32, Design Criteria For Grounding

8.3.14 TVA WB-DC-20-21, Miscellaneous Steel Components for Category I Structures

8.3.15 TVA WB-DC-30-1, Concrete Structure - General

8.3.16 TVA WB-DC-40-29, Flood Protection Provisions

8.3.17 TVA WB-DC-40-64, Design Basis Events Design Criteria

8.3.18 TVA WB-DC-30-16, Instrument Sensing Lines - Slope and Separation

8.3.19 TVA WB-DC-40-36.1, The Classification of Heating Ventilating and Air Conditioning Systems

8.3.20 TVA WB-DC-20-24, Dynamic Earthquake Analysis of Category I Structures and Earth Embankments

8.3.21 TVA WB-DC-20-32, Integrated Interaction Program Screening and Acceptance Criteria

8.3.22 TVA WB-DC-40-31.12, Seismic Qualification of Category I and I(L) Valves and Other Inline Fluid System Components

8.4 System Descriptions

8.4.1 N3-30AB-4001, System Description For Auxiliary Building - Heating, Ventilation and Air Conditioning System

8.4.2 N3-30CB-4002, Control Building Heating Ventilating, Air Conditioning and Air Cleanup System

8.4.3 N3-30RB-4002, Reactor Building Ventilation System

8.4.4 N3-15-4002 Steam Generator Blowdown System

8.4.5 N3-77C-4001, Liquid Radwaste Processing System

8.4.6 N3-70-4002, Component Cooling

8.4.7 N3-14-4002, Condensate Polishing Demineralizer System

8.4.8 N3-77A-4001, Gaseous Waste Disposal System

8.4.9 N3-65-4001, Emergency Gas Treatment System

8.5 TVA Calculations

8.5.1 EPMCC022495, R0 (B26 950301343) - Temperatures and Pressures of the Fluids Processed by the Off Line Detectors of the Radiation Monitoring System

8.5.2 WBNAPS3-048, R9 (B26 950517 341) - RG 1.97 Type E Variables - Range and Accuracy Requirements and demonstrated Range

8.5.3 WBNTSR-062, R2 (B26 930827 401) - Requirements for the Containment Upper and Lower Compartment Radiation Monitors

8.5.4 WBNTSR-037, R0 (B18 891227 259) - Service Building Vent Monitor RE-90-132B Required Range and Accuracy

8.5.5 WBNTSR-028, R1 (B26 950214396) - Main Control Room Normal Air Intake Radiation Monitors Required Range, Safety Limit, Maximum Allowable Response Time and Accuracy

8.5.6 WBNTSR-038, R5 (B26 950303360) - Required Response Time, Range and Accuracy for the Containment Purge Exhaust Monitors

8.5.7 WBNTSR-043, R2 (B26 950302348) - Required Range and Accuracy for the WBNP Airborne Particulate Radiation Monitors (APRM)

8.5.8 WBN-0SG4-095, R11 (B26 950402326) - Selection Criteria for MOVs Requiring Thermal Overload Bypass

8.5.9 WBNTSR-024, R4 - Steam Generator Blowdown Monitors - RE-90-120, 121 Required Response Time, Range, and Accuracy Calculation

8.5.10 WBNTSR-033, R3 - Waste Disposal System Liquid Effluent Monitor RE-90-122 Required Range, Accuracy and Response Time Calculation

8.5.11 WBNTSR-042, R0 (B18 900223 253) - Component Cooling System Monitor 0,1,2-RE-90-123 Required Range, Accuracy, Safety Limit and Response Time Calculation

8.5.12 WBNTSR-020, R2 (B26 950130360) - Safety Limit for Spent Fuel Pool Radiation Monitors

8.5.13 WBNTSR-072, R1 - (B26 950213394) - Refined Requirements for the ERCW Discharge Radiation Monitors

8.5.14 WBNTSR-023, R4 (B26 950216302) - Response Time, Range and Accuracy for the Spent Fuel Pool Radiation Monitors (TSFPRM)

8.5.15 WBNTSR-027, R1 (B26 930827 402) - Containment High Range Radiation Monitors

8.5.16 WBNTSR-031, R3 (B26 950227326) - Turbine Building Sump Monitor RE-90-22 - Required.Range, Accuracy and the maximum allowable Response Time Calculation

8.5 TVA Calculations (continued)

8.5.17 WBNTSR-034, R3 - Condensate Demineralize Effluent Monitor RE-90-225 - Required Range, Accuracy and the Maximum Allowable Response Time Calculation

8.5.18 WBNTSR-032, R2 (B26 950123345) - Response Time, Safety Limit, Range and Accuracy for the Reactor Coolant Drain Tank

8.5.19 WBNTSR-029, R2 (B26 940316 339) - Response Time, Safety Limit, Range and Accuracy for the Reactor Building Floor & Equipment Drain Sump Radiation Monitors

8.5.20 WBNTSR-036, R2 (B26 950310387) - Required Range and Accuracy for the Residual Heat Removal (RHR) Radiation Monitors

8.5.21 WBNTSR-040, R4 - Required Response Time, Range and Accuracy for the Waste Disposal System (WDS) Gaseous Effluent Radiation Monitors

8.5.22 WBNTSR-044, R2 (B26 950302349) - Required Range and Accuracy for the WBNP Area Radiation Monitors

8.5.23 WBNTSR-103, R0 (B26 950421363) - Evaluation of 10 DAC-hr Detection Capability of the Auxiliary Building Exhaust Radiation Monitors

8.5.24 WBNTSR-060, R2 (B26 930614309) - Analysis of Particle Transmission by ample Lines for Watts Bar Unit 1 System 90 Air Monitors

8.5.25 EPMAPA-111694, R0 (B26 941231383) - Condenser Vacuum Pump Exhaust Line to Radiation Monitors -Condensation

8.5.26 EPMSKS-012095, R0 (B26 950128356) - Aux Bldg Vent Sample Line to radiation Monitor - Potential for Condensation

8.5.27 EPMJK-111794, R0 (B26 950428384) - Containment Lower and Upper Compartment Monitors Sample Tubing - Potential for Condensation

8.5.28 EPMSCS-013095, R0 (B26 950428385) - Shield Building Exhaust Vent (SBEV) Radiation Monitors (RM) Sample Tubing - Potential for Condensation

8.5.29 WBNAPS3-052 R2 (B26 911223205) - Minimum Detectable Leak Rate for the Steam Generator Blowdown System

8.5.30 WBNAPS3-053, R1 (B45 880620 238) - Steam Generator Leakage Detection With The Condenser Vacuum Pump Air Exhaust Monitor

8.5.31 WBNAPS3-054, R2 (B26 940624 402) - Reactor Coolant Leakage Detection With the Containment Lower Compartment Airborne Radiation Monitor

8.5.32 WBNTSR-108, R0 (B26 951010 338) - Evaluation of Sample Plateout With Reduced Flow

8.5 TVA Calculations (continued)

8.5.33 WBNTSR-066, R6 - Design Flowrate for the Offline Liquid Radiation Monitors.

8.5.34 WBNTSR-009, R11 - Control Room Operator and Offsite Doses From a Fuel Handling Accident

8.5.35 Calculation 1RE90120, R10, "Demonstrated Accuracy Calculation for WBNP Liquid Effluent Compliance Radiation Monitors"

8.5.36 Calculation WBPE0909002007, R7, "Demonstrated Accuracy Calculation for Waste Disposal System Gas Effluent Radiation Monitor"

8.6 Other

8.6.1 Technical Specification Change TVA-WBN-TS-00-015, "Revision of Boron Concentration Limits and Reactor Core Limitations for Tritium Production Cores (TPCs)" (T04 010821 812).

9.0 TABLES

9.1 Table 9.0-1 - Radiation Monitoring Classification

TABLE 9.0-1
RADIATION MONITORING CLASSIFICATION

Tag No.	Service	Electrical Safety Class	Seismic Category of Detection Asmbly.	WB-DC-30-7 Cat./Type	Process Pipe or Duct Safety Class/ Seismic Category	Sample Line Safety Class/ Seismic Category
Particulate, Iodine, & Noble Gas Monitors:						
0-RE-90-101	Effluent	Non-1E (3)	I(L) (7)	2/E(1)	Q or S/Seismic I	C/Seismic I
1-RE-90-106*	Airborne	1E (5)	I(5)	N/A	N/A	(4)/Seismic I
1-RE-90-112	Airborne	1E (5)	I(5)	N/A	N/A	(4)/Seismic I
1-RE-90-119	Effluent	Non-1E (3)	Non-seismic	2/E	H/Non-seismic (2)	H/Non-seismic
0-RE-90-132	Effluent	Non-1E	Non-seismic (2)	N/A	Non-seismic (2)	H/Non-seismic
1,2-RE-90-400	Effluent	Non-1E (3)	I(L) (7)	2/C,2/E	Q or S/Seismic I	C/Seismic I
1-RE-90-404	Effluent	Non-1E (3)	Non-seismic (2)	2/E	H/Non-seismic (2)	H/Non-seismic
1,2-RE-90-402	Effluent	Non-1E	I(L) (7)	3/E	Q or S/Seismic I	C/Seismic I
*Monitor 1-RE-90-106 does not perform real time iodine monitoring, but does have an iodine filter.						
Tritium Samplers:						
0-SMPL-90-800	Effluent	Non-1E	I(L) (7)	N/A	Q or S/Seismic I	C/Seismic I
1-SMPL-90-801	Effluent	Non-1E	I(L) (7)	N/A	Q or S/Seismic I	C/Seismic I
2-SMPL-90-801	Effluent	Non-1E	I(L) (7)	N/A	Q or S/Seismic I	C/Seismic I
Off-line Gas Monitors:						
0-RE-90-125	Process	1E	I	N/A	Q or S/Seismic I	C/Seismic I
0-RE-90-126	Process	1E	I	N/A	Q or S/Seismic I	C/Seismic I
1-RE-90-130	Process	1E	I	N/A	Q or S/Seismic I	C/Seismic I
1-RE-90-131	Process	1E	I	N/A	Q or S/Seismic I	C/Seismic I
0-RE-90-205	Process	1E	I	N/A	Q or S/Seismic I	C/Seismic I
0-RE-90-206	Process	1E	I	N/A	Q or S/Seismic I	C/Seismic I
Off-line Liquid Monitors:						
1-RE-90-120,121	Effluent	Non-1E	Non-seismic (2)	N/A	H/Non-seismic(2)	H/Non-seismic

9.1 Table 9.0-1 - Radiation Monitoring Classification (continued)

TABLE 9.0-1
RADIATION MONITORING CLASSIFICATION

Tag No.	Service	Electrical Safety Class	Seismic Category of Detection Asmbly.	WB-DC-30-7 Cat./Type	Process Pipe or Duct Safety Class/ Seismic Category	Sample Line Safety Class/ Seismic Category
0-RE-90-122	Effluent	Non-1E	I(L)	N/A	G/Seismic I(L)	G/Seismic I(L)
0-RE-90-123	Process	Non-1E	I(L)	N/A	C/Seismic I	C/Seismic I
1,2-RE-90-123	Process	Non-1E	I(L)	N/A	C/Seismic I	C/Seismic I
0-RE-90-133,140	Effluent	1E(5)	I(5 & 6)	2/E	C/Seismic I	C/Seismic I
0-RE-90-134,141	Effluent	1E(5)	I(5 & 6)	2/E	C/Seismic I	C/Seismic I
0-RE-90-225	Effluent	Non-1E	Non-seismic(2)	N/A	H/Non-seismic(2)	H/Non-seismic
<u>On/In-Line Monitor</u>:						
0-RE-90-102	Airborne	1E	I(5)	N/A	N/A	N/A
0-RE-90-103	Airborne	1E	I(5)	N/A	N/A	N/A
0-RE-90-212	Effluent	Non-1E	Non-seismic (2)	N/A	N/A	N/A
1-RE-90-421	Effluent	Non-1E (3)	I(L)	2/C,E	N/A	N/A
1-RE-90-422	Effluent	Non-1E (3)	I(L)	2/C,E	N/A	N/A
1-RE-90-423	Effluent	Non-1E (3)	I(L)	2/C,E	N/A	N/A
1-RE-90-424	Effluent	Non-1E (3)	I(L)	2/C,E	N/A	N/A
0-RE-90-118	Effluent	Non-1E (3)	I(L)	N/A	G/Seismic I(L)	N/A
<u>Area Type Monitors</u>:						
1,2-RE-90-001	Area	Non-1E	I(L)	N/A	N/A	N/A
1-RE-90-002	Airborne	Non-1E	I(L)	N/A	N/A	N/A
0-RE-90-003	Area	Non-1E	I(L)	N/A	N/A	N/A
0-RE-90-004	Area	Non-1E	I(L)	N/A	N/A	N/A
0-RE-90-005	Area	Non-1E	I(L)	N/A	N/A	N/A
1,2-RE-90-006	Area	Non-1E	I(L)	N/A	N/A	N/A
1,2-RE-90-007	Area	Non-1E	I(L)	N/A	N/A	N/A
1,2-RE-90-008	Area	Non-1E	I(L)	N/A	N/A	N/A
0-RE-90-009	Area	Non-1E	I(L)	N/A	N/A	N/A
1,2-RE-90-010	Area	Non 1E	I(L)	N/A	N/A	N/A

9.1 Table 9.0-1 - Radiation Monitoring Classification (continued)

TABLE 9.0-1
RADIATION MONITORING CLASSIFICATION

Tag No.	Service	Electrical Safety Class	Seismic Category of Detection Asmbly.	WB-DC-30-7 Cat./Type	Process Pipe or Duct Safety Class/ Seismic Category	Sample Line Safety Class/ Seismic Category
0-RE-90-011	Area	Non 1E	I(L)	N/A	N/A	N/A
1-RE-90-059	Area	Non 1E	I(L)	N/A	N/A	N/A
1-RE-90-060	Area	Non 1E	I(L)	N/A	N/A	N/A
1-RE-90-061	Area	Non 1E	I(L)	N/A	N/A	N/A
0-RE-90-135	Area	Non-1E	I(L)	2/D	N/A	N/A
0-RE-90-230	Area	Non-1E	Non-seismic(2)	N/A	N/A	N/A
0-RE-90-231	Area	Non-1E	Non-seismic(2)	N/A	N/A	N/A
1-RE-90-271	Airborne	1E	I	1/A,E;3/C	N/A	N/A
1-RE-90-272	Airborne	1E	I	1/A,E;3/C	N/A	N/A
1-RE-90-273	Airborne	1E	I	1/A,E;3/C	N/A	N/A
1-RE-90-274	Airborne	1E	I	1/A,E;3/C	N/A	N/A

Notes:

(1) Applies to Noble Gas Channel only.

(2) Turbine Building and Service Building are non-seismic, WB-DC-20-24 (Reference 8.3.20).

(3) Highly reliable power which is Non-1E, but is diesel backed.

(4) Class B between the containment isolation valves and Class C elsewhere.

(5) TVA design decision (see Section 3.0).

(6) Sample pumps included in this monitor assembly are only required to meet Seismic Category I(L) pressure boundary retention requirements.

(7) Radiation monitoring and associated flow monitoring and sample flow control equipment in the class "instrument" boundary (Reference WB-DC-40-36 Section 3.5) is connected to TVA class C sample lines. Fluid retaining portions within the instrument boundary are required to meet seismic category 1(L)b, position retention only. This is acceptable because these instruments are not required to perform a primary safety function. Loss of the Class C fluid is not a concern since the fluid is gaseous and is either connected to atmosphere, or discharges into the same ventilation system as does the air in the space surrounding the monitor. There are no spray concerns since the fluid is gaseous, and the fluid is not of a high enough temperature or pressure to adversely impact primary safety related equipment in the compartment. This meets the intent of R. G. 1.29 Section C.2.

9.2 Table 9.0-2 - Radiation Monitor Characteristics

TABLE 9.0-2
RADIATION MONITOR CHARACTERISTICS

Tag No.	Name	Monitor Service	Type of Channel and Detectors Type (5)	Readout		High Radiation Alarm Visual=V Audible=A		Required Range (Reference)	Required Accuracy (Reference)
				Local	Remote	Local	Remote		
<u>Particulate Iodine & Noble Gas Monitors</u>:									
0-RE-90-101	Auxiliary Building Ventilation	Effluent		No	Yes	None	V&A		
0-RE-90-101A			Particulate (B)(1)					8.5.2	8.5.2
0-RE-90-101B			Noble Gas (B)(1)					8.5.2	8.5.2
0-RE-90-101C			Iodine (G)(1)					8.5.2	8.5.2
1-RE-90-106	Containment Lower Compartment	Airborne		Yes	Yes	V&A	V&A		
1-RE-90-106A			Particulate (B)(2)					8.5.3	8.5.3
1-RE-90-106B			Noble Gas (B)(2)					8.5.3	8.5.3
1-RE-90-112	Containment Upper Compartment	Airborne		Yes	Yes	V&A	V&A		
1-RE-90-112A			Particulate (B)(2)					8.5.3	8.5.3
1-RE-90-112B			Noble Gas (B)(2)					8.5.3	8.5.3
1-RE-90-112C			Iodine (G)(2)			None	None		
1-RE-90-119	Condenser Vacuum Pump Exhaust (Normal Range)	Effluent	Gas (B)(1)	No	Yes	None	V&A	8.5.2	8.5.2
0-RE-90-132	Service Bldg Ventilation	Effluent		No	Yes	None	V&A		
0-RE-90-132B			Noble Gas (B)(2)					8.5.4	8.5.4
1,2-RE-90-400	Shield Bldg Vent	Effluent	Noble Gas (B,GM or Cd-Te)(3)	Yes	Yes	V&A	V&A	8.5.2	8.5.2

9.2 Table 9.0-2 - Radiation Monitor Characteristics (continued)

TABLE 9.0-2
RADIATION MONITOR CHARACTERISTICS

Tag No.	Name	Monitor Service	Type of Channel and Detectors Type (5)	Readout		High Radiation Alarm Visual=V Audible=A		Required Range (Reference)	Required Accuracy (Reference)
				Local	Remote	Local	Remote		
1,2-RE-90-402	Shield Bldg Vent	Effluent	N/A	N/A	N/A	N/A	N/A	8.5.2	8.5.2
1-RE-90-404	Condenser Vacuum Vent Accident Range	Effluent	Gas (GM)(1)	Yes	Yes	V&A	V&A	8.5.2	8.5.2
0-SMPL-90-800	Auxiliary Building Tritium Sampler	Effluent	N/A	*	N/A	N/A	N/A	N/A	N/A
1-SMPL-90-801	Unit 1 Shield Building Tritium Sampler	Effluent	N/A	*	N/A	N/A	N/A	N/A	N/A
2-SMPL-90-801	Unit 2 Shield Building Tritium Sampler	Effluent	N/A	*	N/A	N/A	N/A	N/A	N/A
			*Totalized Flow Only						
Off-Line Gas Monitors:									
0-RE-90-125	Main Control Room Normal Air Intake	Process	Gas (B)(2)	No	Yes	None	V&A	8.5.5	8.5.5
0-RE-90-126	Main Control Room Normal Air Intake	Process	Gas (B)(2)	No	Yes	None	V&A	8.5.5	8.5.5
1-RE-90-130	Containment Purge Air Exhaust	Process	Gas (B)(2)	Yes	No	None	V&A	8.5.6	8.5.6
1-RE-90-131	Containment Purge Air Exhaust	Process	Gas (B)(2)	Yes	No	None	V&A	8.5.6	8.5.6
0-RE-90-205	Main Control Room Emergency Air Intake	Process	Gas (B)(2)	No	Yes	None	V&A	8.5.5	8.5.5
0-RE-90-206	Main Control Room Emergency Air Intake	Process	Gas (B)(2)	No	Yes	None	V&A	8.5.5	8.5.5

9.2 Table 9.0-2 - Radiation Monitor Characteristics (continued)

TABLE 9.0-2
RADIATION MONITOR CHARACTERISTICS

Tag No.	Name	Monitor Service	Type of Channel and Detectors Type (5)	Readout		High Radiation Alarm Visual=V Audible=A		Required Range (Reference)	Required Accuracy (Reference)
				Local	Remote	Local	Remote		
Off-Line Liquid Monitors:									
1-RE-90-120,121	Steam Generator Blowdown Liquid	Effluent	Liquid (G)(2)	No	Yes	None	V&A	8.5.9	8.5.9
0-RE-90-122	Waste Disposal System Liquid	Effluent	Liquid (G)(2)	No	Yes	None	V&A	8.5.10	8.5.10
0-RE-90-123	Component Cooling System	Process	Liquid (G)(2)	No	Yes	None	V&A	8.5.11	8.5.11
1,2-RE-90-123A	Component Cooling System	Process	Liquid (G)(2)	No	Yes	None	V&A	8.5.11	8.5.11
0-RE-90-133,140	Essential Raw Cooling Water Effluent	Effluent	Liquid (G)(2)	No	Yes	None	V&A	8.5.13	8.5.13
0-RE-90-134,141	Essential Raw Cooling Water Effluent	Effluent	Liquid (G)(2)	No	Yes	None	V&A	8.5.13	8.5.13
0-RE-90-225	Condensate Demineralizer Regenerant Waste Discharge	Effluent	Liquid (G)(2)	No	Yes	None	V&A	8.5.17	8.5.17
On/In-Line Monitors:									
0-RE-90-102	Spent Fuel Pool Area Accident Monitor	Airborne	Area (GM)(4)	No	Yes	None	V&A	8.5.14	8.5.14
0-RE-90-103	Spent Fuel Pool Area Accident Monitor	Airborne	Area (GM)(4)	No	Yes	None	V&A	8.5.14	8.5.14
0-RE-90-212	Turbine Building Sump Discharge Monitor	Effluent	Liquid (G)(2)	Yes	No	V&A	V&A	8.5.16	8.5.16

9.2 Table 9.0-2 - Radiation Monitor Characteristics (continued)

TABLE 9.0-2
RADIATION MONITOR CHARACTERISTICS

Tag No.	Name	Monitor Service	Type of Channel and Detectors Type (5)	Readout		High Radiation Alarm Visual=V Audible=A		Required Range (Reference)	Required Accuracy (Reference)
				Local	Remote	Local	Remote		
1-RE-90-421	Main Steam Line	Effluent	Area (IC)(1)	No	Yes	No	V&A	8.5.2	8.5.2
1-RE-90-422	Main Steam Line	Effluent	Area (IC)(1)	No	Yes	No	V&A	8.5.2	8.5.2
1-RE-90-423	Main Steam Line	Effluent	Area (IC)(1)	No	Yes	No	V&A	8.5.2	8.5.2
1-RE-90-424	Main Steam Line	Effluent	Area (IC)(1)	No	Yes	No	V&A	8.5.2	8.5.2
0-RE-90-118	Waste Disposal System Gas Effluent	Effluent	In-line (B)(4)	Yes	Yes	V&A	V&A	8.5.21	8.5.21
<u>Area Type Monitors</u>:									
1,2-RE-90-001	Spent Fuel Pool Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
1-RE-90-002	Personnel Lock	Airborne	Area (IC)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
0-RE-90-003	Waste Packaging Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
0-RE-90-004	Decontamination Room	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
0-RE-90-005	Spent Fuel Pool Pumps Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
1,2-RE-90-006	Component Cooling Heat Exchanger Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
1,2-RE-90-007	Sample Room	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
1,2-RE-90-008	Aux FW Pump Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
0-RE-90-009	Waste Evap Condensate Tank Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
1,2-RE-90-010	CVCS Board Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
0-RE-90-011	Containment Spray & RHR Pump Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22

9.2 Table 9.0-2 - Radiation Monitor Characteristics (continued)

TABLE 9.0-2
RADIATION MONITOR CHARACTERISTICS

Tag No.	Name	Monitor Service	Type of Channel and Detectors Type (5)	Readout		High Radiation Alarm Visual=V Audible=A		Required Range (Reference)	Required Accuracy (Reference)
				Local	Remote	Local	Remote		
1-RE-90-059	RB Upper Compartment	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
1-RE-90-060	RB Upper Compartment	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
1-RE-90-061	RB Lower Compartment Instrument Room	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
0-RE-90-135	Main Control Room	Area	Area (GM)(4)	No	Yes	None	V&A	8.5.22	8.5.22
0-RE-90-230	Condensate Demin Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
0-RE-90-231	Condensate Demin Area	Area	Area (GM)(4)	Yes	Yes	V&A	V&A	8.5.22	8.5.22
1-RE-90-271	RB Upper Compartment PAM	Airborne	Area (IC)(1)	No	Yes	None	V&A	8.5.2	8.5.2
1-RE-90-272	RB Upper Compartment PAM	Airborne	Area (IC)(1)	No	Yes	None	V&A	8.5.2	8.5.2
1-RE-90-273	RB Lower Compartment PAM	Airborne	Area (IC)(1)	No	Yes	None	V&A	8.5.2	8.5.2
1-RE-90-274	RB Lower Compartment PAM	Area	Area (IC)(1)	No	Yes	None	V&A	8.5.2	8.5.2

Notes:

(1) Calculation WBNAPS3-048 (Reference 8.5.2)
(2) General Atomics Calibration Reports E-115-388, E-199-349, E-199-352, E-115-59 and E-199-35
(3) Eberline Calibration Data and System Specific Information Manual, contract number 83X62-829854
(4) Radiation Monitoring System for TVA E-199-263, Oct. 1975, pp 1-2,3

9.2 Table 9.0-2 - Radiation Monitor Characteristics (continued)

(5) G = Gamma Scintillator
B = Beta Scintillator
GM = Geiger Muller
IC = Ionization Chamber
Cd-Te = Cadmium Telluride

9.3 Table 9.0-3 - Radiation Monitors that Initiate Automatic Control Functions

TABLE 9.0-3
RADIATION MONITORS THAT INITIATE AUTOMATIC CONTROL FUNCTIONS

Tag No.	Name	Sample Fluid	Channel Type	Monitor Function	Control Function	Response Time Reference
Off-Line Gas Monitors:						
0-RE-90-125	Main Control Room Normal Air Intake	Air	Off-line Gas	Continuously measures normal ventilation air intake into Control Room	Initiates Control Room isolation	8.5.5
0-RE-90-126	Main Control Room Normal Air Intake	Air	Off-line Gas	Continuously measures normal ventilation air intake into Control Room	Initiates Control Room isolation	8.5.5
1-RE-90-130	Containment Purge Air Exhaust	Air	Off-line Gas	Measures Containment Bldg. releases to environment	Initiates containment ventilation isolation. Also isolates Aux. Bldg. ventilation exhaust & causes startup of ABGTS during refuel operations.	8.5.6
1-RE-90-131	Containment Purge Air Exhaust	Air	Off-line Gas	Measures Containment Bldg. releases to environment	Initiates containment ventilation isolation. Also isolates Aux. Bldg. ventilation exhaust & causes startup of ABGTS during refuel operations.	8.5.6
Off-Line Liquid Monitors:						
1-RE-90-120 -121	Steam Generator Blowdown Liquid	Water	Off-line Liquid	Measures releases to environment	Terminates release and diverts flow to condensate system	8.5.9
0-RE-90-122	Waste Disposal System Liquid	Water	Off-line Liquid	Measures releases to environment	Terminates discharge from liquid waste tanks	8.5.10
O-RE-90-123	Component Cooling System	Water	Off-line Liquid	Measures component cooling system activity	Closes component cooling surge tank vent valve	8.5.11

9.3 Table 9.0-3 - Radiation Monitors that Initiate Automatic Control Functions (continued)

TABLE 9.0-3
RADIATION MONITORS THAT INITIATE AUTOMATIC CONTROL FUNCTIONS

Tag No.	Name	Sample Fluid	Channel Type	Monitor Function	Control Function	Response Time Reference
1,2-RE-90-123A	Component Cooling System	Water	Off-line Liquid	Measures component cooling system activity	Closes component cooling surge tank vent valve	8.5.11
0-RE-90-225	Condensate Demineralizer Regenerant Waste Discharge	Water	Off-line Liquid	Measures condensate demineralizer regenerant effluent activity	Terminates discharge to Cooling Tower blowdown	8.5.17
<u>On/In-line Monitors</u>:						
0-RE-90-102	Spent Fuel Pool Area Accident Monitor	N/A	Area	Monitors Spent Fuel Pool for fuel damage	Isolates Auxiliary Bldg. ventilation exhaust and causes startup of ABGTS. Also initiates containment vent isolation during refuel operations.	8.5.14
0-RE-90-103	Spent Fuel Pool Area Accident Monitor	N/A	Area	Monitors Spent Fuel Pool for fuel damage	Isolates Auxiliary Bldg. ventilation exhaust and causes startup of ABGTS. Also initiates containment vent isolation during refuel operations.	8.5.14
0-RE-90-118	Waste Disposal System Gas Effluent	Air	In-line Gas	Continuously monitors gaseous release from waste gas decay tanks	Terminates release from the waste gas decay tanks	8.5.21

9.4 Table 9.0-4 - Radiation Monitoring Functions

TABLE 9.0-4
RADIATION MONITORING FUNCTIONS

Tag No.	Service	Primary Safety Function (2)	RG 1.97 Post Accident Monitoring Function	High Alarm Safety Limit Reference (3)
Particulate, Iodine, & Noble Gas Monitors:				
0-RE-90-101	Effluent	No	Yes	ODCM
1-RE-90-106	Airborne	No(4)	No	8.5.3
1-RE-90-112	Airborne	No(4)	No	8.5.3
1-RE-90-119	Effluent	No	Yes	ODCM
0-RE-90-132	Effluent	No	No	ODCM
1,2-RE-90-400	Effluent	No	Yes	ODCM
1,2-RE-90-402	Effluent	No	Yes	N/A
1-RE-90-404	Effluent	No	Yes	ODCM
Off-Line Gas Monitors:				
0-RE-90-125	Process	Yes	No	8.5.5
0-RE-90-126	Process	Yes	No	8.5.5
1-RE-90-130	Process	Yes	No	8.5.6, ODCM
1-RE-90-131	Process	Yes	No	8.5.6, ODCM
0-RE-90-205	Process	Yes	No	8.5.5
0-RE-90-206	Process	Yes	No	8.5.5
Continuous Tritium Sampler:				
0-SMPL-90-800	Effluent	No	No	N/A
1,2-SMPL-90-801	Effluent	No	No	N/A
Off-Line Liquid Monitors:				
1-RE-90-120,121	Effluent	No	No	ODCM
0-RE-90-122	Effluent	No	No	ODCM
0-RE-90-123	Process	No	No	8.5.11
1,2-RE-90-123A	Process	No	No	8.5.11
0-RE-90-133,140	Process	No(4)	Yes	8.5.13
0-RE-90-134,141	Process	No(4)	Yes	8.5.13
0-RE-90-225	Effluent	No	No	ODCM
On/In-Line Monitors:				
0-RE-90-102	Airborne	Yes	No	8.5.12
0-RE-90-103	Airborne	Yes	No	8.5.12
0-RE-90-118	Effluent	No	No	8.5.21
0-RE-90-212	Effluent	No	No	ODCM
1-RE-90-421	Effluent	No	Yes	(3)
1-RE-90-422	Effluent	No	Yes	(3)
1-RE-90-423	Effluent	No	Yes	(3)
1-RE-90-424	Effluent	No	Yes	(3)

9.4 Table 9.0-4 - Radiation Monitoring Functions (continued)

TABLE 9.0-4
RADIATION MONITORING FUNCTIONS

Tag No.	Service	Primary Safety Function (2)	RG 1.97 Post Accident Monitoring Function	High Alarm Safety Limit Reference (3)
Area Type Detectors:				
1,2-RE-90-001	Area	No	No	BY RADCON
1-RE-90-002	Airborne	No	No(1)	BY RADCON
0-RE-90-003	Area	No	No	BY RADCON
0-RE-90-004	Area	No	No	BY RADCON
0-RE-90-005	Area	No	No	BY RADCON
1,2-RE-90-006	Area	No	No	BY RADCON
1,2-RE-90-007	Area	No	No	BY RADCON
1,2-RE-90-008	Area	No	No	BY RADCON
0-RE-90-009	Area	No	No	BY RADCON
1,2-RE-90-010	Area	No	No	BY RADCON
0-RE-90-011	Area	No	No	BY RADCON
1-RE-90-059	Area	No	No	BY RADCON
1-RE-90-060	Area	No	No	BY RADCON
1-RE-90-061	Area	No	No	BY RADCON
0-RE-90-135	Area	No	Yes	BY RADCON
0-RE-90-230	Area	No	No	BY RADCON
0-RE-90-231	Area	No	No	BY RADCON
1-RE-90-271	Airborne	Yes	Yes	8.5.15
1-RE-90-272	Airborne	Yes	Yes	8.5.15
1-RE-90-273	Airborne	Yes	Yes	8.5.15
1-RE-90-274	Airborne	Yes	Yes	8.5.15

Notes:

(1) Provides backup post-accident monitor capability, not required by WB-DC-30-7 (Reference 8.3.5).

(2) This column represents only primary safety related functions as defined in Section 3.0.

(3) See also the applicable setpoint and scaling documents.

(4) see discussion in text regarding safety related, seismic, and electrical power classifications in the Q-List and in Table 9.0-1.

Source Notes
(Page 1 of 1)

Source Note Number	Source Note Tracking Number/Document	Applicable Sections/Summary
1	CATD 22911-WBN-01	Various - Not Specifically Noted
2	NCO850404193	3.1.4B, 3.1.4C, 3.1.4E -Automatic Termination of Liquid Discharges
3	NCO850404354	3.1.2B, 3.1.2C -Requirement for Radiation Monitors in Control Building Air Intake
4	NCO850404213	3.1.5D -High Range Radiation Monitors in Upper and Lower Compartments
5	NCO820253045	3.1.5D -Containment High Range Monitor
6	NCO850404214	3.1.5D -High Range Radiation Monitors in Upper and Lower Containment
7	NCO890112037 and MSC-04387	1.0 -Revise Design Criteria to Establish Design Basis
8	NCO850192001	3.1.1B, 3.1.1C, 3.1.1E, 3.1.1F, 3.1.1G, 3.1.2D, 3.1.6B -Provide Capabilities for Continuous Collection of Effluents (Gaseous) When Exhaust Flows Occur
9	NCO920054491	3.1.6C -Provide Radiation Monitors Around Fuel Storage Area
10	50.55(e) 390/86-49	Various - not specifically and 391/86-46 noted

Enclosure 2
TVA Letter Dated October 29, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

Attachment 7

General Atomics Detector Type Comparison

DETECTOR TYPE COMPARISON

LOOP	OLD DETECTOR TYPE	NEW DETECTOR TYPE
271 - 274	**RD-23**	**RD-23 same detector type supplied**

LOOP	OLD DETECTOR TYPE	NEW DETECTOR TYPE
130 & 131	**RD-32 Gas** 31 in height X13.25 in square, vertical ¾ - 150 # raised face flange inlet/outlet Weight 950# Circular mating connectors 2 SCFM flow rate 2 in dia. PMT with 0.01 thk X2.125 od, plastic Phosphor Scintillator RCA PMT 6342A Checksource .5 µCi Cl^{36}	**RD-52A-40D** 16 in h X 15 in w X 25 in d, circular lead shield 4 in 4 lead shielding Weight 1300 # Standard BNC for signal and MHV for high voltage 2 SCFM Nominal flow rate 2 in dia. PMT type 9856KA with 0.01 thk X2.125 od, plastic Phosphor Checksource 0.15 µCi Cl-36
		Iodine and Particulate Filters on skid

LOOP	OLD DETECTOR TYPE	NEW DETECTOR TYPE
106	**RD-32 Gas** 31 in height X13.25 in square, vertical ¾ - 150 # raised face flange inlet/outlet Weight 950# Circular mating connectors 2 SCFM flow rate 2 in dia. PMT with 0.01 thk X2.125 od plastic Phosphor Scintillator RCA PMT 6342A Checksource .5 µCi Cl^{36}	**RD-59-30D** 9 in h X 13 in w X 20 in d, rectangular lead shielding Built in ½ in inlet and outlet lines with 3/8 drain 3 in 4 lead shielding Sample pressure, 15 psig maximum Weight 1200 # 4 SCFM max flow rate Standard BNC for signal and MHV for high voltage 2 in dia. PMT type 9856KA 0.01 thk X2.125 od, plastic Phosphor Checksource 0.15 µCi Cl-36
		Iodine filter cartridge on skid
	RD-36 Moving filter Particulate 4 SCFM sampling area 1 in sample inlet /outlet Laminated glass filter paper with spun-bonded polyester Integrated preamplifier Circular mating connectors Checksource 0.10 µCi Cl^{36} 0.01 thk X 0.63 OD phosphor 2 in dia.PMT type 9856KA Laminated Filter glass, spun-bonded polyester	**RD- 56C** 12 in h X 23 in w X 12 in d, rectangular assembly Weight 350 # ½ in inlet/outlet sample lines 2 in lead shield Standard BNC for signal and MHV for high voltage Checksource 0.07 µCi Cl-36 PMT type 931B 1.5X.75X.01 thk, plastic phosphor Laminated glass filter paper with spun-bonded polyester

LOOP	OLD DETECTOR TYPE	NEW DETECTOR TYPE
112	**RD-32 Gas** 31 in height X13.25 in square, vertical ¾ - 150 # raised face flange inlet/outlet Weight 950# Circular mating connectors 2 SCFM flow rate 2 in PMT with 0.01 thk X2.125 od, plastic Phosphor Scintillator RCA PMT 6342A Check source .5 µCi Cl^{36}	**RD-52A-40D** 16 in h X 15 in w X 25 in d, circular lead shield 4 in 4 lead shielding Weight 1300 # Standard BNC for signal and MHV for high voltage 2 SCFM Nominal flow rate 2 in dia. PMT type 9856KA with 0.01 thk X2.125 od, plastic Phosphor Checksource 0.15 µCi Cl-36
	RD35 Iodine 21.9 in height X12.5 in w X 10 in d, Vertical 1 in inlet/outlet sample lines Weight 390# Built in preamplifier Circular mating connectors Cheecksource 8 µCi Ba-133 2x2 NaI (Ti) crystal, PMT type 9856KA Laminated Filter glass, spun-bonded polyester Filter cartridge	**RD- 59-30D** 9 in h X 13 in w X 20 in d, rectangular lead shielding Built in ½ in inlet and outlet lines with 3/8 drain 3 in 4 lead shielding Weight 1200 # 4 SCFM max flow rate Standard BNC for signal and MHV for high voltage Dual Checksource assembly included Checksource 8 µCi Ba-133 47 mm Iodine cartridge 2x2 NaI (Ti) crystal, PMT type 9856KA
	RD-36 Moving filter Particulate 4 SCFM sampling area 1 in sample inlet /outlet Laminated glass filter paper with spun-bonded polyester Integrated preamplifier Circular mating connectors Checksource 0.10 µCi Cl^{36} .01 thk X 0.63 od, phosphor PMT type 9856KA Laminated Filter glass, spunbonded polyester	**RD- 56C** 12 in h X 23 in w X 12 in d, rectangular Weight 350 # ½ in inlet/outlet sample lines 2 in lead shield Standard BNC for signal and MHV for high voltage Checksource 0.07 µCi Cl-36 PMT type 931B 1.5X.75X.01 thk, plastic phosphor Laminated glass filter paper with spun-bonded polyester

Enclosure 2
TVA Letter Dated October 29, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

Attachment 8

Unit 1 PAM Variables Changed Under 10 CFR 50.59 Listing And 50.59 Documents.

Reg. Guide 1.97 50.59 Listing

Var. #	Variable Name	U2 Variable Source	U1 50.59?	Notes
5	Containment Sump Level (Wide Range)	Eagle 21	Y	DCN 39608
9	RCS Pressurizer Level (NOTE)	Eagle 21	N	Recorder not yet replaced on Unit 1
10	RCS Pressure Wide Range (NOTE)	Eagle 21	N	Recorder not yet replaced on Unit 1
11	RCS Temperature T Cold	Eagle 21	Y	DCNs: 52331, 52028
12	RCS Temperature T Hot	Eagle 21	Y	DCNs: 52331, 52028
14	Steam Generator Level (Narrow Range)	Eagle 21	Y	DCNs: 51443, 51310
15	Steam Generator Pressure	Eagle 21	Y	DCN: 52389
20	Control Rod Position	CERPI	Y	DCNs: 52957, 52265, 51666, 51072, 50681
53	ERCW Supply Temperature	ICS	Y	DCN: 39911
58	Inverter Current (120V ac Vital)	Ammeter shunt	Y	DCNs: 51370, 51368
59	Inverter Voltage (120V ac Vital)	Direct	Y	DCNs: 51370, 51368
63	Main Feedwater Flow	Eagle 21	Y	DCNs: 51443, 51310
66	Pressurizer Heater Status (Electric Current)	ICS	Y	DCN: 39911
73	RHR Heat Exchanger Outlet Temperature	Foxboro IA	Y	DCN: 52028
82	Steam Generator Level (Wide Range)	Eagle 21	Y	DCNs: 51443, 50917
83	Main Steam Flow	Eagle 21	Y	DCNs: 51443, 51310

NOTE: The original response showed these variables as changed under 10 CFR 50.59. The response was based on the plan to replace all paper recorders in Unit 1. The assumption was that these recorders would be replaced prior to Unit 2 startup. While this may still occur, the recorders have not been replaced at this time and the 50.59 column has been changed from Y to N.

QA Record

SAFETY ASSESSMENT/SCREENING REVIEW/SAFETY EVALUATION COVERSHEET

Safety Assessment/Screening Review Only ☐ Safety Assessment/Screening Review/Safety Evaluation ☒

Safety Assessment/Evaluation Revision No. 0

If Not Rev. 0, Previous Revision's RIMS No. (if applicable)

RIMS Accession No

T28 980318 807

Plant WBN Affected unit(s) 1

	Activity	**Number** (Include Revision No.)	
☒	Design Change	DCN No.	W-39608-A
☐	Engineering Document Change	EDC No.	
☐	Temporary Alteration	TACF No.	
☐	Special Test/Experiment	Special Test No.	
☐	Temporary Shielding Request	TSRF No.	
☐	Procedure Change	Procedure No. and	
☐	New Procedure	PCF No. (if applicable)	
☐	Maintenance	Procedure No.	
		WR/WO No.	
☐	Other (Identify)		

Comments:

Brief Description/Comments: This DCN replaces the four Containment Sump level transmitters 1-LT-63-180, -181, -182 & -183.. These instruments provide input to level switches which are the permissive to switch over from RWST to recirculation from the sump. These transmitters also input into indicators used for Post Accident Monitoring (PAM) indication. These instrument loops are required for Tech Spec compliance. The instrumentation and indication are not described in enough detail in the FSAR to require a text revision, except for FSAR Table 7.5-2, which will be revised to reflect the new instrument range.

Distribution

cc: RIMS
Site 10CFR50.59 Program Coordinator - F. A. KOONTZ, EQB-2N
Preparer - K. H. Moseley LP4F-C

I. SAFETY ASSESSMENT

A. Description

This DCN (M-39608-A) replaces the Containment Sump level transmitters in unit 1 (1-LT-63-180, -181, -182, and -183). The existing transmitters are Barton transmitters with a diaphragm seal and capillary tubing. The current transmitters have a problem with the capillary tubing and seal assembly leaking fill fluid, and maintaining the transmitter within calibration. The new transmitters are manufactured by Gulton Statham, are 1E qualified, do not use capillary tubing, are more accurate, and can be submersed during a LOCA. The instrument loop response time is improved.

The containment sump provides for a collection chamber for reactor coolant and ice melt following an LOCA. The sump is a water source for long term recirculation for the functions of RHR, emergency core cooling, containment atmosphere cleanup, and containment long term cooling.

The sump is in the lower containment, below the refueling cavity. This portion of containment is an open, one-level area. The water from a LOCA fills the floor area and covers the sump entrance. Four safety related level transmitters are provided to measure the containment sump level. The containment sump level transmitters provide input to allow switchover from RWST to Containment Sump and also provide input to PAM Category I indicators 1-LI-63-180 and -181. (1-LI-63-182 and -183 are not selected as PAM indicators, only 2 are required). Each transmitter provides an input to a bistable located in the Eagle racks, to form one protection channel. The bistables provide trip signals when level is above setpoint. The output of each channel is fed to both train A and B of the SSPS. Within each train, the four trip signals are combined in a 2 out of 4 circuit to produce an output that is combined with the output of the low RWST level circuit. When this logic signal is made up, the valves from the RWST are closed, and the containment sump becomes the water source for long term recirculation. Each transmitter also provides input to a common alarm.

This DCN only replaces the containment sump level transmitters. The existing permissive setpoint for switchover from RWST remains the same. Implementation of this DCN does not require any changes inside the crane wall.

The PAM requirement is to monitor from the bottom of the containment to the equivalent of 600,000 gallons of water. There is an existing deviation (Deviation 32) which documents that we presently start measuring containment level at 6 inches off the floor. This deviation does not change and is not being revised.

The range of the transmitter is changing from 0 to 20 feet (240") to 0 to 200" (16' & 8"). As stated above, the new transmitters are more accurate, which will improve instrument loop accuracy. The total volume of water available to flood containment post LOCA is 844,000 gallons considering the design criteria's maximum expected loading of 3 x 10^6 lbs. of ice, which is equivalent to a maximum steady state flood level of approximately 717' - 2-2/5". The Tech. Spec. minimum of available ice is 2.361 x 10^6 lbs of ice. The new transmitters will cover the span of 703' 3 & 3/8" to 719' 11 & 3/8". Therefore, the new transmitters' range is fully adequate to monitor the maximum equilibrium flood level, and exceeds the PAM requirements of monitoring up to 600, 000 gallons.

Implementation of this DCN requires the mounting of the new transmitters, rerouting instrument sense lines, and cables, and revising the dropping resistor at the Eagle racks. The setpoint will not change, and indication scales are not affected as they currently read in 0 - 100% scale. Operating procedures will be affected to reflect the change in transmitter range represented by the 0 - 100 % indicators.

This DCN is staged, which will allow for partial implementation in a situation where there is a failure of one of the existing transmitters.

Implementing the proposed activities may require revision of existing plant procedures, and/or the issuance of new plant procedures of the following types to maintain and operate the equipment during normal plant conditions.

- Maintenance Instructions (MIs)
- Instrument Maintenance Instructions (IMIs)
- Surveillance Instructions (SIs)
- System Operating Instructions (SOIs)
- General Operating Instructions (GOIs)
- Special Maintenance Instructions (SMIs)
- Periodic Instructions (PIs)
- Annunciator Response Instructions (ARIs)
- Fuel Handling Instructions (FHIs)

These procedures shall integrate the requirements contained within this design change package. Revision to these procedures for reasons other than implementation of this modification are not within the scope of this Safety Assessment. Functional impacts of the revision to these procedures to implement these changes are not within the scope of this Safety Assessment. Functional impacts of any required procedure changes must be reviewed by those responsible for the procedure revision per SSP-2.03.

References

1. Watts Bar System Description Manual, N3-74-4001, R4, Residual Heat Removal System
2. Watts Bar System Description Manual, N3-63-4001, R5, Safety Injection System
3. Watts Bar System Design Criteria, WB-DC-30-7, Post Accident Monitoring System
4. Watts Bar System Design Criteria, WB-DC-30-4, Separation/Isolation
5. UFSAR 7.5 Reactor Trips
6. UFSAR Chapter 15 Accident Analysis
7. DCN M39608-A
8. Gulton-Statham Qualification Test Report: PER 1006, Contract 223019
9. Watts Bar SER

B. Safety Assessment Checklist

SAFETY ASSESSMENT CHECKLIST

SAFETY ASSESSMENT CHECKLIST

	Potential Impact On Nuclear Safety	N/A	
1.	☒	☐	Fire Protection (Appendix R)
2.	☐	☒	Internal Flooding Protection (MELB)
3.	☐	☒	Pipe Breaks
4.	☐	☒	Pipe Whip
5.	☐	☒	Modification to Non-Seismic Areas in CB/AB
6.	☐	☒	Jet Impingement Effects
7.	☒	☐	Seismic/Dead Weight
8.	☒	☐	Internal/External Missiles
9.	☐	☒	Heavy Load Lifts or Safe Load Paths (NUREG-0612)/External Missiles
10.	☐	☒	Toxic Gases
11.	☐	☒	Hazardous Material
12.	☒	☐	Human Factors
13.	☒	☐	Electrical Separation/Isolation
14.	☒	☐	Primary Containment Integrity/Isolation
15.	☐	☒	Secondary Containment Integrity/Isolation
16.	☒	☐	Equipment Reliability
17.	☐	☒	Materials Compatibility
18.	☒	☐	Single Failure Criteria
19.	☐	☒	Control Room Habitability
20.	☒	☐	Environmental Qualification Category
21.	☒	☐	Equipment Failure Modes
22.	☐	☒	Tornado or External Flood Protection
23.	☐	☒	Protective Coatings Inside Containment
24.	☒	☐	Water Spray/Condensation
25.	☒	☐	System Design Parameters
26.	☒	☐	Test and Retest Scoping Document (Post Modification Test)
27.	☐	☒	Chemistry Changes or Chemical Release Pathways
28.	☒	☐	Equipment Redundancy
29.	☐	☒	Equipment Diversity

SAFETY ASSESSMENT CHECKLIST

SAFETY ASSESSMENT CHECKLIST

	Potential Impact On Nuclear Safety	N/A	
30.	☒	☐	Physical Separation
31.	☒	☐	Electrical Loads
32.	☒	☐	Response Time of Emergency Safeguards Equipment
33.	☒	☐	Safety Injection/Core Cooling Capability
34.	☒	☐	Decay Heat Removal Capability
35.	☐	☒	Reactor Coolant Pressure boundary
36.	☐	☒	Reactor Core Parameters
37.	☐	☒	Pipe Vibration
38.	☐	☒	Security System
39.	☐	☒	Scaffolding
40.	☐	☒	Electrical Breaker Alignment Changes
41.	☐	☒	Instrument/Relay Settings
42.	☐	☒	Compensatory Measure
43.	☐	☒	Environmental Impact Statement (See STD-13.3)
44.	☒	☐	Design Basis Document
45.	☐	☒	Radwaste System Changes
46.	☐	☒	Valve Alignment Changes
47.	☐	☒	Shield Building Integrity (SQN/WBN)
48.	☐	☒	New Radioactive Effluent (Liquid or Gaseous) Release Pathways
49.	☒	☐	Temporary Shielding
50.	☒	☐	Instrument Setpoints
51.	☐	☒	ASME Section XI
52.	☐	☒	Shutdown Reactivity Control
53.	☐	☒	Ventilation Cooling for Electronic Equipment
54	☐	☒	Requires an increase in operator staffing to complete newly required actions
55	☒	☐	EMI/RFI Potential
56	☐	☒	Erosion/Corrosion/MIC
57	☐	☒	Digital Upgrade (NRC Generic Letter 95-02)

C. Acceptability From a Nuclear Safety Standpoint

There were no items found in the checklist for which this modification will potentially reduce nuclear safety. The following checklist items are applicable to this modification and are discussed in detail.

1. Fire Protection (Appendix R)

Fire barriers will be breached and resealed in accordance with appropriate plant procedures during the implementation of this DCN. An appendix R checklist has been completed and this modification is designed and will be installed in accordance with Appendix R principals.

7. Seismic/Dead Weight

The new transmitters and all associated work of mounting and installing instrument tubing and electrical conduits has analyzed for seismic I component integrity and position retention for their location by Civil Engineering. This change is safe for additions or deletions to plant seismic/dead weights. Reference Civil calculation: WCG ACQ 0557.

8. Internal/External Missiles

The new transmitters are located outside the crane wall. There are no potential missiles in the areas in which these transmitters and associated cabling and tubing are located. The new transmitters associated cabling and instrument tubing is seismically supported. All equipment in containment where the transmitters, cabling, and associated tubing is located, is qualified as a minimum to meet IL B requirements, will therefore not create the potential for a missile. Therefore, this DCN will not increase the potential of an accident due to a missile hazard, and nuclear safety is not decreased.

12. Human Factors

The operator's interface in the control room is affected by this DCN. The layout for the associated indicators and alarms will be replaced to reflect the new range. The single point indicators will have a 0 - 200 inch / 0 - 100% dual scale. Operator responses to the indicator and alarms are not changed by this DCN. Partial implementation of this DCN will require administrative controls to identify procedural differences between affected instrument loops. The effective setpoint has not changed, and the existing scale of 0 - 100 % on the indicators will still be utilized. However, as identified in the Human Factors Evaluation, with the span differences between transmitters (during partial implementation), the scales on the meters will have different equivalent levels. As evaluated in the Human Factor's Evaluation, it has been determined that the scope of this DCN will not adversely affect plant operations. Color banding on the indicator scales will help distinguish the replaced scales in the control room.

13. Electrical Separation/Isolation

The instruments involved are safety related. The modification will be performed in accordance with WB-DC-30-4, "Separation/Isolation" such that there are no adverse impacts on class 1E equipment through proximity or through the power system. These instruments are adequately protected by protective device (fuse/breaker) coordination.

14. Primary Containment Integrity/Isolation

This DCN replaces four safety related level transmitters which are located in the raceway. The replacement transmitters are qualified to perform their function and provide input to the logic circuit to isolate containment from the RWST as the original transmitters. This DCN utilizes the same electrical penetrations as the existing instrument loops, and no changes are required at the penetrations. Therefore, primary containment integrity/isolation has not been degraded.

16. Equipment Reliability

This DCN is replacing obsolete equipment, this modification results in more reliable instrumentation and indication to the operator. The probability of swap-over at an incorrect setpoint or a failure due to loss of diaphragm seal fluid, will be decreased. Equipment reliability is improved and nuclear safety is not decreased by this modification.

18. Single Failure Criteria

This DCN is replacing obsolete equipment, this modification results in more reliable instrumentation and indication to the operator. The system logic is for a 2 out the 4 transmitters (high containment sump level) logic as input to the swap-over logic from the RWST. A single failure of a transmitter loop will not impact this logic function, as three other transmitters can still make up this logic function. The new transmitters are IE qualified, and a common mode failure is not credible. The same type of transmitters have been used in the same application at Sequoyah for a number of years, with no failures.

20. Environmental Qualification Category

The new transmitters are 1E safety related devices, which have been qualified to operate at their specific locations. A location specific dose calculation was performed for the transmitters (WBNAPS3-090), and other applicable environmental considerations are documented in EQ binder WBNEQ-LT-002. This binder requires the replacement of these transmitters, approximately every 7 ½ years. This will ensure the functionality and the accuracy of the instrument remains within the parameters analyzed in the Demonstrated Accuracy Calculation 1-LT-63-180, and can perform their function in the event of an accident.

21. Equipment Failure Modes

The replacement transmitters are 1E safety related and are also qualified to operate in the environment they will be installed. These are the same type of transmitter (differential pressure sensing) as the existing Barton transmitters. No new failure modes will be introduced from implementing this DCN. One failure mode is eliminated because the new transmitters do not use a closed capillary system and the potential of the failure of a diaphragm seal does not exist. The failure mode of the new transmitter is identical to the old transmitter. If a failure of one of the transmitters was low as would occur for loss of power, signal degradation, or pressure sensor failure, the signal may remain below setpoint. The other three loops would be available to perform the required signal to initiate swap-over. If the transmitter failed with a high output, such as may occur for a power supply regulation failure or a sensitized sensor, the resultant signal may be above the setpoint. In this case, half of the swap-over logic (2 out of 4) would be made up, which could not create a spurious actuation of any control function by its self. There are no expected common mode failures. These failure effects are no different than what is currently applicable with the existing Barton dp transmitters. Therefore, no new failure modes will be introduced from implementing this DCN.

24. Water Spray/Condensation

The design has considered the effects of water spray and condensation on these instruments. The design includes a condensation chamber on the low pressure side of the instrument to collect condensation during normal and accident conditions, and ensure accurate operation of the instrument loops. The high pressure side is routed downward through the transmitter and tied directly to the lower sensing point. Any condensation on the high pressure side would drain through the transmitter and onto the containment floor. Therefore, condensation will not be a problem. For water spray considerations, the sense lines are routed above the maximum expected flood level in containment, with the vented sense lines pointed down to prevent sprayed water from entering the sense line. This also allows for condensation to drain out of the sense line.

25. System Design Parameters

The basic configuration and requirements for the monitoring Containment Sump level have not changed. Only the method of monitoring the required parameters is changing and the instrumentation is being upgraded to be more reliable and useful to the operator. Nuclear Safety is not decreased.

26. Test and Retest Scoping Document (Post Modification Test)

A test scoping document has been written to require pressure testing of the instrument sense line and for the tubing assembly used as a conduit. The testing is to be performed after implementation, and is also required any time the tubing/conduit assemblies are reworked. This test ensures pressure boundary integrity is maintained. In the event of an accident, the low pressure side of the transmitter is correctly referenced to atmosphere, and the instrument pigtails will remain dry. Performance of these tests ensures instrument accuracy is maintained.

28. Equipment Redundancy

The configuration of equipment redundancy is being maintained for this function. There are four separate instrument loops, which independently function to initiate the required 2 out of 4 logic signal for containment sump level high.

30. Physical Separation

The instruments involved are safety related. The modification will be performed such that physical separation is maintained for this type of IE equipment and associated sense lines and cables.

31. Electrical Loads

The replacement level transmitters are being supplied from the existing power supply for the existing Barton transmitters, which is from the Eagle 21 system. Though the transmitter is being replaced with a different model, and the dropping resistor value is also changing, the change is negligible due to the total loop resistance is within the normal load limitation for adequate supply voltage of the Eagle 21 system, and does not affect loading.

32. Response Time of Emergency Safeguards Equipment

For the R.G. 1.97 function, a response time analysis is not required since electronic loops respond within a few seconds. The resultant operator recognition and response is very slow compared to this. For the swapover function, a response time analysis is not required since these loops only makeup part of the logic, where the containment sump level swapover point is reached prior to the RWST Low level swapover point. That is, the minimum RWST inventory will flood the sump to above the containment sump level transmitter setpoint before the RWST is emptied to the RWST low level transmitter setpoint.

33. Safety Injection/Core Cooling Capacity

This DCN replaces the existing Barton transmitters which utilized a silicon filled diaphragm seal system. The new instrumentation is more accurate, and operates at the existing setpoint which assures adequate reliability for switchover. Implementation of this DCN improves the accuracy of the control loop, which in turn ensures sufficient inventory is available in the sump prior to swapover and that acceptable sump level is detected. This ensures the capability of the Safety Injection and core cooling to perform their function as designed.

34. Decay Heat Removal Capability

This DCN replaces the existing Barton transmitters which utilize a silicon filled diaphragm seal system. The new instrumentation is more accurate, and operates at the existing setpoint which assures adequate reliability for switchover. Implementation of this DCN improves the accuracy of the control loop, which in turn ensures sufficient inventory is available in the sump prior to swapover and that acceptable sump level is detected. This ensures the capability of the Decay Heat Removal System to perform its function as designed.

44. Design Basis Document

System Design Criteria, Post Accident Monitoring System, WB-DC-30-7, is being revised as a part of this DCN to clarify the description of the existing deviation number 32, which discusses the range of the Containment Sump level transmitters. Deviation 32 documents that we presently start measuring containment level at 6 inches off the floor. This deviation does not change and is not being revised. No new deviations are being taken against R.G. 1.97. This change is to reference the revised upper level being monitored.

System Description N3-63-4001 is being revised to reflect the change in the % of range used for verifying leak detection in the containment. The value has not changed, only the equivalent percent of range has changed.

A new exception was taken to WB-DC-30-5 to allow the use of vendor supplied pigtails on the transmitters rather than cables qualified to IEEE 383 for vertical flame test requirements. The vendor pigtails were qualified to a different standard and are qualified for this application.

A new exception to WB-DC-30-22 that required flexible conduit to be used in seismic considerations was taken to allow the use of the seismically qualified tubing used to maintain the cables in a dry watertight conduit considering the effects of a LOCA.

A new exception was also taken against G-40 for routing the associated cables below the maximum flood level. This was acceptable based upon the previous exception which maintains the cables in a dry, watertight environment

A new exception to N3E-934 was taken which requires that potentially radioactive processes have their drains and high point vents permanently piped to the closed drain system. This application does not utilize drain lines or high point vents, as it is not a part of a potentially contaminated process system which would need to be controlled and diverted to the Radwaste drain system. Another exception to N3E-934 was for slope requirements for liquid filled sense lines of sloping down from the root valve to the instrument. The sense line in this application was routed to eliminate the effects of condensate buildup as described above and ensure an accurate reference leg to the instrument.

49. Tempory Shielding

Tempory shielding may be required during implementation of this DCN. All work requiring shielding will be controlled based on Rad Con procedures.

50. Instrument Setpoints

Because the transmitters range is changed, this DCN modifies operator action setpoints in percent of span used for the SDPS display. The previous value was < 80 % of span . The new value is < 83 % of span. This is not a control setpoint, but is used for operations monitoring of the containment sump level to determine if the water level is greater than the maximum equilibrium level. If water is greater than this value, then there is the potential for the inventory to be supplemented from a source beyond that analyzed for a LOCA. The equivalent swapover setpoint and EOP setpoint values in inches of water has not been changed by this DCN. Therefore, this DCN does not affect directly or indirectly the operations at the facility. Westinghouse calculation WCAP 12096 shows the loop accuracy is within the previous calculated loop accuracy, therefore, with the swapover setpoint (in inches) unchanged, the safety margin is not affected.

55. EMI/RFI

The new equipment being installed has been documented to meet the requirements of TVA Standard Specification E18.14.01 for on EMI/RFI through FCC testing. Therefore, the potential for spurious actuation's from these transmitters, or the causing of an actuation of another device because of these new transmitters is not likely.

D. **Safety Assessment - Review and Approvals**

Preparer: Ken Moseley Date: 3/13/98
Name Signature

Reviewer: Shawn Cutts Date: 3/13/98
Name Signature

Other: Reviewers (as appropriate) Date:
Name/Organization Signature

SCREENING REVIEW

II. SCREENING REVIEW

A. Potential Technical Specification (T/S) Impact

Yes ☐ No ☒ Is a change to the T/S required for conducting or implementing the change (design or procedure), test, or experiment?

Justification: The instrumentation affected by this DCN is included in the Technical Specifications. The DCN does not affect the existing instrument setpoints, decrease margin or modify how the system operates, and the Tech Specs are not affected.

If the answer is "Yes", a T/S change is required prior to implementation or the activity needs to be revised or canceled.

B. Is an SE obviously required?

Yes ☐ No ☒ If yes, provide basis for conclusion and proceed to Part D.

C. Potential Safety Analysis Impact

Yes ☐ No ☒ Is this a special test, or experiment not described in the SAR?

Does the proposed activity affect (directly or indirectly) any information presented in the SAR or deviate from the description given in the SAR?

Yes ☒ No ☐ By changing: the system design or functional requirements; the technical content of text, tables, graphs, or figures? (For radwaste changes see Note in Appendix B for guidance.)

Justification: The text is not affected by this change. Only the equipment with which a function is accomplished as described in the FSAR is changed. However, FSAR Figure 10.2.4 (1-47W610-47-3) will be revised due to this modification. The FSAR drawings will be updated in accordance with NADP-7, "FSAR Management".

Does the proposed change involve new procedures or instructions or revisions thereof that:

Yes ☐ No ☒ NA ☐ Differ with system operation characteristics from that described in the SAR?

Yes ☐ No ☒ NA ☐ Conflict with or affect a process or procedure outlined, summarized, or described in the SAR?

Justification: This change does not involve procedures that affect system operational characteristics described in the FSAR or impact compliance with the Technical Specification. Maintenance procedures will be revised to address equipment specific changes. Operational procedures will be revised only to reflect the range in which the 0 - 100 % control room meters represent. These procedures are not outlined, summarized or described in the SAR. This change does not conflict with or affect any processes or procedures outlined, summarized, or described in the FSAR

If the questions are answered "No" or "N/A," the activity may be implemented without further evaluation. If any question is answered "Yes," an SE is required.

D. Screening Review - Review and Approvals

Preparer: Ken Moseley (Name) Ken Moseley (Signature) Date: 3/13/98

Reviewer: Sherry Cutts (Name) (Signature) Date: 3/13/98

Other: Reviewers (as appropriate) ______ (Name/Organization) ______ (Signature) Date: ______

SAFETY EVALUATION

A. **Description and Accident Evaluation:**

Detailed description of the change, test, or experiment, including the design basis accident, and credible failure modes of activity. Summarize why the activity does or does not constitute a USQ.

This DCN (M-39608-A) replaces the Containment Sump level transmitters in unit 1. The existing transmitters are Barton transmitters with a diaphragm seal and capillary tubing. These existing transmitters have a problem with the capillary tubing leaking fill fluid, and maintaining the transmitter within calibration. The new transmitters are 1E qualified, do not have capillary tubing, are more accurate, and can be submersed during a LOCA. This change upgrades equipment used to perform a function. Functional performance of the plant is not affected and protective logic is not affected.

The range of the transmitter is changing from 0 to 20 feet (240") to 0 to 200" (16' & 8") which will improve instrument loop accuracy. The existing setpoint for switchover from RWST remains the same. The new transmitters' range is fully adequate to monitor the maximum equilibrium flood level, which is above the PAM requirement of 600,000 gallons.

The sump is in the lower containment, below the refueling cavity. The sump is a water source for long term recirculation for the functions of RHR, emergency core cooling, containment atmosphere cleanup, and containment long term cooling. The transmitters will be located just outside the sump in the raceway. These transmitters are associated with the protective features used to detect and mitigate the effects of Condition III & IV events associated with a LOCA. Four safety related level transmitters (one per channel) are provided to measure the containment sump level. These transmitters provide input to allow switchover from RWST to Containment Sump recirculation and also provide input to PAM Category I indicators 1-LI-63-180 and -181. The four containment sump level high trip signals are combined in a 2 out of 4 circuit to produce an output that is combined with the output of the RWST low level switches. When this logic signal is made up the valves from the RWST are closed, and the containment sump becomes the water source for long term recirculaiton.

Implementation of this DCN requires the mounting of the new transmitters, rerouting instrument sense lines, and cables, and revising the dropping resistor at the Eagle racks. The setpoint will not change, and indication scales are not affected as they currently read in 0 - 100% scale.

This change upgrades existing plant equipment. The failure modes of the replacement equipment do not differ from the equipment being replaced, and common mode failure has been demonstrated not to be an issue based on experience with these types of transmitters at Sequoyah. The installed loops (equipment and cable/conduit) are separated physically and electrically. Proper separation/isolation of cable routing and equipment is maintained by the DCN and appropriate plant installation procedures. The independence of safety related equipment is not challenged. Civil calculations have been performed to verify that, when installed per the DCN, the equipment will remain able to perform it's function following a seismic event. The equipment has been tested and the test report reviewed documenting the new transmitters are not to be susceptible to EMI/RFI and will not cause radiated emissions outside the requirements of DS-E18.14.01 and adversely affect the operation of surrounding equipment. This change will not compromise the ability of plant safety-related equipment to perform its intended function. Westinghouse calculation WCAP 12096 shows the loop accuracy is within the previous calculated loop accuracy, therefore, with the swapover setpoint unchanged, the safety margin is not affected.

B. Evaluation of Effects

B.1 May the proposed activity increase the probability of an accident previously evaluated in the SAR? Yes ☐ No ☒

Justification: This DCN affects only monitoring devices used for PAM Cat I and protective functions. It does not add or modify any plant systems which failure can result in an accident. This change does not modify any interfaces with plant systems whose failure can result in an accident. This change will not increase the likelihood of a design basis accident.

B.2 May the proposed activity increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR? Yes ☐ No ☒

Justification: This change, DCN M-39242-A, replaces existing equipment with more reliable instrumentation. The instrumentation and associated cable, conduit and sense lines are qualified and installed to operate in their environment. Therefore the probability of an inadvertent failure is not increased. These transmitters provide input to allow switchover from RWST to Containment Sump and also provide input to PAM indicators 1-LI-63-180 and -181. Each transmitter provides an input to a bistable located in the Eagle racks, to form one protection channel. The bistables provide trip signals when level is above setpoint. The output of each channel is fed to both train A and B of the SSPS. Within each train, the four trip signals are combined in a 2 out of 4 circuit to produce an output that is combined with the output of the low RWST level circuit. When this logic signal is made up the valves from the RWST are closed, where the containment sump is the water source for long term recirculation. Each transmitter provides MCR indication and input to a common alarm. Considering the methodology the switchover logic is made up, the failure of one transmitter will not prevent system switchover from RWST to the containment sump from taking place or prevent MCR indication. This change does not introduce any additional equipment failure modes. Therefore, this change does not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

B.3 May the proposed activity increase the consequences of an accident previously evaluated in the SAR? Yes ☐ No ☒

Justification These transmitters are associated with the protective features used to detect and mitigate the effects of Condition III & IV events associated with a LOCA. The protective functional logic requirements for these transmitters has not changed. The new instrumentation is more reliable, (no capillary system) and are more accurate per WCAP 12096. The existing values in the Technical Specifications, setpoints, allowable values, and margin are not changed. The ability to respond to a LOCA has not changed. There is no adverse impact on primary and secondary containment integrity, isolation, source terms, filtration of EGTS, ABGTS or CREVS. Therefore, this DCN does not change the radiological consequences of an accident previously evaluated in the SAR:

B.4 May the proposed activity increase the consequences of a malfunction of equipment important to safety previously evaluated in the SAR? Yes ☐ No ☒

Justification: This change upgrades existing plant equipment. The failure modes of the replacement equipment do not differ from the equipment being replaced.. Proper separation/isolation of cable routing and equipment is maintained by the DCN and appropriate plant installation procedures. The independence of safety related equipment is not challenged. Civil calculations have been performed to verify that, when installed per the DCN, the equipment will retain it's position in a seismic event. The equipment has been tested and the test report reviewed documenting the new transmitters are not to be susceptible to EMI/RFI and will not cause radiated emissions outside the requirements of DS-E18.14.01 and adversely affect the operation of surrounding equipment. This change will not compromise the ability of plant safety-related equipment to perform its intended function. This change does not increase the radiological consequences of a malfunction of equipment important to safety previously evaluated in the SAR.

B.5 May the proposed activity create a possibility for an accident of a different type than any evaluated previously in the SAR? Yes ☐ No ☒

Justification: There are no functions or controls being added or revised by this change. No interfaces are changed other than the 4 - 20 mA output replacing the 10 - 50 mA output of the transmitter representing the transmitter range. Since this interface has changed (resistors replaced) and calibrations will be performed to assure the loop will function per the current design basis, this change does not create a possibility for an accident of a different type.

B.6 May the proposed activity create a possibility for a malfunction of a different type than any evaluated previously in the SAR? Yes ☐ No ☒

Justification: These transmitters provide input to allow switchover from RWST to Containment Sump and also provide input to PAM indicators 1-LI-63-180 and -181. Each transmitter provides an input to a bistable located in the Eagle racks, to form one protection channel. The bistables provide trip signals when level is above setpoint. The output of each channel is fed to both train A and B of the SSPS. Within each train, the four trip signals are combined in a 2 out of 4 circuit to produce an output that is combined with the output of the low RWST level circuit. When this logic signal is made up the valves from the RWST are closed, where the containment sump is the water source for long term recirculation. Each transmitter provides MCR indication and input to a common alarm. Considering the methodology the switchover logic is made up, the failure of one transmitter will not prevent system switchover from RWST to the containment sump from taking place or prevent MCR indication. This change does not introduce any additional equipment or control failure modes. Therefore, this change does not create a new malfunction pathway than previously evaluated in the SAR.

B.7 May the proposed activity reduce the margin of safety as defined in the basis for any Technical Specification? Yes ☐ No ☒

Justification: This DCN does not modify any system trip setpoints or indicated ranges , therefore, this DCN does not affect directly or indirectly the operations at the facility. Westinghouse calculation WCAP 12096 shows the loop accuracy is within the previous calculated loop accuracy, therefore, with the swapover setpoint unchanged, the safety margin is not affected. This change does not reduce any margin of safety identified in the basis for any Technical Specification.

C. Unreviewed Safety Question Determination Conclusion

The change, test, or experiment:

Does not involve an unreviewed safety question. ☒

Involves an unreviewed safety question and must be revised, canceled, or reviewed by the NRC prior to implementation. ☐

D. Safety Evaluation - Reviews and Approvals

Preparer: Ken Mossley Name Ken Mosley Signature Date: 3/13/98
Reviewer: Shony Cotts Name Signature Date: 3/13/98
Reviewer: (FORC/QR)[a] [redacted] Name David A. Kulick Signature Date: 3/18/98
Other: Reviewers (as appropriate) Name Signature Date:

Raw
3/18/98

[a] As required by Technical Specification.

PIC P-50169-A
Page 8

T25 990219 971

DCN M-39911-A
Page 86

SAFETY ASSESSMENT/SCREENING REVIEW/SAFETY EVALUATION COVERSHEET
Page 1 of 43

SAFETY ASSESSMENT/SCREENING REVIEW/SAFETY EVALUATION COVERSHEET

Document Number SA-M-39911-A Rev. 1

Screening Review Only ☐
Safety Assessment/Screening Review ☐
Safety Assessment/Screening Review/Safety Evaluation ☒
Procedure Exemption ☐
Procedure Change Evaluation ☐

Plant WBN
Affected Unit(s) 1
Preparing Group CEE
Preparer Stacey L. Parrott
Reviewer Robert P. Balch

Activity		Number (Include Revision No.)
☒ Design Change	DCN No.	M-39911-A
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No. and PCF No. (if applicable)	
☐ New Procedure	Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comments:
DCN M-39911-A Revision 1 (Tracking Number WBPLEE-98-093-1)

Revision: (Provide a brief summary of the reason for the revision to the SR, SA, or SE)

SA has been revised to add additional assessment of removing 1-XR-1-5 from panel 1-R-177. The SR and SE have been evaluated by this revision and upon further review it has been resolved that there was no impact to these documents. In order to verify that there are no impacts to the SR and SE, these documents have also been raised to revision 1.

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PIC P-50169-A
Page 9

T25 981214 868

DCN M-39911-A
Page 86a

SAFETY ASSESSMENT/SCREENING REVIEW/SAFETY EVALUATION COVERSHEET

Screening Review Only ☐ Safety Assessment/Screening Review/Safety Evaluation ☒
Safety Assessment/Screening Review ☐

Plant WBN
Affected Unit(s) 1
Preparing Group CEE

Preparer J. Mike Casner
Reviewer William G. Sexton

Activity	Number (Include Revision No.)	
☒ Design Change	DCN No.	M-39911-A
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No. and PCF No. (if applicable)	
☐ New Procedure	Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comments:

DCN M-39911-A Revision 0, (Tracking Number WBPLEE-98-093-0)

Revision: (Provide a brief summary of the reason for the revision to the SR, SA, or SE)

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SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 3 of 43
Rev.: 001

I. SAFETY ASSESSMENT

A. Description

1. Brief synopsis of the change, special test, experiment or condition including the systems, structures, and components affected. Include the number of the activity proposed (e.g., ECN/DCN No., procedure No.).

DCN M-39911-A, replaces the obsolete Unit 1 Westinghouse P2500 Plant Process Computer and consolidates the Emergency Response Facilities Data System (ERFDS) into a new Plant Integrated Computer System (ICS). The ICS provides an operator friendly, state of the art, real time process computer system for the WBN plant operators and Emergency Operation Facility (EOF) personnel. This modification consists of replacing the P2500 processor, data acquisition equipment, and applicable operator interface devices. Through the use of special adapters, most of the actual field terminations will remain unchanged while the scanning and converting electronics will be replaced. All input signal jumpering that resulted in redundant computer points between the P2500 and ERFDS multiplexers have been removed. These redundant points are no longer needed since the ICS can access all data directly from either the existing P2500 or ERFDS multiplexers.

After this modification; the new ICS computer will be operational and performing all functions of the old P2500 computer and most of the functions of the Emergency Response Facilities Data System (ERFDS), including SPDS, BISI, BOP, NSSS, Communications Data Links, and RHR Mid-Loop Operation Monitoring Functions. All display functions currently associated with the Emergency Response Facilities Data System (ERFDS) computer will be incorporated into the ICS. The ICS will be driving all the current Main Control Room (MCR) and Technical Support Center (TSC) "ERFDS" displays. The "ERFDS" display terminology will no longer exist after this modification, and all the displays will be "ICS" displays, or in ICS terminology Satellite Display Stations (SDS). The only functions that will still be performed on the old ERFDS processor are Environmental Data Station (MET Tower) functions; limited Eberline radiation monitoring functions; Turbine Supervisory functions (Bentley Nevada); and Landis and Gyr interface functions (Switch Gear). These functions are still performed on the old ERFDS processor but are available to the ICS for processing via a data link. [Note: These functions are only intended to remain on the old ERFDS processor temporarily. As part of the next phase of the ICS project the above functions will be transferred entirely to the ICS and the ERFDS processor will be removed.]

This modification will add new data acquisition equipment in Aux. Inst. Rm. panel 1-R-177 to incorporate the functions of the Main Steam RAD Release Rate Computer/Recorder (1-XR-1-5) into the ICS. The Main Steam RAD Release Rate Computer/Recorder (1-XR-1-5) will be removed.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 4 of 43
Rev.: 001

Some of the key points associated with this modification are:

1. Replace the P2500 computer with dual Alpha computers.
2. Replace the P2500 software with SAIC-based software.
3. Replace the P2500 and some limited ERFDS scanning and conversion electronics with fiber optic data acquisition equipment to be located in the existing I/O cabinets.
4. Delete all redundant input cabling between the P2500 and ERFDS I/O cabinets.
5. Add a data link between the ERFDS and ICS.
6. Add a data link between the ICS and PEDS.
7. The ICS will be powered from the TSC inverter. The new power scheme will be diversified as possible in order to prevent the failure of one fuse or breaker from disabling the entire ICS system.
8. Computer Inverter #1 and it's associated equipment which currently power the P2500 computer will be removed.
9. A new IRIG-B Time Synchronizer will be installed in the computer room to provide time synchronization between the ICS, RONAN annunciator system, Turbine Supervisory system (Bentley Nevada), and the MCR clock.
10. Add new chassis in Aux. Inst. Rm. panel (1-R-177) for incorporation of the Main Steam RAD Release Rate Computer/Recorder (1-XR-1-5) into the ICS.
11. New software will be developed and loaded into the ICS to insure that all functions of the Main Steam RAD Release Rate Computer are incorporated into the ICS.
12. Run Fiber Optic cable (1C1186) from Computer Room to Aux. Instrument Room panel (1-R-177) to support incorporation of the Main Steam RAD Release Rate Computer/Recorder into the ICS.
13. In the MCR the Graphical User Interface (GUI) will be deleted and replaced with an ICS SDS. The existing communications hubs will be replaced with redundant hubs.
14. Replace P2500 printers in MCR with new laser printers (for logs and alarms).
15. Replace all special function ERFDS workstation (After this modification ICS SDS) keyboards with new standard computer keyboards in both the MCR and TSC. This change is needed since the existing keyboards can not be replaced by DCN M-39931-A (MCR and TSC PC replacement modification). The existing keyboards were specially designed to support the existing ERFDS software.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Rev.: 001

16. Deactivate P2500 point U2035 (CCW Pump Average Overall Efficiency). This point was evaluated to be no longer needed by WBN personnel.

17. Add an ICS trouble alarm to the RONAN Annunciator system. This is accomplished by combining existing Windows 99A ["RCP MOTOR THRUST BEARING TEMP HI" (Computer Point Y9002C)] and 100A ["RCP STATOR TEMP HI (FROM P-2500)" (Computer Point Y9001C)] on MCR window box 1-XA-55-5B into one window (100A on window box 1-XA-55-5B). The new combined window 100A will be re-engraved to read "RCP STATOR/MTR THRUST BRG TEMP HI" and window 99A will be blanked. The combining of these computer points on one annunciator window will spare an input cable to RONAN, which will then be used for the new "PLANT COMPUTER TROUBLE" annunciator. This annunciator will be located on window 136F on MCR Window Box 1-XA-55-6D. This new Plant Computer Trouble alarm will annunciate for the following conditions: (1) the primary alpha computer is down and the backup alpha computer is running, (2) the primary and backup alpha computers are both down, or (3) there is a loss of power to the chassis that contains the new Delay Timer (Watchdog) I/O Card.

18. Resolve PER WBPER980807. The following computer points were identified by operations as critical computer points that should be included on the RONAN annunciator system. These points will be added to existing annunciator window 83D ["ROD DEVN & SEQ PWR RANGE TILT COMPUTER ALARM" (Computer Point Y9000C)] on MCR Window Box 1-XA-55-4B:

U0270D	DELTA FLUX ALARM (AXIAL FLUX DIFFERENCE (AFD))	
P1000A	CONTAINMENT 1 PRESSURE	
P1001A	CONTAINMENT 2 PRESSURE	
P1002A	CONTAINMENT 3 PRESSURE	
P1003A	CONTAINMENT 4 PRESSURE	
U0965	RBF&ED POCKET SMP 15M AVG RORISE,	(Calculated Point)
U0966	RBF&ED POCKET SMP 15M AVG RORISE,	(Calculated Point)
U0968	RBF&ED POCKET SMP 60M AVG RORISE,	(Calculated Point)
U0969	RBF&ED POCKET SMP 60M AVG RORISE,	(Calculated Point)

As part of this change annunciator window 83D will be re-engraved to read "PLANT COMPUTER GENERATED ALARM (SEE ICS)". Since this annunciator modification will result in numerous computer points activating one annunciator window, a special screen will be added to the ICS displays especially for the 83D alarm. After this change whenever any of these computer points exceed their alarm setpoints, window 83D will annunciate. Operators should then go to an ICS SDS and proceed to the NSSS menu and select the "Annunciator 83D Alarms" screen. This screen will then give operations personnel exact indication of which critical alarm brought in the 83D annunciator window. Therefore, decreasing their response time to the annunciator.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 6 of 43
Rev.: 001

Systems Affected:

Main Systems Affected by DCN M-39911-A:

System 261	Plant Process Computer System
System 264	Emergency Response Facilities Data System (ERFDS), formerly the Technical Support Center Computer
System 241	120V AC Computer System
System 239	250V DC Power System
System 290	Control Building Conduit and Cable Trays
System 001	Main Steam System

Minor Impacts to Systems (Typically documentation and computer point ID changes):

System 002	Condensate System
System 003	Main Feedwater System
System 005	Extraction Steam System
System 006	Heater Drains and Vents System
System 024	Raw Cooling Water System
System 027	Condenser Circulating Water System
System 030	Ventilating System
System 031	Air Conditioning (cooling-Heating) System
System 032	Control Air System
System 035	Generator Cooling System
System 043	Sampling and Water Quality System
System 046A	Main Feedwater Control System
System 046B	Auxiliary Feedwater Control System
System 047	Turbogenerator Control System
System 054	Injection Water System
System 055	Annunciator/Sequential Events Recording System
System 056	Plant Temperature Monitoring
System 062	Chemical Volume and Control System
System 063	Safety Injection System
System 065	Emergency Gas Treatment System
System 067	Essential Raw Cooling water System
System 068	Reactor Coolant System
System 070	Component Cooling Water System
System 072	Containment Spray System
System 074	Residual Heat Removal System
System 077	Waste Disposal System

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 7 of 43
Rev.: 001

System 082	Standby Diesel Generator System
System 085	Control Rod Drive System
System 088	Containment Isolation System
System 090	Radiation Monitoring System
System 092	Neutron Monitoring System
System 094	Incore Flux Detector System
System 099	Reactor Protection System

2. References (SAR/Technical Specifications/etc.).

1. Watts Bar Nuclear Plant (WBNP) Updated Final Safety Analysis Report (UFSAR) - Initial issue.

FSAR Sections:
- 2.0 Site Characteristics
- 2.3 Meteorology
- 4.0 Reactor
  - 4.3.2.2.5 Limiting Power Distributions
- 5.0 Reactor Coolant System
- 5.2 Integrity Of Reactor Coolant Pressure Boundary
- 5.6 Instrumentation Application
- 7.0 Instrumentation And Controls
- 7.5.1 Post Accident Monitoring Instrumentation (PAM)
  - 7.5.1.4.3 Design Criteria For Category 1 Variables
  - 7.5.1.4.4 Design Criteria For Category 2 Variables
  - 7.5.1.4.5 Design Criteria For Category 3 Variables
  - 7.5.1.6 Analysis

- 7.5.2 Emergency Response Facilities Data System (ERFDS)
  - 7.5.2.1 Safety Parameter Display System
  - 7.5.2.1.2 Design Basis
  - 7.5.2.2 Bypassed and Inoperable Status Indication System (BISI)
  - 7.5.2.3 Technical Support Center and Nuclear Data Links
  - 7.5.2.3.2 Communication Data Links

- 7.6.2 Residual Heat Removal Isolation Valves
  - 7.6.2.1 Description

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 8 of 43
Rev.: 001

7.7 Control Systems
7.7.1.3 Plant Control Signals for Monitoring and Indicating

8.3 Onsite (Standby) Power System
8.3.2.1.2 Non-Safety-Related DC Power Systems

9.4 Air Conditioning, Heating, Cooling, And Ventilation Systems

Chapter 15.0 Accident Analyses

FSAR Tables: TABLE 7.5-1 - Post Accident Monitoring Instrumentation Component Qualification Matrix

2. Watts Bar Safety Evaluation Report (NUREG-0847) related to the operation of Watts Bar Nuclear Plant Units 1 and 2 including supplements 1-20.

3. WBNP Unit 1 Technical Specifications (TS) revised through Amendment 12

4. WBNP Technical Requirements Manual, Revision 9

5. WBNP Technical Bases, Revision 19

6. Design Criteria:

WB-DC-30-8	EMERGENCY RESPONSE FACILITIES DATA SYSTEM
WB-DC-30-29	PLANT INTEGRATED COMPUTER SYSTEM
WB-DC-00-3	TECHNICAL SUPPORT CENTER
WB-DC-30-7	POST ACCIDENT MONITORING INSTRUMENTATION
WB-DC-30-23	HUMAN FACTORS
WB-DC-40-24	RADIATION MONITORING
WB-DC-30-27	AC AND DC CONTROL POWER SYSTEMS
WB-DC-40-57	ANTICIPATED TRANSIENTS WITHOUT SCRAM MITIGATION SYSTEM ACTUATION CIRCUITRY (AMSAC)
WB-DC-40-31.13	SEISMIC QUALIFICATION OF CATEGORY I(L) FLUID SYSTEM COMPONENTS AND ELECTRICAL OR MECHANICAL EQUIPMENT.

7. System Descriptions:

N3-15-4002	STEAM BLOWDOWN SYSTEM
N3-30RB-4002	REACTOR BUILDING VENTILATION SYSTEM
N3-41-4002	STEAM GENERATOR WET LAYOUT
N3-1-4002	MAIN STEAM SYSTEM

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 9 of 43
Rev.: 001

N3-85-4003	CONTROL ROD DRIVE SYSTEM
N3-94-4003	INCORE INSTRUMENTATION SYSTEM
N3-99-4003	REACTOR PROTECTION SYSTEM
N3-72-4001	CONTAINMENT HEAT REMOVAL SPRAY SYSTEM
N3-67-4002	ESSENTIAL RAW COOLING WATER SYSTEM
N3-68-4001	REACTOR COOLANT SYSTEM

8. Watts Bar Safety Evaluation Report (NUREG-0737), Item II.F.1.1 - Revised Response (T04940519905)

9. Root Cause Analysis Report CHPER990021 R0

10. DCN P-50169-A

B. Safety Assessment Checklist (Form SPP-9.4-4) - (required for all changes)

SEE ATTACHED

C. Acceptability from a Nuclear Safety Standpoint

A determination if the proposed activity is acceptable from a nuclear safety perspective. This includes a written justification for the acceptability.

Justification : Checklist Item No. 4 - Control Room Habitability noted as a potential impact on Nuclear Safety.

This modification adds, replaces, and removes electrical equipment located in the MCR. This equipment and the replacement equipment will affect the analyzed heat loads for the MCR. All heat loads increases/deletions resulting from new, replaced, or removed equipment have been analyzed and determined to be acceptable per the results of mechanical engineering calculations issued for DCN M-39911-A. These heat loads have no adverse impact on the MCR room temperature and have no adverse affect on the capacity of the MCR HVAC system. Therefore, there is no reduction in nuclear safety.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 10 of 43
Rev.: 001

Justification : Checklist Item No. 6 - Design Basis Document noted as a potential impact on Nuclear Safety.

As described in Section A of this Safety Assessment, DCN M-39911A replaces the obsolete Unit 1 Westinghouse P2500 Plant Process Computer and consolidates numerous functions of the Emergency Response Facilities Data System (ERFDS) into a new Plant Integrated Computer System (ICS). As a result of these changes all Design Criteria and System Descriptions were reviewed and revisions to the following prepared:

Design Criteria:

WB-DC-30-8	EMERGENCY RESPONSE FACILITIES DATA SYSTEM	VOIDED
WB-DC-30-29	PLANT INTEGRATED COMPUTER SYSTEM	ENTIRE REVISION
WB-DC-00-3	TECHNICAL SUPPORT CENTER	REVISED
WB-DC-30-7	POST ACCIDENT MONITORING INSTRUMENTATION	REVISED
WB-DC-30-23	HUMAN FACTORS	REVISED
WB-DC-40-24	RADIATION MONITORING	REVISED
WB-DC-30-27	AC AND DC CONTROL POWER SYSTEMS	REVISED
WB-DC-40-57	ANTICIPATED TRANSIENTS WITHOUT SCRAM MITIGATION SYSTEM ACTUATION CIRCUITRY (AMSAC)	REVISED

System Descriptions:

N3-15-4002	STEAM BLOWDOWN SYSTEM	REVISED
N3-30RB-4002	REACTOR BUILDING VENTILATION SYSTEM	REVISED
N3-41-4002	STEAM GENERATOR WET LAYOUT	REVISED
N3-1-4002	MAIN STEAM SYSTEM	REVISED
N3-85-4003	CONTROL ROD DRIVE SYSTEM	REVISED
N3-94-4003	INCORE INSTRUMENTATION SYSTEM	REVISED
N3-99-4003	REACTOR PROTECTION SYSTEM	REVISED
N3-72-4001	CONTAINMENT HEAT REMOVAL SPRAY SYSTEM	REVISED
N3-67-4002	ESSENTIAL RAW COOLING WATER SYSTEM	REVISED
N3-68-4001	REACTOR COOLANT SYSTEM	REVISED

The above Design Criteria and System Descriptions revisions have been evaluated and were found to be acceptable and accurately document the changes made as a result of DCN M-39911A. Therefore, nuclear safety is not reduced.

Justification : Checklist Item No. 7 - Digital Upgrade (NRC Generic Letter 95-02) noted as a potential impact on Nuclear Safety.

NRC Generic Letter 95-02 primarily addresses analog to digital instrumentation and controls replacements in safety related systems, and the possibility of common mode software failures associated with them.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 11 of 43
Rev.: 001

DCN M-39911A replaces the obsolete Unit 1 Westinghouse P2500 Plant Process Computer and consolidates numerous functions of the Emergency Response Facilities Data System (ERFDS) into a new Plant Integrated Computer System (ICS). The existing P2500 and ERFDS computers are already performing both analog to digital and digital to digital conversions. The ICS will perform the same analog to digital and digital to digital conversions with similar failure modes to that of the P2500 and ERFDS computers.. The ICS is not safety related and is properly isolated and separated from safety related equipment. The ICS is not required to meet the single failure criterion or be qualified to IEEE criteria for Class 1E equipment. The ICS is not to be used to perform functions essential to the health and safety of the public. Although the ICS indirectly provides support to safety related systems by alerting operators that an abnormal condition may exist, operators cannot procedurally take inappropriate safety related action based solely on ICS information. There are other safety grade equipment that is provided for mitigating the events of design basis accidents. Since the ICS is designed to seismic category I(L)B criteria inside seismic category I areas, it will not fail during a design basis seismic event in a manner which will adversely affect safety-related structures, systems or components.

After this modification, the new ICS computer will be operational and performing all functions of the old P2500 computer and most of the functions of the Emergency Response Facilities Data System (ERFDS), including SPDS, BISI, BOP, NSSS, Communications Data Links, and RHR Mid-Loop Operation Monitoring Functions. All display functions currently associated with the Emergency Response Facilities Data System (ERFDS) computer will be incorporated into the ICS. The ICS software will be similar to that of the P2500 and ERFDS and will be designed, developed, and tested in accordance with SPP-2.6. The requirements of SPP-2.6 includes formal test cases for ICS software as well as informal supplemental testing to further demonstrate software features and challenge calculation algorithms. Therefore, there is a high degree of confidence that the ICS software and calculations are correct.

Therefore, with respect to Digital Upgrades (NRC Generic Letter 95-02) nuclear safety is not reduced.

Justification : Checklist Item No. 8 - Electrical Breaker Alignment Changes and Item 9 - Electrical Loads noted as a potential impact on Nuclear Safety.

Currently, the P2500 is powered from the Unit 1 Plant Computer Inverter. In a effort to improve the reliability of power for the ICS, power for the electrical loads associated with the ICS will be provided by the Unit 1 Technical Support Center (TSC) Inverter (except 1-R-177 ICS loads). This change will allow for the removal of the Plant Computer Inverter. As part of this change a new 120 VAC distribution network was required to be installed in computer room panel 1-R-103 for the ICS I/O equipment. The ICS's I/O equipment, located in Aux. Instrument Room rack 1-R-177 will be powered from the 120VAC Vital Instrument Board I-IV. Electrical engineering calculations have been revised to document the acceptability of these load changes and

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 12 of 43
Rev.: 001

breaker/fuse coordination for electrical equipment associated with this DCN. Therefore, nuclear safety is not reduced.

Justification : Checklist Item No. 10 - Electrical Separation/Isolation noted as a potential impact on Nuclear Safety.

This modification (DCN M39911-A) will add/abandon/remove numerous scheduled cabling associated with the computers. The majority of this cabling is located in the computer room. There is however, one major signal cable run and the rework of one existing power cable associated with the ICS modification. The new signal cable is a fiber optic cable (1C1186) which will be run from the computer room (panel 1-R-155) to the Aux. Instrument Room (panel 1-R-177). This cable is part of the incorporation of the Main Steam RAD Release Rate Computer/Recorder (1-XR-1-5) into the ICS. The other significant cable work is to power cable M42. This cable is an existing power cable which was installed (but not terminated on either end) during a previous modification (M33791B) for use during this modification. Cable M42 currently runs from the TSC Distribution Panel #1 (located in the 250V Battery Board Room #1) to under the sub-floor of the Computer room. During this modification cable M42 will be terminated in the TSC Distribution Panel #1 and to the new ICS distribution network located in 1-R-103 (Computer Room). As part of the termination process cable M42 will be reworked/rerouted as necessary to insure that all separation/isolation requirements are satisfied.

As stated previously, there are also numerous cable additions, abandonments, and deletions associated with this modification. The majority of this cable work will be limited to the computer room with only limited cable work required in the Aux. Instrument Room, 250V Battery Board Room, MCR, and Aux. Building Lighting Board #3. All cable work associated with the modification will be done in accordance with all applicable separation criteria (WB-DC-30-4). All equipment associated with this modification is non-safety related and is properly isolated and separated from safety related equipment. None of the safety related isolation devices used between safety related systems and the ICS were affected by this modification. Therefore, per the above discussion, nuclear safety is not reduced.

Justification : Item No. 11 - EMI/RFI Potential noted as a potential impact on Nuclear Safety.

All equipment added as part of this modification has been evaluated for EMI/RFI interference as part of DCN M-39911A. This equipment was determined to be acceptable for use with no reduction in nuclear safety.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 13 of 43
Rev.: 001

Justification : Checklist Item No. 13 - Environmental Qualification Category noted as a potential impact on Nuclear Safety.

Computer equipment changes attributed to this DCN generally reduced the heat loads in the affected rooms. Existing non-conservative methodologies were found in the heat load calcs and when corrected, resulted in the LOCA temperature for the Unit 1 Auxiliary Instrument Room, 708-C1 being higher than the maximum allowed. PER CHPER980147 was initiated to document this condition and track corrective actions which are beyond the scope of this design change. This room is a mild environment and therefore no EQ Binders will be affected. There is no reduction to nuclear safety caused by heat load reductions associated with DCN M-39911-A.

Justification : Checklist Item No. 14 - Equipment Diversity; Item 16 - Equipment Redundancy and Item 17 - Equipment Reliability noted as a potential impact on Nuclear Safety.

The ICS is non-safety related and is not required to meet the single failure criterion or to be qualified to IEEE criteria for Class 1E equipment. Although the ICS is not required to meet single failure criteria, system redundancy has been incorporated into the ICS to enhance reliability. The ICS will have dual Alpha computer processors with one serving as the main and one as the backup processor. The ICS will be powered by the TSC Inverter. This Inverter has three sources of power including 250V DC Station battery power inverted to 120V AC, for use during a station blackout. The ICS Power distribution system has also been diversified as much as possible in order to prevent the failure of one fuse or breaker from disabling the entire ICS system. In the MCR the single communications hub will be replaced with 2 communications hubs. With dual communications hubs, 3 MCR ICS satellite display station (SDS) will be connected to one hub and 2 to the other hub. With this configuration, in the unlikely event of a communications hub failure, the MCR will still have at least 2 operational ICS SDS and, with only a minor signal cable modification, all 5 workstations can be driven off a single operating communications hub.

Therefore, per the previous discussion this modification maintains or increases equipment Diversity, Redundancy, and Reliability with no reduction to nuclear safety.

Justification : Checklist Item 15- Equipment Failure Modes and Item No. 49 - Single Failure Criteria noted as a potential impact on Nuclear Safety

The ICS is non-safety related and it is not required to meet the single failure criterion or to be qualified to IEEE criteria for Class 1E equipment. There are no new single failures or equipment failure modes introduced by this modification. This modification actually increases the redundancy and reliability of the computer system thereby reducing the probability of a failure of the ICS. Therefore nuclear safety is not reduced.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A
Page 14 of 43
Rev.: 001

Justification : Checklist Item No. 19 - Fire Protection (Appendix R) noted as a potential impact on Nuclear Safety

This DCN does not change location or function of any Fire Safe Shutdown equipment or cables. The modification does not involve any fire rated compartmentation and does not interfere with any sprinkler heads or emergency lighting unit illumination paths. All affected penetrations associated with cable additions/deletions will be restored to tested configuration in accordance with plant procedures to ensure fire barriers and pressure boundaries are maintained. Breaching permits will be handled in accordance with site procedures. This modification does affect the combustion loading for the Computer Room, Aux Instrument Room, MCR, and 250V Battery Board Room. Therefore, mechanical engineering calculation WBN-MEB-EPMDOM012990 has been revised to document the acceptability of the combustion loading changes associated with this DCN.

The Fire Protection Report will require a minor revision as a result of this modification. Applicable references to the P2500 or ERFDS computer systems shall be removed and replaced with appropriate Plant Computer references.

This DCN has no adverse impact on the plant with regards to Appendix R Fire Protection. Therefore, nuclear safety is not reduced.

Justification : Checklist Item No. 22 - Human Factors noted as a potential impact on Nuclear Safety

The WBN ICS software is essentially the same as that installed on the SQN Unit 1 and 2 ICS. The basic SAIC Plant Monitoring System (PMS) that is the backbone of the ICS software package is in service at many other nuclear power plants including Susquehanna, Waterford, Seabrook, Browns Ferry, and Diablo Canyon.

The ICS was subjected to an extensive Human Factors Engineering (HFE) review during its design, development, and testing at SQN. There was extensive SQN Senior Reactor Operator (SRO) involvement in the man-machine interface design including display development.

The new WBN ICS screen displays (including SPDS and BISI) have been enhanced from those currently running on the P2500 and ERFDS. All ICS screen displays will receive an extensive Human Factor Engineering (HFE) review. This review will be done by Computer Engineering Service, Inc. (CES), under contract P-95BYE-119256-001, Release 1279465. This review will consist of an initial HFE of the new ICS display screens. Secondly, Operation's personnel will be interviewed after new the software becomes operational on the WBN simulator. The final HFE shall then be submitted to TVA for approval. All concerns will be resolved or justified before the WBN ICS becomes operational. Only ICS computer displays will be evaluated by CES; all other hardware modifications will be evaluated from a HFE perspective as part of the normal DCN process.

SAFETY ASSESSMENT FORM

This DCN will also replace the Operator's GUI workstation with a new ICS satellite display station (SDS). The new ICS SDS will consist of a new central processing unit (CPU), monitor, keyboard, and mouse. All special function ERFDS workstation (after this modification ICS SDS) keyboards will be replaced with new standard computer keyboards in both the MCR and TSC. This change is needed since the existing keyboards could not be replaced by DCN M-39931-A (MCR and TSC PC replacement modification) because the existing keyboards were specially designed to support the existing ERFDS software. The two P2500 line printers (located in the horseshoe) will be replaced with laser printers. The P2500 line printer at 1-M-24 (in the hallway) is no longer needed and will be removed.

An ICS trouble alarm will be added to the RONAN Annunciator system. This is accomplished by combining existing Windows 99A ["RCP MOTOR THRUST BEARING TEMP HI" (Computer Point Y9002C)] and 100A ["RCP STATOR TEMP HI (FROM P-2500)" (Computer Point Y9001C)] on MCR window box 1-XA-55-5B into one window (100A on window box 1-XA-55-5B). The new combined window 100A will be re-engraved to read "RCP STATOR/MTR THRUST BRG TEMP HI" and window 99A will be blanked. The combining of these computer points on one annunciator window will spare an input cable to RONAN, which will then be used for the new "PLANT COMPUTER TROUBLE" annunciator. This annunciator will be located on window 136F on MCR Window Box 1-XA-55-6D. This new Plant Computer Trouble alarm will annunciate for the following conditions: (1) the primary alpha computer is down and the backup alpha computer is running, (2) the primary and backup alpha computers are both down, or (3) there is loss of power to the chassis that contains the new Delay Timer (Watchdog) I/O Card.

PER WBPER980807 will also be resolved by this DCN. The following operations identified critical computer points will be added to existing annunciator window 83D ["ROD DEVN & SEQ PWR RANGE TILT COMPUTER ALARM" (Computer Point Y9000C)] on MCR Window Box 1-XA-55-4B:

U0270D	DELTA FLUX ALARM (AXIAL FLUX DIFFERENCE (AFD))	
P1000A	CONTAINMENT 1 PRESSURE	
P1001A	CONTAINMENT 2 PRESSURE	
P1002A	CONTAINMENT 3 PRESSURE	
P1003A	CONTAINMENT 4 PRESSURE	
U0965	RBF&ED POCKET SMP 15M AVG RORISE,	(Calculated Point)
U0966	RBF&ED POCKET SMP 15M AVG RORISE,	(Calculated Point)
U0968	RBF&ED POCKET SMP 60M AVG RORISE,	(Calculated Point)
U0969	RBF&ED POCKET SMP 60M AVG RORISE,	(Calculated Point)

As part of this change annunciator window 83D will be re-engraved to read "PLANT COMPUTER GENERATED ALARM (SEE ICS)". Since this annunciator modification will add so many new computer points to one annunciator window a special screen will be added to the ICS especially for the 83D alarm. After this change whenever these computer points exceed their alarm setpoints, window 83D will be activated. Operators should then go to an ICS SDS and proceed to the NSSS menu and

SAFETY ASSESSMENT FORM

select the "Annunciator 83D Alarms" screen. This screen will then give operations personnel exact indication of exactly which critical alarm brought in the 83D annunciator window.

MCR operators will receive training on the ICS on the WBN plant specific control room simulator prior to placing the ICS in service. Therefore, the chances of human error are decreased.

As a result of the removal of Computer Inverter #1 by this modification annunciator window 16E (" PFD INVR/PWR BD 1 OR COMP INVR 1 OR TSC INVR 1 ABNORMAL") on window box 1-XA-55-1C will be re-engrave to read " PFD INVR/PWR BD 1 OR TSC INVR 1 ABNORMAL".

Again, only ICS computer displays will be evaluated by CES. However, a Human Factors Engineering (HFE) review was completed in accordance with DS-E18.1.24 for all other changes discussed above. This HFE review found the design acceptable from an HFE perspective. Therefore, nuclear safety is not reduced.

Justification : Checklist Item No. 23 - Instrument Setpoints noted as a potential impact on Nuclear Safety

DCN M-39911-A, replaces the obsolete Unit 1 Westinghouse P2500 Plant Process Computer and consolidates the Emergency Response Facilities Data System (ERFDS) into a new Plant Integrated Computer System (ICS). As part of this change, electrical engineering calculation WBN-ICS-Generic was prepared and issued to document the inaccuracies of the new ICS. The results of this calculation shows that the new ICS is more accurate than the old P2500 and ERFDS systems design criteria requirements. The ICS is also more accurate than the Design Criteria requirements that the analog to digital (A/D) conversion should be calibrated accurate/repeatable to +/- 0.25 percent. However, in order to minimize the impact to plant procedures the conservative Design Criteria accuracies were used. All Nuclear Engineering Setpoint and Scaling Documents (NESSDs) and supporting calculations were reviewed to determine impact. Only a limited number of NESSDs revisions were required for inaccuracy adjustments. But numerous NESSDs and calculations were revised to remove P2500 and ERFDS references and to correct computer point IDs which were changed/removed due to the removal of redundant inputs between the P2500 and ERFDS systems. All calculations affected by this DCN have been revised and issued as a part of this modification. All NESSDs affected by this DCN have been revised and are included in the DCN package.
See Page 100a for additional discussion of Checklist Item No. 23 R1

Per the above discussion there are no changes to any alarm or instrument setpoints associated with this modification. All necessary documentation revisions to NESSDs and supporting calculations have been performed . Therefore, there is not reduction in nuclear safety.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 17 of 43
Rev.: 001

B. Safety Assessment Checklist Justifications

23. Instrument Setpoints (Contd)

The removal of the Main Steam Rad Release Rate Recorder (1-XR-1-5) will involve determination and removal of cables from terminal points located in R-panel 1-R-146. The Rate Recorder no longer performs it's originally intended function of recording steam flow and SG pressure output data from EAGLE 21. Those functions are now performed by other components in separate instrument loops. However, since the recorder is wired in series with the downstream components, it has served to complete the electrical circuit for the components remaining in the loop. In order to continue to complete the circuit for the remaining components following removal of the recorder, permanent field cables will be installed in panel 1-R-146. The cables will be terminated on the terminal points from which the field cables for the recorder were removed. This will tie the points back together and complete the circuits.

The removal of the recorder, and the subsequent installation of permanent field cables in its place will not affect the integrity of the remaining components within the affected loops. The ranges, setpoints and allowable values of the remaining loop components will remain unchanged. The EAGLE 21 analog output boards have an impedance range of 100 to 600 ohms, per the EAGLE 21 vendor manual, and the loop impedance will remain within this range after removal of the recorder, and therefore there is no adverse impact on the EAGLE 21 output for these loops.

R1

The remaining loop components downstream of EAGLE 21 (pressure switches, pressure indicators, recorder, and computer log points) do not perform any Safety Related function, nor do they monitor or mitigate any Design Basis Accident described in the SAR. The contact side of the pressure switches, for water hammer, have been previously disconnected and no longer perform any bistable function. The pressure indicators only provide backup indication for plant parameters already displayed on PAM 1 and PAM 2 MCR indicators, and the PAM indicators are not in the same instrument loops, and are thus not affected by this change. The computer log points, and the recorder (SG loop 3) are Non-Divisional, non-1E, not Safety-Related and do not perform any Safety-Related function.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 18 of 43
Rev.: 001

Justification : Checklist Item No. 28 - Materials Compatibility noted as a potential impact on Nuclear Safety

All new equipment affected by this modification is being installed to support replacement of the P2500 Plant Process Computer. This equipment will operate efficiently with all equipment which was previously installed by DCN M-39931-A and all remaining ERFDS computer software. All new equipment will also be year 2000 compliant. Therefore, there are no material compatibility problems and no reduction in nuclear safety.

Justification : Checklist Item No. 36 - Radioactive Effluent (Liquid or Gaseous) Release Pathways noted as a potential impact on Nuclear Safety.

This modification will remove Main Steam Rad Release Rate Recorder (1-XR-1-5) from R-panel 1-R-177. The recorder is outdated, therefore, this DCN will replace the recorder with an interface monitor which communicates the release rate input information to the new ICS computer. The change does not affect any operational or functional features of the noble gas release monitoring through the Steam Generator Atmospheric relief valve flow paths. Therefore, there are no potential release pathways issues that will decrease nuclear safety.

R1

Justification : Checklist Item No. 39 - Reactor Core Parameters noted as a potential impact on Nuclear Safety.

Reactor core parameters that were previously monitored with the P2500 computer software will now be monitored by the ICS. P2500, software algorithms including thermal power, axial flux difference (AFD), Quadrant Power Tilt Ratio (QPTR), Rod Supervision, heatup/cooldown, and RCS inventory, will be loaded into the ICS. This ICS software will be designed, developed, and tested in accordance with SPP-2.6. Test case results of the calorimetric calculation and the other calculations identified above from the old P2500 are compared to similar calculations made by the ICS as part of the validation testing. The requirements of SPP-2.6 includes formal test cases for ICS software as well as informal supplemental testing to further demonstrate software features and challenge calculation algorithms. Therefore, there is a high degree of confidence that the ICS calculations are correct. Per the above discussion there is no reduction in nuclear safety.

Justification : Checklist Item No. 43 - Scaffolding noted as a potential impact on Nuclear Safety

This modification may require the erection of temporary scaffolding. If scaffolding is required it will be constructed and controlled in accordance with WBN plant procedures. Nuclear safety will not be decreased by the construction of scaffolding.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 19 of 43
Rev.: 001

Justification : Checklist Item No. 46 - Seismic/Dead Weight noted as a potential impact on Nuclear Safety

This modification will install, replace, and remove equipment located in the Auxiliary Control Building (ACB) in the following locations: Aux. Instrument Room, 250V Battery Board Room, MCR, TSC, Computer Room, and the Auxiliary Building (Aux. Building Lighting Board #3). The ACB is a Category I structure. Equipment changes as a result of this DCN have been analyzed and determined to be acceptable per the results of civil engineering calculations issued for DCN M-39911-A.

For cables that require routing or re-routing, the affected raceways have been evaluated in accordance with WBN EAI 3.15 to confirm the addition of cables will not exceed the maximum fill weights, affected conduit (new or existing) will be field routed in accordance with WBN MAI-3.1.

Therefore, per the above discussion there is no reduction in nuclear safety.

Justification : Checklist Item No. 48 - Shutdown Reactivity Control noted as a potential impact on Nuclear Safety.

Shutdown reactivity control parameters that are currently monitored by the P2500 computer will now be monitored by the ICS. P2500 shutdown reactivity control programs such as for Xenon and Samarium will be loaded on the ICS. Currently on the P2500 the program for Samarium has been deactivated, since Westinghouse does not support the use of Samarium. For possible future use, the program for Samarium will be loaded in the ICS but will remain deactivated. Both Xenon and Samarium ICS software will be designed, developed, and tested in accordance with SPP-2.6. Test case results of the calculations identified above from the old P2500 are compared to similar calculations made by the ICS as part of the validation testing. The requirements of SPP-2.6 includes formal test cases for ICS software as well as informal supplemental testing to further demonstrate software features and challenge calculation algorithms. Therefore, there is a high degree of confidence that the ICS calculations concerning shutdown reactivity control are correct. Per the above discussion there is no reduction in nuclear safety.

SAFETY ASSESSMENT FORM

Document No.: DCN M-39911-A

Page 20 of 43
Rev.: 001

Justification Conclusions:

Based upon the previous discussion, this modification is safe from a nuclear safety standpoint.

D. Review and Approvals

Preparer:	J. Mike Casner Name	J Mike Casner Signature	12/9/98 Date
Reviewer:	William G. Sexton Name	WG Sexton Signature	12/9/98 Date
Other: Reviewers (as appropriate)	James K. Rochelle Name	JK Rochelle Signature	12/9/98 Date
Other Reviewers:	John F. Lund Name	John F. Lund Signature	09DEC98 Date

Justification Conclusions:

Based upon the previous discussion, this modification is safe from a nuclear safety standpoint.

D. Review and Approvals

Preparer:	STACEY L. PARROTT Name	Stacey L. Parrott Signature	2-19-99 Date
Reviewer:	ROBERT P. BALCH Name	Robert P. Balch Signature	2-19-99 Date
Other: Reviewers (as appropriate)	James K. Rochelle Name	JK Rochelle Signature	2-19-99 Date
Other Reviewers:	John F. Lund Name	John F. Lund Signature	19FEB99 Date

R1

SAFETY ASSESSMENT CHECKLIST

Document No.: DCN M-39911-A

Page 21 of 43
Rev.: 001

	Potential Impact On Nuclear Safety	N/A	
1.	☐	☒	ASME Section XI
2.	☐	☒	Chemistry Changes or Chemical Release Pathways
3.	☐	☒	Compensatory Measure
4.	☒	☐	Control Room Habitability
5.	☐	☒	Decay Heat Removal Capability
6.	☒	☐	Design Basis Document
7.	☒	☐	Digital Upgrade (NRC Generic Letter 95-02)
8.	☒	☐	Electrical Breaker Alignment Changes
9.	☒	☐	Electrical Loads
10.	☒	☐	Electrical Separation/Isolation
11.	☒	☐	EMI/RFI Potential
12.	☐	☒	Environmental Impact Statement (See SPP-5.5)
13.	☒	☐	Environmental Qualification Category
14.	☒	☐	Equipment Diversity
15.	☒	☐	Equipment Failure Modes
16.	☒	☐	Equipment Redundancy
17.	☒	☐	Equipment Reliability
18.	☐	☒	Erosion/Corrosion/MIC
19.	☒	☐	Fire Protection (Appendix R)
20.	☐	☒	Hazardous Material
21.	☐	☒	Heavy Load Lifts or Safe Load Paths (NUREG-0612)
22.	☒	☐	Human Factors
23.	☒	☐	Instrument Setpoints
24.	☐	☒	Instrument/Relay Settings
25.	☐	☒	Internal Flooding Protection (MELB)
26.	☐	☒	Internal/External Missiles
27.	☐	☒	Jet Impingement Effects
28.	☒	☐	Materials Compatibility
29.	☐	☒	Modification to Non-Seismic Areas in CB/AB

SAFETY ASSESSMENT CHECKLIST

Document No.: DCN M-39911-A

Page 22 of 43
Rev.: 001

	Potential Impact On Nuclear Safety	N/A	
30.	☐	☒	Physical Separation
31.	☐	☒	Pipe Breaks
32.	☐	☒	Pipe Vibration
33.	☐	☒	Pipe Whip
34.	☐	☒	Primary Containment Integrity/Isolation
35.	☐	☒	Protective Coatings Inside Containment
36	☒	☐	Radioactive Effluent (Liquid or Gaseous) Release Pathways
37.	☐	☒	Radwaste System Changes
38.	☐	☒	Reactor Coolant Pressure boundary
39.	☒	☐	Reactor Core Parameters
40.	☐	☒	Requires an increase in operator staffing to complete newly required actions
41.	☐	☒	Response Time of Emergency Safeguards Equipment
42.	☐	☒	Safety Injection/Core Cooling Capability
43.	☒	☐	Scaffolding
44.	☐	☒	Secondary Containment Integrity/Isolation
45.	☐	☒	Security System
46.	☒	☐	Seismic/Dead Weight
47.	☐	☒	Shield Building Integrity (SQN/WBN)
48.	☒	☐	Shutdown Reactivity Control
49.	☒	☐	Single Failure Criteria
50.	☐	☒	System Design Parameters
51.	☐	☒	Temporary Shielding
52.	☐	☒	Test and Retest Scoping Document (Post Modification Test)
53.	☐	☒	Tornado or External Flood Protection
54.	☐	☒	Toxic Gases
55.	☐	☒	Valve Alignment Changes
56.	☐	☒	Ventilation Cooling for Electronic Equipment
57.	☐	☒	Water Spray/Condensation

R1

SCREENING REVIEW FORM

Document No.: DCN M-39911-A

Page 23 of 43
Rev.: 001

A. Potential Technical Specification (T/S) Impact (List TS sections reviewed)

Yes ☐ No ☒ Is a change to the T/S required for conducting or implementing the change (design or procedure), test, or experiment?

Justification:

There are no T/S requirements directly associated with the P2500 Plant Process computer, the Emergency Response Facilities Data System (ERFDS), or the new Plant Integrated Computer System (ICS). However, the Technical Specification (TS) Basis for Section 3.3.3 "Post Accident Monitoring (PAM) Indication", Table 3.3.3-1 function 15 & 16 "Steam Generator Water Level (Wide and Narrow Range)" must be revised. Per NADP-6 "Technical Specifications/Licenses and Amendments", changes to the Basis of the TS may be made without prior approval by the NRC provided the change is supported by a safety assessment/safety evaluation and has been PORC approved. Therefore, a safety assessment/safety evaluation with PORC approval is required for DCN M-39911-A.

If the answer is "Yes," a T/S change is required prior to implementation or the activity needs to be revised or canceled.

B. Potential Safety Analysis Impact (List FSAR sections reviewed)

Yes ☐ No ☒ Is this a special test, or experiment not described in the SAR?

Does the proposed activity affect (directly or indirectly) any information presented in the SAR or deviate from the description given in the SAR?

Yes ☒ No ☐ By changing: The system design or functional requirements; the technical content of text, tables, graphs, or figures? (For radwaste changes see Note in Appendix B for guidance.) If the answer is "Yes," process an FSAR change.

Justification:

The entire SAR was reviewed for potential SAR impacts. The follow Text Sections, Table, and Figures are affected by DCN M-39911-A:

FSAR Text Sections:

7.5.1 Post Accident Monitoring Instrumentation (PAM)
    7.5.1.4.3 Design Criteria For Category 1 Variables
    7.5.1.4.4 Design Criteria For Category 2 Variables
    7.5.1.4.5 Design Criteria For Category 3 Variables
    7.5.1.6 Analysis

SCREENING REVIEW FORM

Document No.: DCN M-39911-A

Page 24 of 43
Rev.: 001

7.5.2 Emergency Response Facilities Data System (ERFDS)
  7.5.2.1 Safety Parameter Display System
  7.5.2.1.2 Design Basis
  7.5.2.2 Bypassed and Inoperable Status Indication System (BISI)
  7.5.2.3 Technical Support Center and Nuclear Data Links
  7.5.2.3.2 Communication Data Links

7.6.2 Residual Heat Removal Isolation Valves
  7.6.2.1 Description

FSAR Tables:

TABLE 7.5-1 Post Accident Monitoring Instrumentation Component Qualification Matrix

FSAR Figures:

Affected Drawing	Affected FSAR Figures
1-47W200-3	1.2-3
1-47W610-1-1	10.3-2
1-47W610-1-2	10.3-3
1-47W610-1-2A	10.3-3 SH A
1-47W610-1-3	10.3-4
1-47W610-1-3A	10.3-4 SH A
1-47W610-2-1	10.4-9
1-47W610-2-2	10.4-10
1-47W610-2-3	10.4-11
1-47W610-3-1	10.4-14
1-47W610-3-1A	10.4-14 SH A
1-47W610-3-1B	10.4-14 SH B
1-47W610-3-1C	10.4-14 SH C
1-47W610-3-1D	10-4-14 SH D
1-47W610-3-2	10.4-15
1-47W610-3-2A	10.4-15 SH A
1-47W610-3-2B	10.4-15 SH B
1-47W610-3-2C	10-4-15 SH C
1-47W610-3-3	10.4-16
1-47W610-3-7	10-4-16-A
1-47W610-6-1	10.4-29
1-47W610-6-2	10.4-30
1-47W610-6-3	10.4-31
1-47W610-6-4	10.4-32
1-47W610-6-5	10.4-33
1-47W610-24-1	9.2-36
1-47W610-24-2	9.2-37
1-47W610-27-1	10.4-4

SCREENING REVIEW FORM

Document No.: DCN M-39911-A

Page 25 of 43
Rev.: 001

Affected Drawing	Affected FSAR Figures
1-47W610-27-2	10.4-5
1-47W610-30-1	9.4-30
1-47W610-30-1B	9.4-30 SH B
1-47W610-30-2	9.4-31
1-47W610-30-3	9.4-11
1-47W610-30-4	9.4-17
1-47W610-31-1	9.4-4
1-47W610-31-2	9.4-4A
1-47W610-32-1	9.3-1
1-47W610-32-2	9.3-2
1-47W610-47-1	10.2-2
1-47W610-47-2	10.2-3
1-47W610-47-3	10.2-4
1-47W610-62-1	9.3-15 SH 7
1-47W610-62-2	9.3-15 SH 8
1-47W610-62-3	9.3-15 SH 9
1-47W610-63-1	6.3-1 SH 2
1-47W610-63-1A	6.3-1-2 SH A
1-47W610-63-2	6.3-1-3
1-47W610-63-2B	6.3-1-3 SH B
1-47W610-65-1	6.2.3-15
1-47W610-65-1A	6.2.3-15A
1-47W610-67-1	9.2-10
1-47W610-67-2	9.2-11
1-47W610-67-2A	9.2-11 SH A
1-47W610-67-3	9.2-12
1-47W610-67-4	9.2-13
1-47W610-68-1	5.1-1 SH 2
1-47W610-68-2	5.1-1 SH 3
1-47W610-68-3	5.1-1 SH 4
1-47W610-68-4	5.1-1 SH 5
1-47W610-68-5	5.1-1 SH 6
1-47W610-68-5A	5.1-1-6 SH A
1-47W610-68-6	5.1-1-7
1-47W610-68-7	5.1-1-8
1-47W610-70-1	9.2-20
1-47W610-70-1A	9.2-20A
1-47W610-70-2	9.2-21
1-47W610-70-3	9.2-22
1-47W610-74-1	5.5-4 SH 2
1-47W610-77-5	11.3-2 SH 2
1-47W610-82-2	9.5-25A
1-47W610-82-3	9.5-25B
1-47W610-82-4	9.5-25C
1-47W610-90-1	9.4-12
1-47W611-1-1	10.3-5
1-47W611-3-2	7.3-3 SH 1 & 10.4-18

SCREENING REVIEW FORM

Document No.: DCN M-39911-A

Page 26 of 43
Rev.: 001

Affected Drawing	Affected FSAR Figures
1-47W610-82-4	9.5-25C
1-47W610-90-1	9.4-12
1-47W611-1-1	10.3-5
1-47W611-3-2	7.3-3 SH 1 & 10.4-18
1-47W611-3-4	7.3-3 SH 2
1-47W611-63-1	7.3-3 SH 3 & 10.3-8
1-47W611-88-1	7.3-3 SH 4
1-47W611-99-1	7.2-1 SH 1
1-47W611-99-6	7.2-1 SH3
1-45W704-1	8.2-12

Does the proposed change involve new procedures or instructions or revisions thereof that:

Yes ☐ No ☒ N/A ☐ Differ with system operation characteristics from that described in the SAR?

Yes ☐ No ☒ N/A ☐ Conflict with or affect a process or procedure outlined, summarized, or described in the SAR?

Justification:

This change does not involve any new procedures, instructions, or revisions that differ with any information presented in the SAR.

If the questions are answered "No" or "N/A," the activity may be implemented without a safety evaluation. If any question is answered "Yes," an SE is required.

Per the above discussion a safety evaluation is required for DCN M-39911-A.

C. Review and Approvals

Preparer: J. Mike Casner — J Mike Casner — 12/9/98
Name — Signature — Date

Reviewer: William G. Sexton — W G Sexton — 12/9/98
Name — Signature — Date

Other Reviewers (as appropriate): James K. Rochelle — James K. Rochelle — 12/9/98
Name/Organization — Signature — Date

Other Reviewers: John F. Lund — John F. Lund — 09DEC98
Name — Signature — Date

SCREENING REVIEW FORM

Document No.: DCN M-39911-A

Page 27 of 43
Rev.: 001

C. Review and Approvals

Preparer: STACEY L. PARROTT — Stacey L. Parrott — 2-19-99
Name — Signature — Date

Reviewer: ROBERT P. BALCH — Robert P. Balch — 2-19-99
Name — Signature — Date

Other: James K. Rochelle — James K. Rochelle — 2-19-99
Reviewers (as appropriate) — Name/Organization — Signature — Date

Other Reviewers: John F. Lund — John F. Lund — 19FEB99
Name — Signature — Date

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SAFETY EVALUATION FORM

Document No.: DCN M-39911-A

Page 28 of 43
Rev.: 001

A. Description and Accident Evaluation:

Detailed description of the change, test, or experiment, including the design basis accident, and credible failure modes of activity.

DCN M-39911-A, replaces the obsolete Unit 1 Westinghouse P2500 Plant Process Computer and consolidates the Emergency Response Facilities Data System (ERFDS) into a new Plant Integrated Computer System (ICS). The ICS provides an operator friendly, state of the art, real time process computer system for the WBN plant operators and Emergency Operation Facility (EOF) personnel. This modification consists of replacing the P2500 processor, data acquisition equipment, and applicable operator interface devices. Through the use of special adapters, most of the actual field terminations will remain unchanged while the scanning and converting electronics will be replaced. All input signal jumpering that resulted in redundant computer points between the P2500 and ERFDS multiplexers have been removed. These redundant points are no longer needed since the ICS can access all data directly from either the existing P2500 or ERFDS multiplexers.

After this modification, the new ICS computer will be operational and performing all functions of the old P2500 computer and most of the functions of the Emergency Response Facilities Data System (ERFDS), including SPDS, BISI, BOP, NSSS, Communications Data Links, and RHR Mid-Loop Operation Monitoring Functions. All display functions currently associated with the Emergency Response Facilities Data System (ERFDS) computer will be incorporated into the ICS. The ICS will be driving all the current Main Control Room (MCR) and Technical Support Center (TSC) "ERFDS" displays. The "ERFDS" display terminology will no longer exist after this modification, and all the displays will be "ICS" displays, or in ICS terminology Satellite Display Stations (SDS). The only functions that will still be performed on the old ERFDS processor are Environmental Data Station (MET Tower) functions; limited Eberline radiation monitoring functions; Turbine Supervisory functions (Bentley Nevada); and Landis and Gyr interface functions (Switch Gear). These functions are still performed on the old ERFDS processor but are available to the ICS for processing via a data link. [Note: These functions are only intended to remain on the old ERFDS processor temporarily. As part of the next phase of the ICS project the above functions will be transferred entirely to the ICS and the ERFDS processor will be removed.]

This modification will add new data acquisition equipment in Aux. Inst. Rm. panel 1-R-177 to incorporate the functions of the Main Steam RAD Release Rate Computer/Recorder (1-XR-1-5) into the ICS. The Main Steam RAD Release Rate Computer/Recorder (1-XR-1-5) will be removed.

During the installation of the ICS the data typically monitored by the P2500 or ERFDS computers will be unavailable. At Operations request, temporary monitoring will be established for specific computer points that were identified by operations (there are no functional requirements for monitoring the identified computer points). This temporary monitoring will be established and controlled via the Work Order (WO) process.

SAFETY EVALUATION FORM

The Maintenance Organization will prepare and issue Technical Instruction TI-264.002. This instruction will address the performance of Plant Instructions such as Surveillance Instructions (SI), that normally use either the P2500 or ERFDS computers to verify results, while the P2500 and ERFDS computers are out of service. A separate Safety Assessment/Evaluation will be performed as required for TI-264.002. The Post Modification Testing (PMT) procedures will adequately detail that the SI requirements have been completed.

Some of the key points associated with this modification are:

1. Replace the P2500 computer with dual Alpha computers.
2. Replace the P2500 software with SAIC-based software.
3. Replace the P2500 and some limited ERFDS scanning and conversion electronics with fiber optic data acquisition equipment to be located in the existing I/O cabinets.
4. Delete all redundant input cabling between the P2500 and ERFDS I/O cabinets.
5. Add a data link between the ERFDS and ICS.
6. Add a data link between the ICS and PEDS.
7. The ICS will be powered from the TSC inverter. The new power scheme will be diversified as possible in order to prevent the failure of one fuse or breaker from disabling the entire ICS system.
8. Computer Inverter #1 and it's associated equipment which currently power the P2500 computer will be removed.
9. A new IRIG-B Time Synchronizer will be installed in the computer room to provide time synchronization between the ICS, RONAN annunciator system, Turbine Supervisory system (Bentley Nevada), and the MCR clock.
10. Add new chassis in Aux. Inst. Rm. panel (1-R-177) for incorporation of the Main Steam RAD Release Rate Computer/Recorder (1-XR-1-5) into the ICS.
11. New software will be developed and loaded into the ICS to insure that all functions of the Main Steam RAD Release Rate Computer are incorporated into the ICS.
12. Run Fiber Optic cable (1C1186) from Computer Room to Aux. Instrument Room panel (1-R-177) to support incorporation of the Main Steam RAD Release Rate Computer/Recorder into the ICS.
13. In the MCR the Graphical User Interface (GUI) will be deleted and replaced with an ICS SDS. The existing communications hubs will be replaced with redundant hubs.
14. Replace P2500 printers in MCR with new laser printers (for logs and alarms).

15. Replace all special function ERFDS workstation (After this modification ICS SDS) keyboards with new standard computer keyboards in both the MCR and TSC. This change is needed since the existing keyboards can not be replaced by DCN M-39931-A (MCR and TSC PC replacement modification). The existing keyboards were specially designed to support the existing ERFDS software.

16. Deactivate P2500 point U2035 (CCW Pump Average Overall Efficiency). This point was evaluated to be no longer needed by WBN personnel.

17. Add an ICS trouble alarm to the RONAN Annunciator system. This is accomplished by combining existing Windows 99A ["RCP MOTOR THRUST BEARING TEMP HI" (Computer Point Y9002C)] and 100A ["RCP STATOR TEMP HI (FROM P-2500)" (Computer Point Y9001C)] on MCR window box 1-XA-55-5B into one window (100A on window box 1-XA-55-5B). The new combined window 100A will be re-engraved to read "RCP STATOR/MTR THRUST BRG TEMP HI" and window 99A will be blanked. The combining of these computer points on one annunciator window will spare an input cable to RONAN, which will then be used for the new "PLANT COMPUTER TROUBLE" annunciator. This annunciator will be located on window 136F on MCR Window Box 1-XA-55-6D. This new Plant Computer Trouble alarm will annunciate for the following conditions: (1) the primary alpha computer is down and the backup alpha computer is running, (2) the primary and backup alpha computers are both down, or (3) there is a loss of power to the chassis that contains the new Delay Timer (Watchdog) I/O Card.

18. Resolve PER WBPER980807. The following computer points were identified by operations as critical computer points that should be included on the RONAN annunciator system. These points will be added to existing annunciator window 83D ["ROD DEVN & SEQ PWR RANGE TILT COMPUTER ALARM" (Computer Point Y9000C)] on MCR Window Box 1-XA-55-4B:

U0270D	DELTA FLUX ALARM (AXIAL FLUX DIFFERENCE (AFD))	
P1000A	CONTAINMENT 1 PRESSURE	
P1001A	CONTAINMENT 2 PRESSURE	
P1002A	CONTAINMENT 3 PRESSURE	
P1003A	CONTAINMENT 4 PRESSURE	
U0965	RBF&ED POCKET SMP 15M AVG RORISE,	(Calculated Point)
U0966	RBF&ED POCKET SMP 15M AVG RORISE,	(Calculated Point)
U0968	RBF&ED POCKET SMP 60M AVG RORISE,	(Calculated Point)
U0969	RBF&ED POCKET SMP 60M AVG RORISE,	(Calculated Point)

As part of this change annunciator window 83D will be re-engraved to read "PLANT COMPUTER GENERATED ALARM (SEE ICS)". Since this annunciator modification will result in numerous computer points activating one annunciator window, a special screen will be added to the ICS displays especially for the 83D alarm. After this change whenever any of these computer points exceed their alarm setpoints, window 83D will annunciate. Operators should then go to an ICS SDS and proceed to the NSSS menu and select the "Annunciator 83D Alarms" screen. This screen will then give operations personnel exact indication of which critical alarm brought in the 83D annunciator window. Therefore, decreasing their response time to the annunciator.

SUMMARY OF MODIFICATION WORK BY ROOM

(This is a summary only and is not intended to be a complete listing of all work required for the installation of the ICS)

AUX. INSTRUMENT ROOM:

- Rack 1-R-177 "Main Steam Data Logger Replacement":
  - Removal of the 1-XR-1-5 recorder.
  - Installation of RTP chassis and fan assembly, lightguide, I/O cards, terminal strip cable assemblies, dropping resistors, and plug strip, etc...
  - Abandon cables as required.

- New fiber optic cable (12 pairs) pulled from computer room to 1-R-177. This fiber will be required to connect the new RTP chassis for the Main Steam Data Logger inputs into the ICS data acquisition network. It will also connect the existing RTP chassis' for panels 1-R-133, -134, 1A1, 1B1, and Eagle-21 interface into the ICS network during a later phase of this project, not included in DCN M-39911A.

250V BATTERY BOARD ROOM #1:

- Demolition of computer inverter #1 and computer inverter #1 SYNC fused disconnect switch (remove or abandon associated cabling/conduit).

- Demolition of anchors / grout pads, as necessary.

- Removal of unit 1 cabling from the computer maintenance supply transfer switch. This will require the deletion of Unit 2 cable M35 in order to allow the removal of computer inverter #1 sync fused disconnect switch. This also includes the abandonment of cable M21 which originates from Auxiliary Building Lighting Board 3.

- TSC distribution panel #1: terminate cable No. M42 (previously installed) at breaker 12 and tag appropriately.

- Nameplate changes to breakers on TSC distribution panel #1.

SAFETY EVALUATION FORM

Document No.: DCN M-39911-A

Page 32 of 43
Rev.: 001

AUX. BUILDING - LIGHTING BOARD 3 :

- Determinate & abandon the computer maintenance supply feeder cable M21 and re-tag breaker as spare.

MAIN CONTROL ROOM:

- Replace GUI workstation with new ICS satellite display station (SDS). The new SDS will consist of a new a central processing unit (CPU), monitor, keyboard, and mouse.
- Replace communication hub with redundant stackable hubs.
- Replace P2500 Alarm and Trend line printers in horseshoe and remove the P2500 line printer at 1-M-24 in hallway. The 2 new printers will be Laser printers.
- Re-design power for the GUI and printers (the GUI will be replaced with a new SDS). The GUI is currently powered from the P2500 computer inverter which will be removed during this modification. The plan is to reutilize the power cable from the P2500 distribution panel and reconnect it to the new power distribution network located 1-R-103. This new network will be powered from TSC Distribution Panel #1, breaker 12.
- 1-M-14: Rework cable 1C1140 under the GUI desk, to accommodate a new 48VDC horn for ICS point annunciation in the main control room. Abandon/delete cabling/equipment associated with the old 24VDC power supply and horn.
- 1-M-21: Rework IRIG-B cabling to RONAN annunciator system from the computer room.
- Replace all special function ERFDS workstation (after this modification ICS SDS) keyboards with new standard computer keyboards. This change is needed since the existing keyboards could not be replaced during DCN M-39931-A (MCR and TSC PC replacement modification) because they were specially designed to support the existing ERFDS software.
- Rework RONAN annunciator windows 1-XA-55-4B-83D, 1-XA-55-5B-99A, 1-XA-55-5B-100A, 1-XA-55-6D-136F, and 1-XA-55-1C-16E.

TECHNICAL SUPPORT CENTER :

- Replace all special function ERFDS workstation (after this modification ICS SDS) keyboards with new standard computer keyboards. This change is needed since the existing keyboards could not be replaced during DCN M-39931-A (MCR and TSC, PC replacement modification) because they were specially designed to support the existing ERFDS software.

SAFETY EVALUATION FORM

Document No.: DCN M-39911-A

COMPUTER ROOM: RACK 1-R-103

- Remove and surplus all equipment inside of this cabinet.
- Install new 120VAC distribution network and route cable M42 (currently under the subfloor near 1-R-103) to new distribution network and terminate. Terminate power cabling to cabinets 1-R-104, -105, & -106. Re-terminate cable 1C520 from old distribution network to the new network. This cable will power the new printers and workstation in the main control room (1-M-14).
- Miscellaneous cable deletions and abandonment's.

COMPUTER ROOM: RACK 1-R-104

- ERFDS intertied cable deletions & abandonment's.
- Abandon &/or delete miscellaneous signal cabling.
- Make changes for new power / grounding, install plug molds.
- Remove old Westinghouse I/O chassis/cards and related equipment & install new chassis/cards and related equipment and terminate fiber optic jumper cabling.
- Internal cable removals.
- Removal of existing AC power cabling (and associated outlets) originating from 1-R-103.
- Install new RTD modules on cold junction box #1 & associated cable terminations on half-shell.
- RTD power supplies will remain.

COMPUTER ROOM: RACK 1-R-105

- ERFDS intertied cable deletions & abandonment's.
- Abandon &/or delete miscellaneous signal cabling.
- Make changes for new power / grounding, install plug molds.

SAFETY EVALUATION FORM

- Remove old Westinghouse I/O chassis/cards and related equipment & install new chassis/cards and related equipment and terminate fiber optic jumper cabling.
- Install new delay timer (Watchdog Timer) barrier terminal strip cable assembly and reland cable onto it. This is for the "Plant Computer Trouble" alarm on RONAN.
- Replace old 48VDC power supply with new ACOPIAN model. Existing P2500 cabling from the old 48VDC power supply to the taper pin busses will be re-used/maintained.
- Internal cable removals.
- Removal of existing AC power cabling (and associated outlets) originating from 1-R-103.
- Rework cable 1C1140, (located in front-right-bottom of panel), extending to 1-R-157 and terminate on relay-out barrier terminal strip. This will be utilized for ICS annunciation in the main control room.
- Rework of pulse input, relay output, and analog output cabling; terminate onto new barrier terminal strip cable assemblies (BTSCA). 48VDC from half-shells 68M & N will be used to supply the sensing and return voltage for the pulse input BTSCAs.
- SSPS demultiplexer equipment will remain including:
    1. Demultiplexer
    2. I/O cable connector panel
    3. 48VDC power supply
    4. 15VDC power supply
- 48VDC circuit breaker panels A & B will remain.
- Blower unit in bottom of cabinet will remain.

COMPUTER ROOM: RACK 1-R-106

- Install new RTD modules on cold junction boxes #2 and #3 & associated cable terminations on half-shell.
- ERFDS intertied cable deletions & abandonment's.
- Abandon &/or delete miscellaneous signal cabling.
- Make changes for new power / grounding, install plug molds.

SAFETY EVALUATION FORM

Document No.: DCN M-39911-A

Page 35 of 43
Rev.: 001

- Remove old Westinghouse I/O chassis/cards and related equipment & install new chassis/cards and related equipment / terminate fiber optic jumper cabling.
- Internal cable removals.
- Removal of existing AC power cabling (and associated outlets) originating from 1-R-103.
- Existing RTP test chassis and associated equipment will remain.

COMPUTER ROOM: RACKS 1-R-151, 2-R-152, 1/2-R-153, 1-R-154, -155, -158, -159, 1(2)-R-160, 1-R-161, -162

- 1-R-151: Remove ERFDS computer DEC PDP 11/84 (entire cabinet).
- 1/2-R-153: Remove ERFDS peripheral expansion cabinet (entire cabinet). UNID 1-R-153 will be reused as one of the two new ICS cabinets. 1-R-151 power feed will also be reused to supply power to the new 1-R-153. Make fiber, coax, and twisted pair connections as required per new design drawings. Cabinet 2-CMPT-264-R152 will have to be removed as it is physically connected to cabinet 1/2-CMPT-264-R153.
- 1-R-154: Remove ERFDS disk & tape drives (entire cabinet). UNID 1-R-154 will be re-used as one of the two new ICS cabinets. 1-R-154 power feed will also be reused for supply to one of the two new ICS cabinets. Make fiber, coax, and twisted pair connections as required per new design drawings.
- 1-R-155: Terminate fiber optic cable from Auxiliary Instrument Room. Miscellaneous cable abandonment's/deletions. Establish new datalink between ERFDS and the ICS.
- 1-R-158: Remove magnetic tape recorder (entire cabinet). Incorporate Plant Temperature Monitoring System (PTMS) interface into the new system (currently tied to the P2500 via modems in rack 1-R-158). Need to disconnect the modems and drop back down under the subfloor and extend to the new panels via a DB-25 to RJ-45 adapter and twisted pair cabling.
- 1-R-159: Remove P2500 printer (entire cabinet).
- 1(2)-R-160: Remove ERFDS line printers (entire device removed).
- 1-R-161: Remove ERFDS operators console and printer. Install 2 new text monitors for programming of redundant ICS computers.
- 1-R-162: Remove VAX printer.

SAFETY EVALUATION FORM

Document No.: DCN M-39911-A

Page 36 of 43
Rev.: 001

COMPUTER ROOM: RACKS 1-R-156 & 1-R-157

- 1-R-156: Installation of 3 new cards: (remote RTP controller, univ. Interface card, & A/D converter)
- 1-R-157: Installation of 2 new cards: (univ. Interface card & A/D converter)
- 1-R-156 & -157: Removal of old DEC DYS50 chassis and associated cabling.
- 1-R-156: Removal of universal chassis #1, reinstallation of new extended side universal chassis #1, and termination of fiber optic jumper cabling. One remote RTP controller will be used for both 1-R-156 and -157 instead of one in each cabinet.
- 1-R-157: Terminate cable 1C1140 onto barrier terminal strip cable assembly that already exists in this cabinet. (1C1140 is being spliced onto and extended from 1-R-105)
- 1-R-156 and -157: Cable deletions / abandonment.

COMPUTER ROOM: RACKS 1-R-100 & 1-R-102:

- 1-R-100: Remove P2500 datalink computer / programmers console and line printer from table. Extend coax cabling (removed from datalink computer) to new cabinet (1-R-153) for time synchronization of ICS to the main control room clock, RONAN annunciation system, and the turbine supervisory system. Install new ICS SDS and printer and associated network cabling.
- 1-R-100: Rework 120VAC outlets under 1-R-100 subfloor.
- 1-R-102: Remove paper tape reader and abandon associated cabling.

COMPUTER ROOM (Miscellaneous):

- Remove computer #1 transfer switch and delete/abandon cabling and conduit.
- Replace floor tiles as necessary.
- Rework power outlets for all new equipment as necessary to accommodate additional plugs and surge/EMI filters.

SAFETY EVALUATION FORM

Design Basis Accident

Essentially all "at power" design basis accidents are associated with the ICS because accident analysis assumes reactor conditions are within Tech. Spec. conditions. Several of these Tech. Spec. parameters are monitored with ICS computer software including thermal power, axial flux difference (AFD), Quadrant Power Tilt Ratio (QPTR), Rod Supervision, heatup/cooldown, and RCS inventory. The power range nuclear instrument gains are adjusted based on calorimetric calculations completed by the ICS. This ICS calorimetric calculation software will be designed, developed, and tested in accordance with SPP-2.6. Test case results of the calorimetric calculation and the other calculations identified above from the old P2500 are compared to similar calculations made by the ICS as part of the validation testing. The requirements of SPP-2.6 includes formal test cases for ICS software as well as informal supplemental testing to further demonstrate software features and challenge calculation algorithms. Therefore, there is a high degree of confidence that the ICS Tech. Spec. compliance calculations are correct.

The ICS is not safety related and is properly isolated and separated from safety related equipment. It is designed to seismic category I(L)B criteria inside seismic category I areas. In the event of an accident, MCR, and ERF personnel can use the SPDS and other aspects of the ICS as an aid to restore the plant to a safe condition. However, Operators must be trained to respond to accidents both with and without the SPDS available. The ICS will not be designed to safety system criteria, and it is not used to perform functions essential to the health and safety of the public. Although the ICS indirectly provides support to safety related systems by alerting operators that an abnormal condition may exist, operators cannot procedurally take inappropriate safety related action based solely on ICS information. There are other safety grade equipment that is provided for mitigating the events of design basis accidents.

Therefore, the new ICS will not adversely impact any previously completed analysis of DBA's. The replacement of the P2500 and limited ERFDS equipment with state-of-the-art ICS equipment does not create any new accidents of any type that would represent an unreviewed safety question.

Credible Failure Modes

The credible failure modes associated with the existing P2500 computer and ERFDS have not changed as a result of this modification. The new ICS is susceptible to the same failure modes as the P2500.

1. Total Loss of ICS
2. Display of Incorrect Information
3. Loss of ICS Satellite Display Stations (SDS)
4. Loss of one or more data sources

The ICS is not defined as being safety-related and it is not required to meet the single failure criterion or be qualified to IEEE criteria for Class 1E equipment. The ICS is not to be used to perform functions essential to the health and safety of the public. Although the ICS indirectly provides support to safety related systems by alerting operators that an abnormal condition may exist, operators cannot procedurally take

SAFETY EVALUATION FORM

inappropriate safety related action based solely on ICS information. Since it is designed to seismic category I(L)B criteria inside seismic category I areas, it will not fail during a design basis seismic event in a manner which will adversely affect safety-related structures, systems or components. Therefore, this modification does not create any new credible failure modes of any type that would represent an unreviewed safety question.

B. Evaluation of Effects

B.1 May the proposed activity increase the probability of an accident previously evaluated in the SAR? Yes ☐ No ☒
Justification:

This modification replaces obsolete computer equipment with an operator friendly, state of the art, real time process computer system for the WBN plant operators and Emergency Operation Facility (EOF) personnel.

The ICS is not safety-related and it is not required to meet the single failure criterion or be qualified to IEEE criteria for Class 1E equipment. It is properly isolated and separated from safety related equipment in accordance with Design Criteria WB-DC-30-4 and is designed to seismic category I(L)B criteria inside seismic category I areas per WB-DC-40-31.13. The ICS is not used to perform functions essential to the health and safety of the public. Although the ICS indirectly provides support to safety related systems by alerting operators that an abnormal condition may exist, operators cannot procedurally take inappropriate safety related action based solely on ICS information. There are other safety grade equipment that is provided for mitigating the events of design basis accidents.

Several Tech. Spec. parameters are monitored with ICS computer software including thermal power, axial flux difference (AFD), Quadrant Power Tilt Ratio (QPTR), Rod Supervision, heatup/cooldown, and RCS inventory. The power range nuclear instrument gains are adjusted based on calorimetric calculations completed by the ICS. This ICS calorimetric calculation software will be designed, developed, and tested in accordance with SPP-2.6. Test case results of the calorimetric calculation and the other calculations identified above from the old P2500 are compared to similar calculations made by the ICS as part of the validation testing. The requirements of SPP-2.6 includes formal test cases for ICS software as well as informal supplemental testing to further demonstrate software features and challenge calculation algorithms. Therefore, there is a high degree of confidence that the ICS Tech. Spec. compliance calculations are correct. The ICS will alert Operations personnel at the same thereshold as the existing P2500 and ERFDS computers. Therefore, there is no increase in the probablity of an acident due to plant operation outside limits as defined in the Techincal Specifications.

The Equipment changes as a result of this DCN have been analyzed and determined to be seismically adequate per the results of civil engineering calculations issued for DCN M-39911-A.

Electrical load changes resulting from new and removed equipment has been analyzed and determined to be acceptable per the results of electrical engineering calculations issued for DCN M-39911-A.

SAFETY EVALUATION FORM

Document No.: DCN M-39911-A

Fire load changes resulting from new and removed equipment has been analyzed and determined to be acceptable per the results of mechanical engineering calculations issued for DCN M-39911-A.

The WBN ICS software is essentially the same as that installed on the SQN Unit 1 and 2 ICS. The basic SAIC Plant Monitoring System (PMS) that is the backbone of the ICS software package is in service at many other nuclear power plants including Susquehanna, Waterford, Seabrook, Browns Ferry, and Diablo Canyon.

The ICS was subjected to an extensive Human Factors Engineering (HFE) review during its design, development, and testing at SQN. There was extensive SQN Senior Reactor Operator (SRO) involvement in the man-machine interface including display development. The enhanced WBN ICS displays (including SPDS and BISI) will also receive an extensive Human Factor Engineering (HFE) review. This review will be done by Computer Engineering Service, INC. (CES), under contract P-95BYE-119256-001, Release 1279465. This review is to be completed and approved and any problems resolved by TVA before this DCN is installed. Only ICS computer displays will be evaluated by CES; all other hardware modifications have been evaluated from a HFE perspective as part DCN M39911-A.

MCR operators will receive training on the ICS on the WBN plant specific control room simulator prior to placing the ICS in service. Therefore the chances of human error are decreased.

A failure of the ICS could not initiate any event or accident. Computer hardware and software developed for the ICS will be designed, developed, and tested in accordance with SPP-2.6. The ICS system architecture includes backup processors with automatic fail over capability, redundant data acquisition processing equipment, and redundant communication cables to the primary ICS man-machine interface (SDS). These features reduce the risks associated with ICS component failures and helps to increases the reliability of the ICS.

The installation of the new Plant Integrated Computer System (ICS) will help to increase the overall effectiveness of plant personnel by providing them with accurate, reliable and timely information which may be used during abnormal and emergency conditions in determining the safety status of the plant and in assessing whether abnormal conditions require corrective action by the operators to avoid a degraded core.

Consequently this modification introduces no increased probability or frequency of an accident previously evaluated in the SAR.

SAFETY EVALUATION FORM

Document No.: DCN M-39911-A

Page 40 of 43
Rev.: 001

B.2 May the proposed activity increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR? Yes ☐ No ☒
Justification:

As stated above, the ICS is not safety-related and it is not required to meet the single failure criterion or be qualified to IEEE criteria for Class 1E equipment. It is properly isolated and separated from safety related equipment, and is designed to seismic category I(L)B criteria inside seismic category I areas. All equipment added as part of DCN M-39911-A has been evaluated for EMI/RFI interference per SS-E18.14.01 and was determined to be adequate for installation and operation in the plant with installation of power supply filters. The computer software is designed, developed, and tested in accordance with the requirements of SPP-2.6.

Although the ICS indirectly provides support to safety related systems by alerting operators that an abnormal condition may exist, operators cannot procedurally take inappropriate safety related action based solely on ICS information. Validated information from other sources will be used prior to taking actions which affect safety. Therefore this modification will not decrease the ability of systems important to safety to perform their intended functions. Therefore, the probability of occurrence of a malfunction of equipment important to safety is not increased.

B.3 May the proposed activity increase the consequences of an accident previously evaluated in the SAR?
Yes ☐ No ☒
Justification:

As noted above, the ICS is not safety related and will not have detrimental effects on safety related equipment. Failure of any ICS equipment will not result in the release of radioactive products.

The ICS software for performing the process radiation levels and radiation release rate calculations will be designed, developed, tested, and verified in accordance with the requirements of SPP-2.6.

Therefore, this modification introduces no increased radiological consequences of an accident previously evaluated in the SAR.

B.4 May the proposed activity increase the consequences of a malfunction of equipment important to safety previously evaluated in the SAR? Yes ☐ No ☒
Justification:

As noted above, the ICS is properly isolated and separated from safety related equipment, and is designed to seismic category I(L)B criteria inside seismic category I areas. Therefore, the radiological consequences of a malfunction of equipment important to safety are not changed.

SAFETY EVALUATION FORM

B.5 May the proposed activity create a possibility for an accident of a different type than any evaluated previously in the SAR? Yes ☐ No ☒
Justification:

The credible failure modes of the ICS are: total loss of ICS, incorrect information displayed, loss of one or more ICS SDS, loss of one or more ICS input data sources. These failure modes are the same as those associated with the P2500. There are administrative procedures in place which permit safe and reliable operation of the plant without the ICS. The ICS monitors input data and flags information which may be incorrect with quality codes. Equipment monitored by the ICS which is important to safety have alternate indications in the MCR as necessary for operators to distinguish between a false ICS indication and the actual condition. If a false indication is received, operators can distinguish between false and legitimate conditions using information readily available to them. As mentioned earlier, the ICS is not to be used to perform functions essential to the health and safety of the public. Although the ICS indirectly provides support to safety related systems by alerting operators that an abnormal condition may exist, operators cannot procedurally take inappropriate safety related action based solely on ICS information. Validated information from other sources will be used prior to taking actions which affect safety.

Therefore this modification will not create a possibility for an accident of a different type that any evaluated previously in the SAR.

B.6 May the proposed activity create a possibility for a malfunction of a different type than any evaluated previously in the SAR? Yes ☐ No ☒
Justification:

Based on the credible failure modes discussed in B.5 above, there will be no new malfunction pathways introduced which have not been previously evaluated in the SAR accident analysis. Therefore there will be no creation of a possibility for a malfunction of a different type than any evaluated previously in the SAR

B.7 May the proposed activity reduce the margin of safety as defined in the basis for any Technical Specification? Yes ☐ No ☒
Justification:

DCN M-39911-A will revise Technical Specification Bases Section 3.3.3 "Post Accident Monitoring (PAM) Indication", Table 3.3.3-1 function 15 & 16 "Steam Generator Water Level (Wide and Narrow Range)". This revision is minor in nature and only removes a reference to the Emergency Response Facility Data System (ERFDS). In this reference a signal was described as input to both the Plant Computer and the ERFDS. With the new ICS redundant inputs are no longer required and therefore, this reference was removed from this TS bases. Therefore, there is no reduction in the margin of safety as defined in the Basis for any Tech Specs.

SAFETY EVALUATION FORM

Document No.: DCN M-39911-A

The ICS has no defined margin of safety as defined in the basis for any technical specification. The secondary heat balance calorimetric is one method which can be used to ensure power is within Rated Thermal Power when nuclear instrumentation is indicating 100% power. This calculation will be designed, developed, tested, and verified in accordance with the requirements of SPP-2.6. It is of comparable accuracy to the existing secondary heat balance calculations performed by the P2500 computer. Software for QPTR, AFD, Rod Deviation, and RCS Inventory is treated in a similar manner. The requirements of SSP-2.6 includes formal test cases for software as well as informal supplemental testing to further demonstrate software features and challenge calculation algorithms.

This modification will not degrade the ability of any equipment important to safety to perform its intended safety function, thereby reducing any margin of safety in the Tech. Specs. Therefore, there is no reduction in the margin of safety as defined in the basis for any technical specification.

C. Unreviewed Safety Question Determination Conclusion

The change, test, or experiment:

Does not involve an unreviewed safety question. ☒

Involves an unreviewed safety question and must be revised, canceled, or reviewed by the NRC prior to implementation. ☐

Summarize why the activity does or does not constitute a USQ.

DCN M-39911-A, replaces the obsolete Unit 1 Westinghouse P2500 Plant Process Computer and consolidates the Emergency Response Facilities Data System (ERFDS) into a new Plant Integrated Computer System (ICS). The ICS provides an operator friendly, state of the art, real time process computer system for the WBN plant operators and Emergency Operation Facility (EOF) personnel. After this modification, the new ICS computer will be operational and performing all functions of the old P2500 computer and most of the functions of the Emergency Response Facilities Data System (ERFDS), including SPDS, BISI, BOP, NSSS, Communications Data Links, and RHR Mid-Loop Operation Monitoring Functions. The ICS is not safety-related and is isolated from safety related equipment. It is designed to seismic category I(L)B criteria inside seismic category I areas. It is not required to meet the single failure criterion or be qualified to IEEE criteria for Class 1E equipment. The ICS is not used to perform functions essential to the health and safety of the public. Although the ICS indirectly provides support to safety related systems by alerting operators that an abnormal condition may exist, operators cannot procedurally take inappropriate safety related action based solely on ICS information. Consequently, this modification introduces no increased probability of an accident or malfunction of equipment important to safety; or create a possibility for an accident or malfunction of a different type than any evaluated previously in the SAR. This modification introduces no increased radiological consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR.

Class B and C software on the ICS will be designed, developed, tested, and verified in accordance with the requirements of SPP-2.6. Consequently no margin of safety as defined in the Basis for Tech Specs is reduced.

SAFETY EVALUATION FORM

Document No.: DCN M-39911-A

Page 43 of 43
Rev.: 001

Multiple SAR drawings are modified to show new and revised computer point IDs. Various SAR text sections and tables are modified in a minor fashion to reflect the new ICS arrangement, expanded functions, and communications scheme.

Technical Specification Bases Section 3.3.3 "Post Accident Monitoring (PAM) Indication", Table 3.3.3-1 function 15 & 16 "Steam Generator Water Level (Wide and Narrow Range)" must be revised. This revision is minor in nature and only removes a reference to the Emergency Response Facility Data System (ERFDS). In this reference a signal was input to both the Plant Computer and the ERFDS. With the new ICS redundant inputs are no longer required and therefore, this reference was removed from this TS bases. Therefore, there is no reduction in the margin of safety as defined in the Basis for any Tech Specs.

Therefore, per the previous discussion DCN M-39911-A does not result in an Unreviewed Safety Question.

D. Reviews and Approvals

	Name	Signature	Date
Preparer:	J. Mike Casner	J. Mike Casner	12/9/98
Reviewer:	William G. Sexton	W G Sexton	12/9/98
Reviewer: (PORC)ᵃ	James K. Rochelle	James K. Rochelle	12/9/98
Other: Reviewers (as appropriate) JFL 09DEC98		David A. Kulisek	12/14/98
	John F. Lund	John F. Lund	09DEC98

ᵃAs required by Technical Specification

D. Reviews and Approvals

	Name	Signature	Date
Preparer:	STACEY L. PARROTT	Stacey L. Parrott	2-19-99
Reviewer:	ROBERT P. BALCH	Robert P. Balch	2-19-99
Reviewer: ~~(PORC)ᵃ~~ APP 2/19/99	James K. Rochelle	James K. Rochelle	2-19-99
Other: Reviewers (as appropriate)	John F. Lund	John F. Lund	19FEB99

ᵃAs required by Technical Specification

R1

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 4

Document No. & Rev: DCN 50681A
SR Rev: 0
50.59 Eval Rev.

Screening Review Only ☒
Screening Review/50.59 Evaluation ☐
Procedure Change Evaluation ☐
Screening Review/Procedure Change Evaluation ☐
(Check only one box)

Plant WBN
Affected Unit(s) 1
Preparing Group CEE

Activity		Number (Include Revision No.)
☒ Design Change	DCN No.	50681A
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (if applicable) Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comment:

This Screening Review is for DCN 50681A which installs conduit and cable to support the Analog Rod Position Indication (ARPI) System Replacement, DCN 51072A. DCN 50681A will be worked during U1C4 and the ARPI System will be replaced during U1C5.

Tracking No: WBPLEE-01-$\overset{84}{0}$-00

Distribution:
cc: EDM
Preparer - Return original to originating document

Reviews and Approvals

Preparer:	ROGER P. FOSTER Name	Signature	11-01-01 Date
Reviewer:	William G. Sexton Name	Signature	11-01-01 Date
Reviewer: (PORC)	Name	Signature	Date
Other Reviewers: (as appropriate)	Name	Signature	Date

DCN No. 50681A
Page 8

SCREENING REVIEW FORM

Page 2 of 4

Document No. & Rev: DCN 50681A

SR Rev: 0

I. For a Screening Review provide a brief description of the change or test. If an 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

The Analog Rod Position Indication (ARPI) System at Watts Bar is being replaced with a new digital system that will solve several of the existing problems present with the ARPI system. The new Rod Position Indication (RPI) System, called the Combustion Engineering Rod Position Indication (CERPI) System, will be implemented by DCN 51072A and will be installed during U~~2~~1C5. AP 4-5-01 The new CERPI system will be located in the existing ARPI cabinets (1-R-41, 1-R-42, 1-R-43 & 1-R-44) and will require additional cables to be run from various auxiliary instrument room panels to provide for plant interfaces to the new system. This DCN provides documentation for The U1C4 Auxiliary Instrument Room cable and conduit work needed to support DCN 51072A.

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

SCREENING REVIEW FORM

Page 3 of 4

Document No. & Rev: DCN 50681A SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

   Yes ☐ No ☒

   Justification: The design function of conduits and cable trays is to provide a raceway used for the routing, support and physical separation/protection of cables. These cables will not be electrically connected to any equipment during this outage modification. This activity meets the requirements of design criteria on seismic category I structures, category I cable tray and conduit supports, electrical raceways, and separation/isolation. Calculation revisions have been done to qualify supports for new conduits being added by this activity and to verify the seismic qualification of the control building is maintained. Therefore, this activity will not adversely affect any UFSAR described design functions.

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification: This activity involves running new conduit and cable in the auxiliary instrument room and does not involve any procedure changes.

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

   Yes ☐ No ☒

   Justification: The proposed activity routes cables in new and existing conduit and existing cable trays located in the auxiliary instrument room and does not involve any evaluation methodologies.

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification: The addition of cable and conduit in the auxiliary instrument does not involve a test or experiment not described in the UFSAR.

5. Does the proposed activity require a change to the Technical Specifications?

   Yes ☐ No ☒

   Justification: The conduit and cable tray system in the auxiliary instrument room are not discussed in the Technical Specifications and therefore, no change is required.

SCREENING REVIEW FORM

Page 4 of 4

Document No. & Rev: DCN 50681A SR Rev: 0

IV. **If** all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

NOTE If an FSAR change is involved process that change per NADP-7, FSAR Management.

All questions, 1 through 5, were answered NO therefore, no 50.59 Evaluation is required.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

UFSAR sections/tables reviewed:

3.10.3	**Methods of Qualifying TVA-Designed Supports for Electrical Equipment Instrumentation and Cables**
8.3.1.4	**Independence of Redundant AC Power Systems**

Design Criteria reviewed:

WB-DC-20-21.1	**Category I Cable Tray Supports**
WB-DC-30-22	**Electrical Raceways**
WB-DC-30-4	**Separation/Isolation**
WB-DC-40-31.10	**Seismically Qualifying Conduit Supports**

SCREENING REVIEW FORM

DCN 50917-A
PAGE 15

Page 1 of 6

Document No. & Rev: 50917-A
SR Rev: 0

TVA 40673 [03-2001] SPP-9.4-2 [03-19-2001]

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 1

Document No. & Rev: DCN 50917-A
SR Rev: 0
50.59 Eval Rev. N/A

Screening Review Only ☒
Screening Review/50.59 Evaluation ☐
Procedure Change Evaluation ☐
Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant WBN
Affected Unit(s) 1
Preparing Group SE-DE (WBP-LEE)

Activity	Number (Include Revision No.)	
☒ Design Change	DCN No.	50917-A
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (if applicable) Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comment:

Tracking No. WBPLEE-01-022

Distribution:
cc: EDM
Preparer - M. L. Young, EQB-2N-WBN

Reviews and Approvals

Preparer:	Maurice L. Young Name	Maurice L. Young Signature	7/17/01 Date
Reviewer:	STACEY L. PARROTT Name	Signature	7/19/01 Date
Reviewer: (PORC)	N/A Name	N/A Signature	Date
Other Reviewers: (as appropriate)	N/A Name	N/A Signature	Date

SCREENING REVIEW FORM

Document No. & Rev: 50917-A

SR Rev: 0

I. For a Screening Review provide a brief description of the change or test.

DCN 50917-A will replace/delete five Foxboro model 6400HF-0 series trend recorders. These recorders are all located on the benchboards in the main Control Room (MCR). These recorders are obsolete. The replacement recorders are Thermo Westronics model SV100, as supplied under contract 01NAN-146789. The new recorder will be a multiple channel paperless video graphic recorder which utilizes thin-film transistor (TFT) liquid crystal display (LCD) technology. Mounting hardware will be supplied by the vendor to mount the new recorder. The recorder meets plant requirements for seismic (ILB) and EMI/RFI qualification. The new recorder will be capable of supporting a minimum of six analog inputs, however, this change will not add any additional inputs for recording by the new recorder.

Recorders 1-TR-72-6 and 1-TR-72-31 are located on MCR panel 1-M-6. 1-TR-72-6 records Containment Spray Heat Exchanger B Outlet temperature from sensor 1-TE-72-6. 1-TR-72-31 records Containment Spray Heat Exchanger A Outlet temperature from sensor 1-TE-72-31. Both recorders are being removed and replaced by new Integrated Computer Points (ICS) T0169A and T0168A respectively. The existing single panel cutout for these recorders will be patched.

Recorder 1-FR-62-139 located on panel 1-M-6 will be deleted. 1-FR-62-139 on pen 1 records boric Acid to blender from sensor 1-FR-62-139 and pen 2 records primary Water to Blender from sensor 1-FIT-62-142. Both recorder channels are also available for display on ICS displays (ICS points F0111D from the 142 loop and F0110D from the 139 loop) and are available at any of the ICS satellite display stations. The existing single panel cutouts for these recorders will be patched.

Recorders 1-LR-3-43 and 1-LR-3-98 are located on panel 1-M-4. Pen 1 on 1-LR-3-43 records Steam generator 1 Wide Range level from sensor 1-LT-3-43. Pen 2 on 1-LR-3-43 records Steam generator 1 Nuclear power Level Demand from input from 1-LM-3-231. Wide Range level from sensor 1-LT-3-56. Pen 3 on 1-LR-3-43 records Steam generator 1 Wide Range level from sensor 1-LT-3-43. Pen 1 on 1-LR-3-98 records Steam generator 3 Wide Range level from sensor 1-LT-3-98. Pen 2 on 1-LR-3-98 records Steam Generator 4 Nuclear power Level Demand from input from 1-LM-3-231. Wide Range level from sensor 1-LT-3-111. Pen 3 on 1-LR-3-43 records Steam Generator 2 Wide Range level from sensor 1-LM-3-232. Both of these recorders are being replaced.

Document No. & Rev: 50917-A SR Rev: 0

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described design function? (See Section 4.2.1.1 of NEI 96-07)

Yes ☐ No ☒

Justification:

This change involves three different SSC design functions. The first SSC design function is the instrumentation requirements related to the containment spray system. UFSAR section 6.2.2.5 states "The operation of the containment spray system is verified by instrument readout in the control room." Presently there are two recorders 1-TR-72-6 and 1-TR-72-31 which provides trending of the outlet temperature of the two containment spray heat exchangers. These instruments allow monitoring (trending) of the heat exchanger outlet temperature while on long term cooling (containment sump recirculation). Two new ICS points are to be created to replace these two recorders. Monitoring/trending capability of the outlet temperature of the two containment spray heat exchangers will exist using the ICS terminals available to the operators. UFSAR Table 6.2.2-3 "Failure Modes and Effects Analysis" lists these two recorders by TVA UNID numbers and this table will be revised to reflect the removal of the recorders and that ICS points are to be used to ascertain the containment spray heat exchanger outlet temperatures. UFSAR Table 7.5.2 "Regulatory Guide 1.97 "Post Accident Monitoring Variables List" contains variable 46 "Containment Spray HX Outlet Outlet Temperature". This variable is a PAM Category D2 variable and will be available to the operator as a PAM CAT D2 variable within the ICS system. Changing the instrumentation used by Operations does not adversely affect the UFSAR described design function of the containment spray system. This change does not involve a change to the SCC that adversely affects the UFSAR.

The second SSC design function is the instrumentation requirements related to the Chemical and Volume Control System (CVCS). UFSAR section 9.3.4.5 "Process control instrumentation is provided to acquire data concerning key parameters about the CVCS." The location of the instrumentation is shown on Figure 9.3-15 (Drawing 1-47W610-62-3). The instrumentation furnishes input signals for monitoring and/or alarming purposes. Indications and/or alarms are provided for the following parameters: 1. Temperature, 2. Pressure, 3. Flow, 4. Water level. Presently recorder trending for boric acid and primary water flow to the blender is available on 1-FR-62-139. This same information is available in ICS as points F0111D & F0110D, therefore the recorder is being deleted. Changing the instrumentation used by Operations does not adversely affect the UFSAR described design function of the CVCS system. This change does not involve a change to the SCC that adversely affects the UFSAR.

The third SSC design function is the instrumentation requirements related to Steam Generator. UFSAR Table 7.5.2 "Regulatory Guide 1.97 "Post Accident Monitoring Variables List" contains variable 82 "Steam Generator level". This variable is a D1 category and requires at least one of the redundant loops to be trended on a non-divisional trend recorder qualified to meet Category 2 requirements. This DCN replaces the existing obsolete Steam Generator Level recorders with new paperless recorders. Changing the obsolete recorders used by Operations to new paper-less recorders does not adversely affect the UFSAR described design function of the steam generator level instrumentation system. This change does not involve a change to the SCC that adversely affects the UFSAR.

SCREENING REVIEW FORM

Page 4 of 6

Document No. & Rev: 50917-A SR Rev: 0

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   This change does not involve procedures that affect system operational characteristics described in the UFSAR or impact compliance with the Technical Specification. Also, this change does not conflict with or affect processes or procedures outlined, summarized, or described in the UFSAR.

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   This change does not involve revising or replacing an evaluation methodology described in the UFSAR. This change does not impact any design bases or safety analyses relating to recorder or trending function.

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   This change does not involve a test or experiment described in the UFSAR. The replacement of the chart paper type recorders with paperless videographic type recorders does not constitute a test or experiment.

5. Does the proposed activity require a change to the Technical Specifications?

   Yes ☐ No ☒

   Justification:

   This change does not impact the Technical Specification (TS). Section 3.3.3 & associated Table 3.3.3-1 "Post Accident Monitoring (PAM) Instrumentation", of the TS were reviewed and no impacts were found. Section 3.6.6, "Containment Spray System" was also reviewed and no impacts were found.

SCREENING REVIEW FORM

Page 5 of 6

Document No. & Rev: 50917-A

SR Rev: 0

IV. **If** all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

<u>NOTE</u> If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

Associated Design Basis Documents:
TVA & Contract Drawings

1-47W610-72-1, R11; 1-47W605-55, R0; 1-47W605-75,R0; 1-47W605-136, R0; 45N1666-3, RY; 45N1665-3, RCC; 45N1645-8, RBB; 45N1645-1, RM; 1-47043CD19,SH3*RF (Contract 54114-1); 1-47043CD16,SH1*RD (Contract 54114-1); 1-47A615-24, R1; 1-45W1697-28, R1; RCC; 45W1673-14, RF; 47A348-290, R*/4; 45N1645-6, RJJ; 45N1645-3, RHH; 1-47W605-54, R*/2D; 1-47W605-74, R0; 1-47W605-132, R0; 1-47W610-62-3, R20; 45N1665-2, RZ; 1-47043CD15, SH3, RG (Contract 54114-1); 45N1643-6, RW; 45N1643-2, RJJ; 1-47W605-53, R*/2D, 1-47W605-72, R0;

Other Documents

1L0030098, R3
1L0030111, R3
1T0720006, R0
1T0720031, R0
1L0030043, R3
1L0030056, R3
WBPLEE-01-22-0
N3-72-4001
WBN-261-01-02
WBPEVAR9211003
VR # 2678
N3-62-4001
VR # 2676
ETNSLSSLWAT110
WBPEVA2 8809048

SCREENING REVIEW FORM

Page 6 of 6

Document No. & Rev: 50917-A

SR Rev: 0

VR # 2681
VR # 2677
VR # 2682
VR # 2672

Design Criteria

WB-DC-30-7, Rev. 12, Post Accident Monitoring Instrumentation (PAM)
WB-DC-30-20, Rev. 2, Control Panels
WB-DC-30-23, Rev. 1, Human Factors
WB-DC-40-31.13, Rev. 4, Seismic Qualification of Category I (L) Fluid System Components and Electrical or Mechanical Equipment

Procedures

TI - 49, Rev. 26, Technical Instruction Compliance Instruments

UFSAR

UFSAR CHANGE PACKAGES 1680 & 1684
Section 7.1.1.2, Safety Related Display Instrumentation
Table 7.5-2, PAM Variables List
Section 6.2.2, Containment Heat Removal Systems
Table 6.2.2-3, Failure Modes and Effects Analysis
Section 9.3.4.2 System Description for CVCS
Section 9.3.4.5, Instrumentation Application CVCS

Technical Specifications

Section 3.3.3, Post Accident Monitoring (PAM) Instrumentation
Section 3.6.6, Containment Spray System

QA RECORD

B44 020912 001

DCN No. 51072-A
Page 22

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 6

Document No. & Rev: **DCN 51072A**

SR Rev: 0

50.59 Eval Rev.

Screening Review Only ☒ Screening Review/50.59 Evaluation ☐

Procedure Change Evaluation ☐

Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant **WBN**

Affected Unit(s) **1**

Preparing Group **CEE**

Activity	Number (Include Revision No.)	
☒ Design Change	DCN No.	**51072A**
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (if applicable)	
	Procedure No.	
☐ Maintenance	WR/WO No.	

☒ Other (Identify) SAR CHANGE PACKAGE 1743 AND T/S BASES CHANGE TS-02-09

Comment:

DCN 51072A replaces the Rod Position Indication (RPI) system with the new Combustion Engineering Rod Position Indication System (CERPI). The analog RPI equipment in Aux. Instr. Rm. Panels 1-R-41 thru 1-R-44 will be replaced with the new PLC based CERPI system. The main control room (MCR) indicators, rod drop lights, rod speed indicator and rod insertion limit recorder will be replaced with two flat panel displays located on 1-M-4.

Tracking No: WBPLEE-02-052-00

Distribution:
cc: EDM
Preparer - Return original to originating document

Reviews and Approvals

Preparer:	R. P. Foster Name	R. P. Foster Signature	8-9-02 Date
Reviewer:	L. P. Woodley Name	L.P. Woodley Signature	8-20-02 Date
Reviewer: (PORC)	Name	N/A Signature	Date
Other Reviewers: (as appropriate)	R. H. Bryan Name	Robert H Bryan Signature	8-20-02 Date

SCREENING REVIEW FORM

Page 2 of 6

Document No. & Rev: DCN 51072A

SR Rev: 0

I. For a Screening Review provide a brief description of the change or test. If an 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

This DCN will replace the Analog Rod Position Indication (RPI) System in Auxiliary Instrument Room panels 1-R-41, -42, -43, & -44. The present RPI system has experienced problems with detector non-linearity, detector steady-state thermal dependence and electro-magnetic coupling to nearby detectors. Reducing or eliminating these problems will ensure compliance with the technical specification accuracy requirement across the entire operating range.

All analog signal processing equipment associated with the RPI system in the Auxiliary Instrument Room racks and indicators in the Main Control Room (MCR) will be replaced with new up-to-date equipment from Westinghouse Nuclear Automation (WNA). The New Westinghouse system is called the Combustion Engineering Rod Position Indication (CERPI) System. The new CERPI system will also replace the Rod Insertion Limit Monitoring (RIL) equipment and the Bank D Withdrawal Limit equipment in 1-R-25. The only control function performed by the CERPI system is the blocking of automatic rod movement when the Bank D Withdrawal Limit has been reached. The rod position indication portion of system 85 is non-safety related.

The existing rod position detectors and associated field cabling will remain intact. The MCR indicators, rod bottom lights and rod speed indicator on 1-M-4 will be replaced with two redundant LCD flat panel displays. The RPI processing equipment will be upgraded to PLC based controllers and new detector interface boards will be installed. The new system will include a maintenance terminal in one of the Auxiliary Instrument Room racks for accessing system diagnostics, ease of maintenance, and calibration access. The new system will also include a Rod Drop Test Computer which will capture rod drop times following a reactor trip in addition to the periodic rod drop testing required by plant Technical Specifications.

The new CERPI system MCR monitors will display the position of each rod in numeric and/or bar format, rod drop indication, rod insertion limit monitoring information, rod movement demand, rod speed, various rod position alarms and CERPI system trouble alarms. The rod insertion limit monitoring and bank D withdrawal limit equipment in 1-R-25 will be abandoned in place and the RIL recorder on 1-M-23A will be deleted.

The existing 57 analog inputs into the Integrated Computer System (ICS) for rod position will be deleted and a data-link installed to receive data digitally. Inputs from rod control logic rack 1-R-25 for rod speed and rod demand signals will be required by the new system. Additionally, reactor trip signals (Train A & B) from 1-R-58 will be required for the CERPI rod drop test computer.

DCN No. 51072-A
Page 24

SCREENING REVIEW FORM

Page 3 of 6

Document No. & Rev: DCN 51072A SR Rev: 0

The UFSAR is being revised to remove reference to the individual rod position indicators, rod bottom bistables and rod bottom lights (Sections 7.7.1, 7.7.2 and 15.2.3). The Technical Specifications (T/S) Bases and UFSAR are both being revised to correct the sections listing that each bank of rods is divided into two groups (T/S Bases Sections B3.1.5, B3.1.6, B3.1.7, B3.1.8 and UFSAR Section 15.2.3). This statement is incorrect since shutdown banks C and D have only one group each while all other banks have two groups each.

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

SCREENING REVIEW FORM

Page 4 of 6

Document No. & Rev: DCN 51072A SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   The design functions of the Rod Position Indication System are to sense the actual position of each control and shutdown rod and display that information to the operator. This system also supplies signals used to determine rod deviations. The design function of the Rod Insertion Limit Monitor is to alert the operator when one or more control bank rods approach excessive rod insertion. The new CERPI system will use the same detectors as the old RPI system but it will calculate a more accurate rod position from the detector signal. The calculation of the rod insertion limits by the CERPI system will be performed using exact values from the ICS computer instead of using the output of a pulse-to-analog converter. The UFSAR does not describe in detail the method in which these design functions are to be performed and since the CERPI system methods provide more accurate and reliable results, this modification does not adversely affect the above listed design functions.

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   The design functions of the Rod Position Indication System and the Rod Insertion Limit Monitor listed above will be performed by the new CERPI system. Procedures for the RPI system are not specifically detailed in the UFSAR such that the change to the CERPI system would have an adverse affect. It will actually enhance the RPI system since the CERPI system is a more accurate and reliable system. Therefore, no procedure changes that could adversely affect how a UFSAR described design function is performed or controlled will be required by this modification.

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   This activity does not revise or replace any evaluation methodology described in the UFSAR.

SCREENING REVIEW FORM

Page 5 of 6

Document No. & Rev: DCN 51072A SR Rev: 0

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   This activity does not involve a test or experiment that is not described in the UFSAR.

5. Does the proposed activity require a change to the Technical Specifications?

   Yes ☐ No ☒

   Justification:
   The surveillance requirements listed in the Technical Specifications for the RPI system and Rod Insertion Limit Monitor will be maintained by the new CERPI system and do not require any changes to the Technical Specifications.

SCREENING REVIEW FORM

Page 6 of 6

Document No. & Rev: DCN 51072A SR Rev: 0

IV. If all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

<u>NOTE</u> If an FSAR change is involved process that change per NADP-7, FSAR Management.

All questions, 1 through 5, were answered NO therefore, no 50.59 Evaluation is required.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

UFSAR sections/tables reviewed:

3.1.2.2	**Protection by Multiple Fission Product Barriers**
3.1.2.3	**Protection and Reactivity Control Systems**
4.2.3	**Reactivity Control System**
7.7.1.3	**Plant Control Signals for Monitoring and Indicating**
7.7.2	**Analysis**
15.2.3	**Rod Cluster Control Assembly Misalignment**
15.3.1	**Single Rod Cluster Control Assembly at Full Power**
15.3.6.1	**Identification of Causes and Accident Description**

Tech Spec/Tech Spec Bases sections reviewed:

3.1.5/B3.1.5	**Rod Group Alignment Limits**
3.1.6/B3.1.6	**Shutdown Bank Insertion Limits**
3.1.7/B3.1.7	**Control Bank Insertion Limits**
3.1.8/B3.1.8	**Rod Position Indication**

Technical Requirements Manual (TRM) / TRM Bases sections reviewed:

TR 3.1.7/B3.1.7	**Position Indication System, Shutdown**

System Description reviewed:

N3-85-4003	**Control Rod Drive System**

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 1

Document No. & Rev: DCN 51310-A

SR Rev: 0

50.59 Eval Rev.

Screening Review Only ☒

Screening Review/50.59 Evaluation ☐

Procedure Change Evaluation ☐

Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant WBN

Affected Unit(s) 1

Preparing Group Design Engr / I & C

Activity		Number (Include Revision No.)
☒ Design Change	DCN No.	**51310-A**
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (if applicable) Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comment:
WBPLEE-02-060-0

Distribution:
cc: EDM
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Reviews and Approvals

	Name	Signature	Date
Preparer:	C. C. Lyke	C. C. Lyke	10/01/02
Reviewer:	STACEY L. PARROTT		10/16/02
Reviewer: (PORC)	N/A	N/A	
Other Reviewers: (as appropriate)	N/A	N/A	

SCREENING REVIEW FORM

Page 1 of NA

Document No. & Rev: DCN 51310-A SR Rev: 0

I. For a Screening Review provide a brief description of the change or test. If an 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

DCN 51310-A will replace four Hagan Controls model Optimac 100 recorders in the Main Control Room (MCR) on panel 1-M-4. UNID's for the recorders are 1-FR-003-0035, 1-FR-003-0048, 1-FR-003-0090, and 1-FR-003-0103. These recorders are obsolete.

There is one recorder on panel 1-M-4 for each of the four steam generator loops. Each recorder has three inputs to monitor feedwater flow, main steam header flow, and steam generator level for its associated steam generator loop.

The replacement recorders are Thermo Westronics model SV100, as supplied under contract 01NAN-146789. The new recorders will be multiple channel paperless video graphic recorders which utilize thin-film transistor (TFT) liquid crystal display (LCD) technology. The recorders meet plant requirements for EMI/RFI qualification. The new recorders will be capable of supporting a minimum of six analog inputs, however, this change will not add any additional inputs for recording by the new recorders. The new recorders will be located on the same panels and use the same panel cutouts and cabling as the existing recorders.

DCN 51310-A will be staged in four stages to correlate with each of the four steam generator loops.
Stage 01 is for steam generator loop 1
Stage 02 is for steam generator loop 2
Stage 03 is for steam generator loop 3
Stage 04 is for steam generator loop 4

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

SCREENING REVIEW FORM

Page 2 of NA

Document No. & Rev: DCN 51310-A SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   The design function of the main steam supply system is to conduct steam from the steam generator outlets to the high pressure turbine and to the condenser steam dump system. This system also supplies steam to the feedwater pump turbines, an auxiliary feedwater pump turbine, moisture-separator reheaters, and the turbine seals.

   The design function of the feedwater system is to supply a sufficient quantity of feedwater to the steam generator secondary side inlet during all normal operating conditions and to guarantee that feedwater will not be delivered to the steam generators when feedwater isolation is required.

   The design function of Post Accident Monitoring (PAM) instrumentation is to monitor plant and environs conditions during and following design basis Condition II, III, and IV faults.

   A recorder to record feedwater flow, main steam header flow, and steam generator level for its associated steam generator loop is not required for the main steam supply system and feedwater system to perform their design functions. A recorder is required to trend PAM variable steam generator level narrow range. Pen 3 on each steam generator loop recorder provides the trend capability for this variable.

   The replacement of these obsolete recorders with current generation video graphic recorders under DCN 51310-A is considered "like for like" replacements so there are no changes in the function of devices that are replaced and no changes in the SSC in which they operate.

   Therefore, this change does not involve a change to the SSC that adversely affects UFSAR section 7.5.1, Post Accident Monitoring Instrumentation (PAM), section 10.3, Main Steam Supply System, or section 10.4.7, Condensate and Feedwater Systems.

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

Yes ☐ No ☒

Justification:

The design function of the main steam supply system is to conduct steam from the steam generator outlets to the high pressure turbine and to the condenser steam dump system. This system also supplies steam to the feedwater pump turbines, an auxiliary feedwater pump turbine, moisture-separator reheaters, and the turbine seals.

The design function of the feedwater system is to supply a sufficient quantity of feedwater to the steam generator secondary side inlet during all normal operating conditions and to guarantee that feedwater will not be delivered to the steam generators when feedwater isolation is required.

The design function of Post Accident Monitoring (PAM) instrumentation is to monitor plant and environs conditions during and following design basis Condition II, III, and IV faults.

This change does not involve procedures that affect system operational characteristics described in the UFSAR or impact compliance with the Technical Specification. Also, this change does not conflict with or affect processes or procedures outlined, summarized, or described in the UFSAR.

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

Yes ☐ No ☒

Justification:

This change does not involve revising or replacing an evaluation methodology described in the UFSAR. This change does not impact any design bases or safety analyses relating to recorder or trending function.

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

Yes ☐ No ☒

Justification:

This change does not involve a test or experiment described in the UFSAR. The replacement of the chart paper type recorders with paperless video graphic type recorders does not constitute a test or experiment.

5. Does the proposed activity require a change to the Technical Specifications?

Yes ☐ No ☒

Justification:

This change does not impact the Technical Specification (TS). Section 3.3.3, Post Accident Monitoring (PAM) Instrumentation, section 3.7.1, Main Steam Safety Valves, section 3.7.2, Main Steam Isolation Valves, and section 3.7.3, Main Feedwater Isolation Valves and Main Feedwater Regulation Valves and Associated Bypass Valves, of the TS were reviewed and no impacts were found.

SCREENING REVIEW FORM

Page ______ of ______

Document No. & Rev: **DCN 51310-A** SR Rev: **0**

IV. If all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

NOTE If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

UFSAR Sections
5.5.5 Steam Generators
7.5.1 Post Accident Monitoring Instrumentation (PAM)
10.3 Main Steam Supply System
10.4.7 Condensate and Feedwater Systems
15.2.8 Loss of Normal Feedwater
15.2.10 Excessive Heat Removal Due to Feedwater System Malfunctions
15.2.13 Accidental Depressurization of the Main Steam System

Technical Specifications Sections
3.3.3 Post Accident Monitoring (PAM) Instrumentation
3.7.1 Main Steam Safety Valves
3.7.2 Main Steam Isolation Valves
3.7.3 Main Feedwater Isolation Valves and Main Feedwater Regulation Valves and Associated Bypass Valves

TVA Drawings
1-47W610-3-1B, Rev. 6   1-47W610-3-1D, Rev. 5
1-47W610-3-2A, Rev. 16   1-47W610-3-2C, Rev. 5
1-47W610-3-1, Rev. 26   1-47W610-3-1A, Rev. 6
1-47W610-1-1, Rev. 26
1-47W611-3-2, Rev. 19
1-47W605-53, Rev. 2   1-47W605-72, Rev. 1
1-47W605-117, Rev. 1   1-47W605-118, Rev. 2
1-47A605-194, Rev. */4
45N706-4, Rev. 18
45N1643-1, Rev. JJ   45N1643-2, Rev. LL
45N1643-6, Rev, Y   45N1643-8, Rev. T
45N1665-2, Rev. AA

Contract 5411401 Drawing
1-47043CD15 SHT 1, Rev. F

System Description
N3-3A-4002, Rev. 8, "Main Feedwater, Feedwater Control and Injection Water"
N3-1-4002, Rev. 9, "Main Steam System"

Design Criteria
WB-DC-30-7, Rev. 15, "Post Accident Monitoring Instrumentation"

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 5

Document No. & Rev: **DCN 51368-A**
SR Rev: 0
50.59 Eval Rev.

Screening Review Only ☒
Screening Review/50.59 Evaluation ☐
Procedure Change Evaluation ☐
Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant **WBN**
Affected Unit(s) **1,2**
Preparing Group **Corporate Electrical Enginnering**

Activity		Number (Include Revision No.)
☒ Design Change	DCN No.	**51368-A**
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (If applicable) Procedure No.	
☐ Maintenance	WR/WO No.	

☒ Other (Identify) **Technical Specification License Amendment Request WBN-TS-03-09**
SAR Change Package # 1764

Comment: **WBPLEE-03-011-00**

This screening review is for DCN 51368-A which abandons the Unit 2 Vital Inverters in place. The Unit 1 and Unit 2 120V AC Vital Instrument Power Boards will be connected together on a per channel basis to allow the operation of one inverter per channel. This change will facilitate the future replacement of the 120V AC Vital Inverters.

Distribution:
cc: EDM
Preparer - Return original to originating document

Reviews and Approvals

	Name	Signature	Date
Preparer:	SHERMANDA SHELTON	Shermanda Shelton	7/17/03
	ROGER P. FOSTER	Roger P. Foster	7-17-03
Reviewer:	DAVID L. KIRBY	David L Kirby	7-21-03
Reviewer: (PORC)			
Other Reviewers: (as appropriate)			

SCREENING REVIEW FORM

Page 2 of 5

Document No. & Rev: **DCN 51368-A** SR Rev: 0

I. For a Screening Review provide a brief description of the change or test. If an 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

DCN 51368-A will facilitate the future replacement of the 120V AC Vital Inverters by making the following changes. Each channel of the Unit 2 120V AC Vital Instrument Power Boards will be disconnected from its Unit 2 Vital Inverter and connected to the corresponding channel of the Unit 1 120 V AC Vital Inverter. The Unit 1 and Unit 2 Vital Instrument Power Boards on each channel will then be fed from only the Unit 1 Vital Inverters. The Unit 2 Vital Inverter will be abandoned in place until it is replaced at a future time. This DCN also installs four (one per channel) 480V AC Vital Disconnect Panels that will allow the Unit 1 120V AC Vital Inverters and the 125V DC Vital Chargers to be individually isolated from the 480V AC Vital Transfer Bus. These new disconnect panels will be field located on the wall adjacent to the 480V AC Vital Transfer Switches on EL 772.0. The Unit 2 120V AC Vital Instrument Power Boards are lightly loaded (3 KVA or less) and will not tax the ability of the Unit 1 Vital Inverter to perform its intended safety function. The load limit for each Unit 1 Vital Instrument Power Board has been reduced to 17 KVA or less which ensures the maximum load on the Unit 1 Inverter will never exceed its rated value of 20 KVA.

This DCN will require a change to FSAR Sections 1.2.2, 8.1, 8.3, and various FSAR figures depicting the Onsite Power System (SAR Change Request 1764). These changes are required to accurately describe and show the new configuration which utilizes the four Unit 1 Vital Inverters and abandons the Unit 2 Vital Inverters. A Tech Spec change and a Tech Spec Bases change will also be required for this modification. A License Amendment Request (WBN-TS-03-09) to change the Tech Specs and Tech Spec Bases has been prepared to update LCO 3.8.7 and Tech Spec Bases Sections 3.8.7 and 3.8.8. The License Amendment will be received prior to implementation of this modification.

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

SCREENING REVIEW FORM

Page 3 of 5

Document No. & Rev: DCN 51368-A SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

Yes ☐ No ☒

Justification:

The design function of the 120-Vac vital power system is to supply a continuous reliable source of Class 1E, regulated, single phase, 120-Vac power for the operation of reactor protection instrumentation and control systems; engineered safety features instrumentation and control systems; and other safety-related components and systems.

The addition of the 480V AC Vital Disconnect Panel allows for isolation of the Unit 1 Inverter and Vital Battery Charger. This does not change the design function because the panels will be feeding the same power to the same loads. The Disconnect Panel switches provide no automatic functions and must be disconnected manually. Control of these switches will be administratively controlled through procedures and any loss of power to battery charger will be indicated by an alarm in the control room. The disconnection of the Unit 2 Inverters and the connection of the Unit 1 and Unit 2 Vital Instrument Power Boards together do not alter the design function of the SSC. Presently, the Unit 1 Inverter provides normal power to the Unit 1 Instrument Power Board and the Unit 2 Inverter provides normal power to the Unit 2 Instrument Power Board. If the Unit 1 Inverter lost power, the Unit 1 and Unit 2 Vital Instrument Power Boards could be switched to the alternate supply from the Instrument Power Distribution Panel. The Unit 2 board is lightly loaded and the loads can be supplied by the Unit 1 Inverter which will still maintain adequate margin. Under the modifications outlined in this DCN, for each channel both the Unit 1 and Unit 2 Instrument Power Boards will be powered by the Unit 1 Inverter. The design function is not adversely affected because with the two boards tied together, the Unit 1 Inverter is the normal power supply and the Instrument Power Distribution Panel is the alternate power supply.

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC *design functions are performed or controlled*? (See Section 4.2.1.2 of NEI 96-07)

Yes ☐ No ☒

Justification:

The design function of the 120-Vac vital power system is to supply a continuous reliable source of Class 1E, regulated, single phase, 120-Vac power for the operation of essential systems. This modification will require revisions to annunciator response and operating procedures due to the deletion of the Unit 2 Inverter, changes to the Unit 2 Instrument Power Board and the addition of the new disconnect panel. These procedure changes will not adversely affect how the 120-Vac vital power system design functions will be performed or controlled.

SCREENING REVIEW FORM

Page 4 of 5

Document No. & Rev: DCN 51368-A SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   This modification changes the vital AC inverter connection arrangement. The design function of the vital AC inverters is to provide 120-Vac electrical power to 1E equipment and this has not been changed. There are no changes associated with this modification that require UFSAR described evaluation methodology to be revised or replaced.

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   There are no tests or experiments that are involved with this modification not addressed in the UFSAR. The design function for the 120-Vac vital power system is not being altered nor is it being operated outside of the bounds presented in the UFSAR.

5. Does the proposed activity require a change to the Technical Specifications?

   Yes ☒ No ☐

   Justification:

   In accordance with the 50.90 process, a Technical Specification License Amendment Request (WBN-TS-03-09) has been prepared and the License Amendment will be received prior to implementing this modification.

SCREENING REVIEW FORM

Document No. & Rev: DCN 51368-A SR Rev: 0

IV. If all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

<u>NOTE</u> If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

SAR Sections Reviewed (Amendment 3):

1.2.2	**Facility Description**
3.1.2	**WBNP Conformance with GDCs**
8.1	**Introduction**
8.3	**Onsite (Standby) Power System**

Technical Specifications Sections Reviewed (Amendment 43):

3.8	**Electrical Power Systems**

Technical Specifications Bases Sections Reviewed (Revision 55):

B 3.6	**Containment Systems**
B 3.7	**Plant Systems**
B 3.8	**Electrical Power Systems**

Design Criteria Reviewed:

WB-DC-30-27 R24	**AC and DC Control Power Systems**

QA RECORD

T44 040927 001

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 5

Document No. & Rev: **DCN 51370-A**

SR Rev: 0

50.59 Eval Rev.

Screening Review Only ☒

Screening Review/50.59 Evaluation ☐

Procedure Change Evaluation ☐

Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant **WBN**

Affected Unit(s) **1**

Preparing Group **Corporate Electrical Engineering**

Activity	Number (Include Revision No.)
☒ Design Change	DCN No. **51370-A**
☐ Engineering Document Change	EDC No.
☐ Temporary Alteration	TACF No.
☐ Special Test/Experiment	Special Test No.
☐ Temporary Shielding Request	TSRF No.
☐ Procedure Change	Procedure No.
☐ New Procedure	PCF No. (if applicable) Procedure No.
☐ Maintenance	WR/WO No.
☒ Other (Identify)	**Technical Specification Bases Change Requests WBN-TS-04-01 and WBN-TS-04-02** **SAR Change Packages 1818 and 1819**

Comment: **WBPLEE-03-093**

This screening review is for DCN 51370-A which replaces the four Unit 1 Vital Inverters and adds four Spare Vital Inverters.

Distribution:

cc: EDM
Preparer - Return original to originating document

Reviews and Approvals

Co-Preparer:	ASHLEY J. TAYLOR Name	Ashley Taylor Signature	4/19/04 Date
Co-Preparer:	WILLIAM M. ROOP, JR. Name	Signature	5/27/04 Date
Reviewer:	DEL SUDKAMP Name	Signature	6/27/04 Date
Reviewer: (PORC)	Name	Signature	Date
Other Reviewers: (as appropriate)	Name	Signature	Date

SCREENING REVIEW FORM

Page 2 of 5

Document No. & Rev: **DCN 51370-A** SR Rev: **0**

I. For a Screening Review provide a brief description of the change or test. If an 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; Including design basis accidents involved, and credible failure modes of the activity.

DCN 51370A is the last phase of the Vital Inverter Replacement plan. The existing disconnected Unit 2 Inverters will be replaced with uninterruptible power supply (UPS) systems which each include a regulated rectifier, auctioneering diodes, an inverter, and a regulated transformer bypass source. A static switch will automatically transfer the load from the inverter output to the regulated transformer bypass supply. This is alarmed in the Main Control Room. A manual bypass switch will allow manual transfer to the regulated transformer bypass source for maintenance or until a Spare Inverter may be aligned. These UPS systems will become the new Unit 1 Inverters. The existing Unit 1 Inverters will be replaced by new Inverters that will become Spare Inverters. They will each include a regulated rectifier, auctioneering diodes, and an inverter and will not have a regulated transformer bypass source, static switch, or manual bypass switch. These can be aligned manually and will be the new 1E alternate source for the 120V AC Vital Instrument Power Boards. Since the Spare Inverters will be qualified uninterruptible power systems, they will meet the Technical Specifications requirements for an operable inverter on a channel when energized, aligned, and the surveillance requirement completed. The Spare Inverters will be shared between units on each channel if Unit 2 is completed.

The Unit 1 and Unit 2 120V AC Vital Instrument Power Boards will continue to be fed from their normal power supply, the Unit 1 Inverter on each channel. This eliminates the necessity of operating all eight inverters for operation of a single reactor unit. Existing cable and conduit will be used with splices as necessary. New cable will be installed between the Vital Disconnect Panels and the new Unit 1 Vital Inverter bypass transformer inputs to power the transformer. New cable will also be installed between the new Unit 1 Inverters and the new Spare Inverters to provide a synchronization signal and paralleled annunciation.

This DCN will be implemented over the span of time prior to and during two outages. The first four stages, for channels I, II, III, and IV respectively, include the changes made before and during the first outage period. This will include physically removing the existing Unit 2 Inverters and replacing them with the new Unit 1 Inverters with the regulated transformer bypass supply as well as electrically disconnecting the existing old Unit 1 Inverters. The existing old Unit 1 Inverters may be physically removed at this time. The last four stages, one each for channels I, II, III, and IV, correspond to the second outage period. If not already completed, this will include physically removing the old Unit 1 Inverters. Then, in their place, the new Spare Inverters will be installed and will reflect the final proposed configuration.

Each outage period will require an FSAR and Technical Specification Bases change so the plant is not in an unapproved interim configuration. Each outage period will require a change to FSAR Section 8.3 and various FSAR figures depicting the Onsite Power System (SAR Change Requests 1818 and 1819). These changes are required to accurately describe and show the appropriate new configuration. Two Technical Specification Bases changes will also be required for this modification. Tech Spec Bases Change Requests (WBN-TS-04-01 and WBN-TS-04-02) to change the Tech Spec Bases have been prepared to update Bases Sections 3.8.7, 3.8.8, and 3.8.9. FSAR Change Request 1818 and Tech Spec Bases Change Requests WBN-TS-04-01 are tied to DCN stages 1 through 4. FSAR Change Request 1819 and Tech Spec Bases Change Requests WBN-TS-04-02 are tied to DCN stages 5 through 8.

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

Revision 0 – Initial Issue

SCREENING REVIEW FORM

Page 3 of 5

Document No. & Rev: DCN 51370-A SR Rev: 0

III. **50.59 Screening Questions** (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

Yes ☐ No ☒

Justification:

The design function of the 120V AC Vital Power System is to supply a continuous reliable source of Class 1E, regulated, single phase, 120V AC power for the operation of reactor protection instrumentation and control systems; engineered safety features instrumentation and control systems; and other safety-related components and systems.

The function of the Inverters will not change. They will continue to provide power to instrumentation that supports the identification and mitigation of accidents as well as critical system control functions during normal plant operation. Replacing the existing Unit 1 Vital Inverters with new UPS systems including regulated transformers and static and manual transfer switches will enhance equipment reliability. The addition of a regulated transformer bypass source and the automatic static switch provides additional capability to supply reliable power during maintenance and inverter failure to the Vital Instrument Power Boards and minimize the potential for a unit trip. The ability to use qualified installed Spare Vital Inverters will allow better opportunities to properly maintain the Inverters and minimize the potential to require unit shutdown for an Inverter problem. This modification will meet or exceed the specifications and capabilities of the old system.

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

Yes ☐ No ☒

Justification:

The design function of the 120V AC Vital Power System is to supply a continuous reliable source of Class 1E, regulated, single phase, 120V AC power for the operation of essential systems. The annunciation signals from the Unit 1 Vital Inverters will now include a signal on automatic transfer of the static switch but otherwise will remain unchanged even though the physical location of the Unit 1 Vital Inverters will change. With the implementation of this DCN, each Spare Vital Inverter's annunciation signals will be sent to the corresponding Unit 1 Inverter and then to Panel 1-M-21 in the Main Control Room, paralleled along with the annunciation for the Unit 1 Vital Inverters. The new Spare Vital Inverters will become the alternate source for the 120V AC Vital Instrument Power Boards and will be a qualified 1E uninterruptible power supply (UPS). One of the alarm inputs for the Power Board undervoltage or breaker trip displays in window box 1-XA-55-1C is the transfer to the alternate source, presently a non safety related source. This alarm input will be removed since the alternate source is a qualified UPS and the alarm is no longer required. These changes do not alter any means of performing or controlling the system design function and do not create or modify any Operator actions. This modification will not adversely affect how the 120V AC Vital Power System design functions will be performed or controlled as described in the UFSAR.

This design change may require revisions to various plant procedures to reflect changes to plant hardware and design output documentation. Updating procedures to ensure they are consistent with this design change is within the scope of the analysis and will not adversely impact any SAR design functions.

SCREENING REVIEW FORM

Page 4 of 5

Document No. & Rev: **DCN 51370-A** SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   This modification changes the Vital Inverter connection arrangement. The design function of the Vital Inverters is to provide 120V AC electrical power to 1E equipment and there is no change in any design basis or safety analysis evaluation methodology to accomplish this function. There are no changes associated with this modification that require UFSAR described evaluation methodology to be revised or replaced.

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   This modification improves the performance and reliability of the Vital Power System by installing new Unit 1 and Spare Inverters. Therefore, this activity does not involve tests or experiments. This activity does not impact the design function for the 120V AC Vital Power System nor is it being operated outside of the bounds of the design or inconsistent with the analysis or descriptions presented in the UFSAR.

5. Does the proposed activity require a change to the Technical Specifications?

   Yes ☐ No ☒

   Justification:

   In accordance with the 50.90 process, Technical Specification Bases Change Requests (WBN-TS-04-01 and WBN-TS-04-02) have been prepared for each outage period. These are Bases changes only and do not revise the Technical Specifications. Therefore, no Technical Specifications changes are required to implement this design change.

SCREENING REVIEW FORM

Page 5 of 5

Document No. & Rev: **DCN 51370-A** SR Rev: **0**

IV. If all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, then only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

<u>NOTE</u> If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

UFSAR Amendment 3 Sections Reviewed:

1.2.2	**Facility Description**
3.2	**Classification of Structures, Systems, and Components**
3.10.4	**Operating License Review**
8.1	**Introduction**
8.3	**Onsite (Standby) Power System**

Technical Specifications Amendment 52 Sections Reviewed:

3.8.7	**Inverters – Operating**
3.8.8	**Inverters – Shutdown**
3.8.9	**Distribution Systems – Operating**
3.8.10	**Distribution Systems – Shutdown**

Technical Specifications Bases Sections Reviewed:

B 3.8.7	**Inverters – Operating**
B 3.8.8	**Inverters – Shutdown**
B 3.8.9	**Distribution Systems – Operating**
B 3.8.10	**Distribution Systems – Shutdown**

Design Criteria Reviewed:

WB-DC-30-27 R25	**AC and DC Control Power Systems**

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 7

Document No. & Rev: **DCN # 51443-B** SR Rev: 1 1

50.59 Eval Rev. N/A

Screening Review Only ☒ Screening Review/50.59 Evaluation ☐

Procedure Change Evaluation ☐

Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant WBN

Affected Unit(s) 0

Preparing Group SE-DE (WBP-LEE)

Activity	Number (Include Revision No.)	
☒ Design Change	DCN No.	51443-B 1
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (if applicable)	
	Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comment:

Tracking No. WBPLEE-03-061, Rev. 1 1

Replace CPU boards in video graphic recorders in MCR

Distribution:
cc: EDM
Preparer – R. K. Hall, EQB-2N-WBN

Reviews and Approvals

Preparer:	R. K. Hall Name	RKHall Signature	5-7-04 Date
Reviewer:	M. L. Young Name	Maurice L. Young Signature	5-10-04 Date
Reviewer: (PORC)	N/A Name	N/A Signature	N/A Date
Other Reviewers: (as appropriate)	N/A Name	N/A Signature	N/A Date

SCREENING REVIEW FORM

Page 2 of 7

Document No. & Rev: **DCN # 51443-B** SR Rev: 1 1

I. For a Screening Review provide a brief description of the change or test. If an 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

The replacement of CPU boards in the SV100 recorders in the Main Control Room is necessary to correct deficiencies and make improvements as developed by the recorder vendor. The CPU board will correct programming deficiency in the recorder's historical real-time recorder viewing capability and random loss of data, improve time clock capabilities, correct daylight savings time roll-over glitches, software enhancement for not allowing the flash card to be filled up completely with data and a larger on-screen notification of the flash card memory reaching capacity. 1

This DCN will be staged, and the following recorders are affected:

Recorder	*Description*	*Panel*	*Stage*
1-FR-2-35	*Condensate Flow*	*1-M-3*	*1*
1-LR-2-12	*Cond Hotwell Lvl*	*1-M-3*	*1*
1-P/TR-2-2	*Cond A Press & Temp Recorder*	*1-M-3*	*1*
1-RR-90-120	*Stm Gen Bldn Liq Mon Rad RCDR*	*0-M-12*	*1*
0-RR-90-122	*Waste Disp Sys Liq Eff Rad Mon 0-RM-90-122A*	*0-M-12*	*1*
1-FR-3-35	*Stm Gen # 1 F.W. Inlet Flow Stem Flow*	*1-M-4*	*2*
1-FR-6-107	*No. 3 HTR Drain Tank Conds Flow*	*1-M-2*	*2*
1-TR-57-110	*Main Transformer Temp Recorder*	*1-M-1*	*2*
0-RR-90-132	*Serv Bldg Vent Mon Radiation Recorder*	*0-M-12*	*2*
0-RR-90-126	*Main Cont Rm Intake Rad Mon 0-RM-90-126*	*0-M-12*	*2*
1-FR-3-48	*Stm Gen # 2 Recdr*	*1-M-4*	*3*
1-LR-3-43	*Stm 1 & 2 Level and Stm Gen # 1 Nuc Pwr Lvl De*	*1-M-4*	*3*
0-RR-90-118	*Waste Disp Sys Gas Eff Rad Mon 0-RM-90-118A*	*0-M-12*	*3*
1-INR-278-46	*Overpower Flux Recorder NR-46*	*1-M-10*	*3*
1-INR-278-47	*Overpower Flux Recorder NR-47*	*1-M-10*	*3*
1-FR-3-90	*Stm Gen # 3 FW Inlet Flow Stm Flow and Level*	*1-M-4*	*4*
0-FR-27-98	*Diffuser Outlet Flow Recorder*	*1-M-15*	*4*
0-TR-27-99	*Diffuser Outlet Temperature*	*1-M-15*	*4*
1-RR-90-112	*Cntmt Bldg Upper Comp Air Mon Rad Rcdr*	*0-M-12*	*4*
1-FR-3-103	*Stm Gen # 4 FW Inlet Flow Stm Flow and Level*	*1-M-4*	*5*
1-RR-90-106	*Cntmt Bldg Compt Air Rad Rcdr*	*0-M-12*	*5*
0-RR-90-101	*Aux Bldg Vent Mon Rad Rcdr*	*0-M-12*	*5*
2-RR-90-400	*Shield Bldg VT Mon Sys Low, Mid, Hi Rng & Eff Rel Rate Activity*	*2-M-30*	*5*
1-LR-3-98	*Steam Gen # 3 Wide Range Level*	*1-M-4*	*6*
1-P/TR-70-161	*CCS HTX Temp & Pmp Press*	*0-M-27B*	*6*
2-TR-70-161	*CCS HTX Temp*	*0-M-27B*	*6*
1-RR-90-119	*Condenser Vacuum Pmp Air Exh Mon RR*	*0-M-12*	*6*
1-UDR-278-760	*Computer Trend Recorder*	*1-M-6*	*7*
1-UDR-278-761	*Computer Trend Recorder*	*1-M-5*	*7*
1-UDR-278-762	*Computer Trend Recorder*	*1-M-1*	*7*
1-UDR-278-763	*Computer Trend Recorder*	*1-M-1*	*7*
1-UDR-278-764	*Computer Trend Recorder*	*1-M-1*	*7*
1-UDR-278-765	*Computer Trend Recorder*	*1-M-1*	*7*
0-RR-90-125	*Main Cont Rm Intake Rad Mon 0-RM-90-125*	*0-M-12*	*8*
0-RR-90-225	*Cond Demin Eff Rad Mon 0-RM-90-225B*	*0-M-12*	*8*
1-RR-90-400	*Shield Bldg Vt Mon Sys Eff Activity Rel Rate*	*1-M-30*	*8*

SCREENING REVIEW FORM

Page 3 of 7

Document No. & Rev: **DCN # 51443-B** SR Rev: 1

WBN PER # 03-003315-000 was written as a result of the firmware deficiencies, and this design change implements the corrective actions associated with correcting the problems with the radiation recorders. WBN PER # 03-011999-000 was written to identify the random data loss that was being experienced by some recorders due to a thread synchronization problem in the firmware. This initialization issue was identified by the recorder vendor and has been fixed by the new CPU board. WBN PER # 03-004850-000 was written to document the poor time clock accuracy associated with the recorders.

System Design and Functions

This change addresses various systems in the plant, but does not change any operational or functional requirements of those systems. The recorders are used for indication and trending purposes in the Main Control Room and are not required for safe shutdown of the plant. The recorders are Quality – Related, and seismic 1L(B). This change meets the design basis requirements as stated by the Design Criteria (DC) and system descriptions for the various systems affected by this change.

Justification for this change

The current firmware configuration does not support all of the required functions applicable to the recorders, specifically when used to view logarithmic historical trends. The firmware does store and record live information properly, it does not allow one to view the historical trend on the recorder screen. The new CPU board will improve the clock accuracy, correct daylight savings time roll-over deficiencies, random data loss due to a thread synchronization error in the firmware, and prevent the flash cards from being filled 100% with data from their respective recorder and includes a larger on-screen notification that the flash media has reached the preset fill level.

This DCN is being revised to change out the CPU boards in the SV100 recorders instead of replacing firmware. The CPU board replacement has a much more 'solid' software package. It will correct programming deficiency in the recorders historical real-time recorder viewing capability and random loss of data, solve the clock accuracy, solve the daylight saving time problem, and the media alert window problem. Also, the new CPU board will eliminate the need to send the EPOM's from the existing recorders back to the vendor to be reconfigured.

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

SCREENING REVIEW FORM

Page 4 of 7

Document No. & Rev: **DCN # 51443-B** SR Rev: 1 | 1

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   The design function of the recorders is to provide indication and trending capability in the Main Control Room of parameters required by procedure, regulation or important to Operations. The replacement of the recorder CPU boards does not change the design function of the recorders, nor does it affect any system design function. This change does not adversely affect any SSC design function described in the UFSAR. All referenced UFSAR sections discuss the design and operational requirements of each system or component and does not discuss the firmware of the recorders to any level of detail. Therefore, this change does not revise or contradict with functional and safety requirements specified in the UFSAR. | 1

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   The design function of the recorders is to provide indication and trending capability in the Main Control Room of parameters required by procedure, regulation or important to Operations. This change does not involve procedures that affect system operational characteristics described in the UFSAR or impact compliance with the Technical Specification. Also, this change does not conflict with or affect processes or procedures outlined, summarized, or described in the UFSAR.

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   This change will replace CPU boards firmware in paperless recorders in the Main Control Room in order to correct deficiencies identified in Problem Evaluation Reports. This change does not revise or replace an evaluation methodology that is described in the UFSAR. This change meets the design basis requirements of the various systems the change is applicable too. This change does not impact any design bases or safety analyses relating to recorder or trending function. | 1

SCREENING REVIEW FORM

Page 5 of 7

Document No. & Rev: **DCN # 51443-B** SR Rev: 1

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   This change does not involve a test or experiment described in the UFSAR. This DCN will replace the recorder CPU boards with an upgraded version from the recorder manufacturer. There are no tests or experiments associated with this activity.

5. Does the proposed activity require a change to the Technical Specifications?

   Yes ☐ No ☒

   Justification:

   This change does not impact the Technical Specifications. The recorders are used for trending and historical purposes only and do not affect the design function or operation of the various systems. This change does not require a change to the Technical Specifications and does not change the safety functions associated with those systems and components associated with the Technical Specifications. Section 3.3, Instrumentation, Section 3.6.6, Containment Spray, Section 3.7, Plant Systems, Section 3.8, Electrical Power System, Section 5.7.2.3, Offsite Dose Calculation Manual, and Section 5.11, High Radiation of the TS were reviewed and no impacts were found.

SCREENING REVIEW FORM

Page 6 of 7

Document No. & Rev: **DCN # 51443-B** SR Rev: 1

IV. **If** all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

NOTE If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

1. **UFSAR Sections**
Section 1.2.2.8, "Cooling Water"
Section 4.4.5.3, "Instrumentation to Limit Maximum Power Output"
Section 5.2.7.4.4, "Main Steam Line Isolation System"
Section 5.5.5, "Steam Generators"
Section 9.2.2, "Component Cooling System"
Section 7, "Instrumentation and Controls"
Section 10.4.5, "Condenser Circulating Water System"
Section 10.4.7, "Condensate and Feedwater Systems"
Section 10.4.8, "Steam Generator Blowdown System"
Section 11.2, "Liquid Waste Systems"
Section 11.2.3.2, "Spent Resin Instrument Design"
Section 11.3.8, "Release Points"
Section 11.4, "Process and Effluent Radiological Monitoring and Sampling System"
Section 12.3.4, "Area Radiation and Airborne Radioactivity Monitoring Instrumentation"
Section 12.3.4.2.2, "Airborne Monitoring Channels"
Section 13.6.3, "Event Records"
Table 7.5-1, "Post Accident Monitoring Instrumentation Component Qualification Matrix"
Table 11.4-2, "Process and Effluent Radiation Monitors Gaseous Media"
Table 11.4-3, "Locations for Gaseous Process and Effluent Radiation Monitor Indicators, Recorders, and Annunciators"

2. **Technical Specifications**
Section 3.3, Instrumentation
Section 3.6.6, Containment Spray System
Section 3.7, Plant Systems
Section 3.8, Electrical Power System
Section 5.7.2.3, Offsite Dose Calculation Manual (ODCM)
Section 5.11, High Radiation

3. **Design Criteria**
WB-DC-30-7, Rev. 16, "Post Accident Monitoring System (PAM)"
WB-DC-30-20, Rev. 2, "Control Panels"
WB-DC-30-23, Rev. 1, "Human Factors"
WB-DC-30-27, Rev. 25 "AC and DC Control Power Systems"

SCREENING REVIEW FORM

Page 7 of 7

Document No. & Rev: **DCN # 51443-B** SR Rev: 1 1

3. **Design Criteria**
   WB-DC-30-29, Rev. 5, "Plant Computer"
   WB-DC-40-24, Rev.13, "Radiation Monitoring"
   WB-DC-40-31.13, Rev. 4, "Seismic Qualification of Category I(L) Fluid System Components and Electrical or Mechanical Equipment"
   WB-DC-40-58, Rev 3A, "Auxiliary Control System"

4. **TVA Drawings** 1
   1-47W610-90 series
   1-47W610-92 series
   1-47W610-2-series
   1-47W610-72-series
   1-47W605-series
   45N1641- series
   45N1635- series
   1-45W706-series
   1-47W610-3-series
   1-47W610-6-series
   1-47W610-27-series
   45N1645-series
   45N1651-series
   45N1653-series

   Contract # 146789
   DM100165

5. **Vendor Manuals**
   WBN-VM-W130-3005, "Thermo Westronics SV100 Smartview Video graphic Recorders"

6. **Technical Requirements Manual**

7. **Safety Evaluation Report** (including all supplements)

8. **Master Equipment List (MEL)**

9. **Contract**
   Watts Bar TVA Contract # 146789 1

10. **Procedures**
    TI-49, Rev. 29, Technical Instruction Compliance Instruments

11. **Design Changes**
    50369-B
    50916-A
    50933-A
    51097-A
    51443-B 1
    50915-A
    50917-A
    50936-A
    51310-A

12. **WBN PERs**
    03-003315-000
    03-011999-000
    03-004850-000

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 5

Document No. & Rev: DCN 51666-A SR Rev: 1

50.59 Eval Rev.

Screening Review Only ☒ Screening Review/50.59 Evaluation ☐

Procedure Change Evaluation ☐

Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant **WBN**

Affected Unit(s) 1

Preparing Group **SE-DE**

Activity		Number (Include Revision No.)	
☒	Design Change	DCN No.	51666-A
☐	Engineering Document Change	EDC No.	
☐	Temporary Alteration	TACF No.	
☐	Special Test/Experiment	Special Test No.	
☐	Temporary Shielding Request	TSRF No.	
☐	Procedure Change	Procedure No.	
☐	New Procedure	PCF No. (if applicable)	
		Procedure No.	
☐	Maintenance	WR/WO No.	
☐	Other (Identify)		

Comment: **Implement software and hardware changes to CERPI.**
WBPLEE-04-037

Distribution:
cc: EDM
Preparer - Return original to originating document

Reviews and Approvals

Preparer:	C. C. Lyke Name	C. C. Lyke Signature	2/23/05 Date
Reviewer:	R. K. Hall Name	RK Hall Signature	2/23/05 Date
Reviewer: (PORC)	Name	Signature	Date
Other Reviewers: (as appropriate)	Name	Signature	Date

SCREENING REVIEW FORM

Page 2 of 5

Document No. & Rev: DCN 51666-A

SR Rev: 1

I. For a Screening Review provide a brief description of the change or test. If a 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

Brief Description

DCN 51666-A makes hardware changes and software modifications to the Computer Enhanced Rod Position Indication (CERPI) system. The modifications correct hardware failures, software deficiencies, and eliminate single failure vulnerabilities. The replacement hardware and revised software are being provided by Westinghouse. The DCN also makes data base changes to the Integrated Computer System (ICS); the changes will be provided by Computer Engineering Section.

Background

Problem Evaluation Report (PER) numbers 8142 (failed 24 Vdc power supply module), 9399 (disagreement between CERPI display and SI-2 pertaining to A1 and A2 shutdown banks), 9120 (lo-insertion limit alarm window #87-A did not clear during control rod pull), and 60258 (communication failure between CERPI CPU and the CERPI display CPU's) have been initiated to document CERPI system deficiencies and anomalies. In addition, PER 9942 documented a CERPI design concern where Westinghouse failed to meet the single failure specification for the CERPI design.

Detailed Description of Change

DCN 51666-A will replace the two maxi modules (W1-24) in the CERPI power supply assembly in the RPI-1 (panel 1-R-41) and RPI-3 (panel 1-R-43) panels in accordance with Westinghouse Field Change Notice (FCN) No. WAT-U1-CERPI-006. Westinghouse has already supplied the replacement modules to the site. This partially resolves the corrective action for PER 8142.

DCN 51666-A implements FCN No. WAT-U1-CERPI-008 to replace screws and use a threadlocker or insulating varnish on affected screws in the Common Q Power Supply system to prevent future loosening of the screws.

DCN 51666-A implements CERPI software modifications. The PC-node box software is changed so that the CERPI displays the correct rods for the A1 and A2 Shutdown banks. The PLC software is changed to allow the "rod speed" and "passive summer-rod demand" bar graphs to be active at all times on the affected CERPI displays. The Rod Insertion Limit (RIL) Lo Limit and Lo-Lo Limit hystersis value is changed from 5 steps to 1 step. The CERPI display is changed to allow the "rod speed" and "passive summer – rod demand" bar graphs to be active at all times. Currently, software switch blocks are used to display this information based on the presence/absence of rod demand signals. The QNX Operating System is being upgraded as well as upgrades to the Photon display application and the TCPIP software. The revised software is provided by Westinghouse and is to be installed in accordance with FCN No. WAT-U1-CERPI-009. This partially resolves the corrective action for PERs 9399, 9120, and 60258.

DCN 51666-A makes data base enhancements in the Integrated Computer System (ICS) to generate a "Loss of Transmittal Data" alarm message and activate the 83D annunciator window "PLANT COMPUTER GENERATED ALARM" whenever there is a loss of data link between the CERPI Maintenance & Test Panel (MTP) computer and the ICS. The DCN also adds a note to an appropriate drawing to allow the storage of extra fuses in rack 1-R-42. In addition, CERPI software revisions adds an AF100 trouble alarm via currently used CERPI output relays to bring in the 86C annunciator window and a MTP or OFPD trouble condition will be indicated on the CERPI system status display. This partially resolves the corrective action for PER 9942.

I. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

Revised description to include FCN No. WAT-U1-CERPI-008 and supersede FCN No. WAT-U1-CERPI-007 with FCN No. WAT-U1-CERPI-009.

SCREENING REVIEW FORM

Page 3 of 5

Document No. & Rev: **DCN 51666-A** SR Rev: 1

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

   Yes ☐ No ☒

   Justification: The design function of the Rod Position Indication System (i.e. CERPI) is to provide continuous rod position information for each Shutdown and Control Rod (57 total). The CERPI system provides meaningful rod position information to the unit operators via the operator display panels on MCR panel 1-M-4. This rod position information is required to satisfy core reactivity requirements for plant modes 1 and 2. UFSAR sections 4.2.3, 7.7, 15.2, and 15.3 discuss rod position indication and system operation.

   The design function of the plant computer (i.e. ICS) as stated in FSAR Section 7.5.2 is to present plant process and equipment status information to the control room operators to assist them in the normal operations of the power station, and inform them of any off-normal conditions.

   DCN 51666-A makes hardware changes and software modifications to the CERPI system to correct hardware failures, correct software deficiencies, and eliminate some single failure vulnerabilities. The replacement hardware and revised software are being provided by Westinghouse.

   DCN 51666-A makes data base changes to the ICS to generate a "Loss of Transmittal Data" alarm message and activate the 83D annunciator window "PLANT COMPUTER GENERATED ALARM" whenever there is a loss of data link between the CERPI Maintenance & Test Panel (MTP) computer and the ICS.

   The changes under DCN 51666-A are not adverse because the changes only correct identified deficiencies and implement enhancements to the CERPI system and utilizes the ICS for alarm purposes. Thus, the DCN change does not affect any UFSAR described design function.

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification: The design function of the Rod Position Indication System (i.e. CERPI) is to provide continuous rod position information for each Shutdown and Control Rod (57 total). The CERPI system provides meaningful rod position information to the unit operators via the operator display panels on MCR panel 1-M-4. This rod position information is required to satisfy core reactivity requirements for plant modes 1 and 2. UFSAR sections 4.2.3, 7.7, 15.2, and 15.3 discuss rod position indication and system operation.

   The design function of the plant computer (i.e. ICS) as stated in FSAR Section 7.5.2 is to present plant process and equipment status information to the control room operators to assist them in the normal operations of the power station, and inform them of any off-normal conditions.

   DCN 51666-A makes hardware changes and software modifications to the CERPI system to correct hardware failures, correct software deficiencies, and eliminate some single failure vulnerabilities. DCN 51666-A also makes data base changes to the ICS to generate an alarm message.

   The modification under DCN 51666-A will result a procedure change (i.e. ARI-81-87). This procedure change will identify the inputs to the annunciator window 83D. This procedure change does not adversely affect how an UFSAR described SSC design function is performed or controlled.

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

   Yes ☐ No ☒

   Justification: There is no UFSAR described evaluation methodology associated with the hardware replacement and software changes to be implemented under DCN 51666-A. Furthermore, the proposed DCN change does not revise any evaluation methodology associated with the Rod Position Indication System (CERPI) or plant computer (ICS).

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification: The proposed change under DCN 51666-A does not involve a test or experiment either described or not described in the UFSAR.

5. Does the proposed activity require a change to the Technical Specifications?

   Yes ☐ No ☒

   Justification: The proposed DCN modification does not affect or contradict with requirements and statements in Tech Spec/Tech Spec Bases section 3.1.7/B3.1.7, Control Bank Insertion Limits; section 3.1.8/B3.1.8, Rod Position Indication; or Technical Requirements Manual (TRM)/TRM Bases section TR 3.1.7/B3.1.7, Position Indication System, Shutdown. Therefore, the proposed activity will not require a change to the Technical Specifications.

SCREENING REVIEW FORM

Document No. & Rev: **DCN 51666-A**
SR Rev: 1

IV. If all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

NOTE If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

UFSAR section 4.2.3, Reactivity Control System

UFSAR section 7.5.2, Plant Computer

UFSAR section 7.7, Control Systems

UFSAR section 15.2, Condition II – Faults of Moderate Frequency

UFSAR section 15.3, Condition III – Infrequent Faults

Tech Spec/Tech Spec Bases section 3.1.7/B3.1.7, Control Bank Insertion Limits

Tech Spec/Tech Spec Bases section 3.1.8/B3.1.8, Rod Position Indication

Technical Requirements Manual (TRM)/TRM Bases section TR 3.1.7/B3.1.7, Position Indication System, Shutdown

System Description for Control Rod Drive System, N3-85-4003, Rev. 9
Design Criteria WB-DC-30-29, Rev. 5, Plant Computer

DCN 51072-A

Contract 2695 Drawings

2E10005-1, Rev. 5

2E10005-8, -12, Rev. 4

D00000435081-1, Rev. 2

2E10010-1, Rev. 0

TVA drawing 1-47A618-261-1, Rev. 7

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 5

Document No. & Rev: DCN 52028-A SR Rev: 0

50.59 Eval Rev.

Screening Review Only ☒ Screening Review/50.59 Evaluation ☐

Procedure Change Evaluation ☐

Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant WBN

Affected Unit(s) 1

Preparing Group WBPLEE

Activity	Number (Include Revision No.)	
☒ Design Change	DCN No.	52028-A
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (If applicable) Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comment: Tracking No. WBPLEE-07-023
Replace Hagan Optimac 100 recorders, 1-TR-68-24, 1-TR-74-14 & 1-TR-74-25, with Thermo Electron recorders.

Distribution:
cc: EDM
Preparer - Return original to originating document

Reviews and Approvals

Preparer:	R. K. Hall Name	KKHall Signature	1/30/08 Date
Reviewer:	R. P. Foster Name	R. P. Signature	1-30-08 Date
Reviewer: (PORC)	Name	NA Signature	Date
Other Reviewers: (as appropriate)	Name	NA Signature	Date

SCREENING REVIEW FORM

Page 2 of 5

Document No. & Rev: DCN 52028-A

SR Rev: 0

DCN 52028-A
Page No. 23

I. For a Screening Review provide a brief description of the change or test. If a 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

DCN 52028-A will replace three Hagan Controls model Optimac 100 recorders in the Main Control Room (MCR) on panel 1-M-5 and 1-M-6. UNID's for the recorders are 1-TR-68-24, 1-TR-74-14 and 1-TR-74-25. These recorders are obsolete and cannot be maintained. This DCN will replace each recorder with a Thermo Electron (formerly Thermo Westronics) model SV100.

Recorder 1-TR-68-24 has two inputs; one input to monitor Reactor Coolant System (RCS) loop 2 hot leg temperature from temperature element 1-TE-68-24, and one input to monitor RCS loop 2 cold leg temperature from temperature element 1-TE-68-41. Recorder 1-TR-74-14 also has two inputs; one input to monitor Residual Heat Removal (RHR) pump A-A discharge temperature from temperature element 1-TE-74-14 and one input to monitor RHR system outlet heat exchanger A temperature from temperature element 1-TE-74-29. Recorder 1-TR-74-25 also has two inputs; one input to monitor Residual Heat Removal (RHR) pump B-B discharge temperature from temperature element 1-TE-74-25 and one input to monitor RHR system outlet heat exchanger B temperature from temperature element 1-TE-74-39.

Process signals from the temperature elements 1-TE-68-24, 1-TE-68-41, 1-TE-74-14 and 1-TE 74-25 are processed through Eagle 21 protection set loops and provide 10 – 50 ma current loops through qualified E/I isolators. A dropping resistor at each input to each recorder coverts the current loop output of 10 to 50 ma to the required DC voltage input for the recorder. The process signals from the temperature element instrument loop for 1-TE-74-29 (RHR outlet heat exchanger A temperature) and 1-TE-74-39 (RHR outlet heat exchange B temperature) provide signals for input to the Integrated Computer System (ICS) Log points T0621A and T0631A respectively. Instrument loops 1-LPT-68-24, 1-LPT-68-41, 1-LPT-74-14 and 1-LPT-74-25 are compliance loops; however, the Eagle 21 D/A and isolator channel output for the MCR compliance indicators are separate channels from the channels that provide the inputs to the recorders.

The replacement recorders are Thermo Electron Model SV100. The new recorders will be multiple channel paperless video graphic recorders which utilize Thin-Film Transistor (TFT) Liquid Crystal Display (LCD) technology. The recorders meet plant requirements for EMI/RFI qualification. The new recorders will be capable of supporting a minimum of six analog inputs; however, this change will not add any additional inputs for recording to the new recorders. The new recorder will be located on the same panel and use the same panel cutouts and cabling as the existing recorders.

The subject recorders are designated as Quality Related, seismic 1(L) B. The new Thermo Westronics recorders have been tested and qualified by the vendor to meet TVA position retention requirements, reference TVA WBN NE Civil Engineering approval memo T71 010702 800. Mounting hardware will be supplied by the vendor to mount the new recorders. Each new recorder weighs 7.5 pounds; the weight of the Optimac 100 is un-available, but it is assumed that it weighs at least as much as the Westronics since it is larger. The SV100 is shorter in cantilever length than the existing Optimac 100 recorders (9 1/4" versus 24"). Therefore, this recorder change out will not impact the panel's seismic qualification.

This DCN does not affect any existing failure modes. A single point failure analysis is not required in accordance with Electrical Design Standard DS E2.0.2. This design change does not create new failure modes or impact existing failure modes. This modification does not add or delete electrical equipment nor does this change modify or replace electrical equipment such that the basic operating principle of the electrical equipment is different.

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

Page 3 of 5

Document No. & Rev: DCN 52028-A

SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

Yes ☐ No ☒

Justification:

The design function of recorder 1-TR-68-24 is to provide information for use by the operator to control coolant temperature during startup and shutdown. More specifically, RCS cold leg and hot leg temperature indication is used for maintaining an adequate reactor heat sink, maintaining the proper relationship between RCS pressure and temperature, verifying vessel Nil-Ductility Temperature (NDT) criteria, establishing correct conditions for RHRs operations, ensuring proper cool down rate, determining whether SI should be terminated or reinstated and determining core Ductility Temperature (DT) during natural circulation. The recorders are the trending recorder for Post Accident Monitoring (PAM) category 2 variable RCS hot/cold leg temperature.

The design function of recorders 1-TR-74-14 and 1-TR-74-25 is to provide information for use by the operator for the RHR pump discharge during the recirculation mode and RHR Heat exchanger's outlet temperature. The recorders are the trending recorder for PAM category 2 variable RHR pump A-A and B-B discharge temperature.

The RCS is discussed in UFSAR section 5.0, PAM instrumentation is discussed in UFSAR Section 7.5.1, the Residual Heat Removal System is discussed in UFSAR section 5.5.7.

The change under DCN 52028-A is not adverse because the replacement of two obsolete recorders with current generation video graphic recorders is considered "like for like" replacements; there is no change in the function of the devices that are replaced and no change in the SSC in which the devices operate. Thus, the DCN change does not affect any UFSAR described design function.

2. *Does the proposed activity involve a change to a procedure that adversely affects an UFSAR described SSC design functions are performed or controlled?* (See Section 4.2.1.2 of NEI 96-07)

Yes ☐ No ☒

Justification:

The design function of recorder 1-TR-68-24 is to provide information for use by the operator to control coolant temperature during startup and shutdown. More specifically, RCS cold leg and hot leg temperature indication is used for maintaining an adequate reactor heat sink, maintaining the proper relationship between RCS pressure and temperature, verifying vessel NDT criteria, establishing correct conditions for RHRs operations, ensuring proper cooldown rate, determining whether SI should be terminated or reinstated and determining core DT during natural circulation. The recorder is the trending recorder for PAM category 2 variable RCS hot/cold leg temperature.

The design function of recorders 1-TR-74-14 and 1-TR-74-25 is to provide information for use by the operator for the RHR pump discharge during the recirculation mode and RHR Heat exchanger's outlet temperature. The recorders are the trending recorder for PAM category 2 variable RHR pump A-A and B-B discharge temperature.

The RCS is discussed in UFSAR section 5.0, PAM instrumentation is discussed in UFSAR Section 7.5.1, the Residual Heat Removal System is discussed in UFSAR section 5.5.7.

The change under DCN 52028-A does not involve procedures that affect system operational characteristics described in the UFSAR or impact compliance with the Technical Specification. Also this change does not conflict with or affect processes or procedures outlined, summarized, or described in the UFSAR.

SCREENING REVIEW FORM

Page 4 of 5

SR Rev: 0

Document No. & Rev: DCN 52028-A

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

Yes ☐ No ☒

Justification: There is no UFSAR described evaluation methodology associated with the hardware replacement to be implemented under DCN 52028-A.

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

Yes ☐ No ☒

Justification: The proposed change under DCN 52028-A does not involve a test or experiment either described or not described in the UFSAR.

5. Does the proposed activity require a change to the Technical Specifications?

Yes ☐ No ☒

Justification: The proposed DCN modification does not affect or contradict any requirements or statements in Tech Spec section 3.3.3 Post Accident Monitoring (PAM) instrumentation, section 3.2 Reactor Coolant System (RCS), or section B 3.9.5 RHR & Coolant Circulation. Therefore, the proposed activity will not require a change to the Technical Specifications.

SCREENING REVIEW FORM

Document No. & Rev: DCN 52028-A
SR Rev: 0

IV. **If** all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

NOTE If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

System Descriptions
N3-68-4001 R25, Reactor Coolant System
N3-74-4001, R12, System Description for Residual Heat Removal System

Design Criteria
WB-DC-30-7, Post Accident Monitoring

UFSAR Sections
5.5.7 – RHR System
5.0 – RCS System
7.5.1 – PAM Instrumentation

Technical Specification Sections
3.2 – RCS
3.3.3 - PAM
B 3.9.5 - RHR

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 5

Document No. & Rev: **DCN 52265-A**

SR Rev: 0

50.59 Eval Rev.

Screening Review Only ☒

Screening Review/50.59 Evaluation ☐

Procedure Change Evaluation ☐

Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant **WBN**

Affected Unit(s) 1

Preparing Group **SE-DE**

Activity		Number (Include Revision No.)
☒ Design Change	DCN No.	**52265-A**
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (if applicable) Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comment: **TRACKING NO. WBPLEE-07-035-0**

This Screening Review is for DCN 52265-A which revises the values for the rod bank overlap switches and the rod insertion limit alarms.

Distribution:
cc: EDM
Preparer - Return original to originating document

Reviews and Approvals

Preparer: **R P. FOSTER** Name — Signature — 1-23-08 Date

Reviewer: **R. K. HALL** Name — Signature — 1/23/08 Date

Reviewer: (PORC) Name — Signature — Date

Other Reviewers: (as appropriate) Kevin S. Elam Name — Kevin Elam Signature — 1/24/08 Date

SCREENING REVIEW FORM

Page 2 of 5

Document No. & Rev: DCN 52265-A

SR Rev: 0

I. For a Screening Review provide a brief description of the change or test. If an 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

DCN 52265-A revises the rod bank overlap switch settings in panel 1-PNL-85-L122 and revises the Rod Insertion Limit (RIL) alarm calculation constants in the Computer Enhanced Rod Position Indication (CERPI) System to improve reactivity management and to account for changes in the Core Operating Limits Report (COLR). When the CERPI system was installed it was programmed with the RIL constant values based on the current COLR. These values may change based on core design. The CERPI RIL alarm calculation constants are stored on the system Programmable Logic Controllers (PLC)s and can be changed through the CERPI Maintenance Test Panel (MTP). The basis for this change is the Westinghouse Cycle 9 Reload Safety Evaluation (RSE) and COLR.

The overlapping of the control banks is required to keep the incremental changes in reactivity relatively constant while the control banks are being moved. Shutdown bank overlap operation is not required. Control bank overlap is controlled by six thumbwheel switches (s1 thru s6) in control rod drive panel 1-L-122. These switches control the rod bank withdrawal overlap values which determine when control bank movement starts and stops. The rod control startup sequence is listed below showing the function of each switch. The sequence is reversed for control bank insertion.

<u>Switch</u>

Control Bank A starts moving out
S1 - Control Bank B starts moving out
S2 - Control Bank A stops moving
S3 - Control Bank C starts moving out
S4 - Control Bank B stops moving
S5 - Control Bank D starts moving out
S6 - Control Bank C stops moving
Control Bank D continues moving as required for control

Presently the control banks (except for bank A) start moving out when the previous bank is at 128 steps but this modification changes that value to 116 steps. The system description for the control rod drive system is being revised due to this modification.

II. Revision: 0 (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

Initial Issue

SCREENING REVIEW FORM

Page 3 of 5

Document No. & Rev: **DCN 52265-A** SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

   Yes ☐ No ☒

   Justification: The design function of the CERPI Rod Insertion Limit Monitor is to ensure sufficient core reactivity shutdown margin. While at power, the Rod Insertion Limits also bound 1) worth inserted due to an ejected rod and 2) power distribution. The CERPI Rod Insertion Limit Monitor compares the COLR Control Bank insertion limits to the actual Control Bank positions and provides an alarm if the actual bank positions approach their COLR limits. The design function of the bank overlap unit is to automatically select the proper Control Bank for movement and to overlap the Control Banks being moved according to a preset pattern which is defined in the COLR. Control Bank overlap is required to keep the incremental changes in reactivity relatively constant while the Control Banks are being moved. The changes being made by this DCN are due to the Westinghouse Watts Bar Unit 1 Cycle 9 revision of the COLR. The Cycle 9 COLR has been prepared and evaluated using the NRC-approved methods identified in Technical Specification Section 5.9.5. Per the Westinghouse RSE, the fuel, core components, and core will continue to operate within their respective design criteria, safety analysis limits, and the Technical Specification requirements. Therefore, the design functions of the fuel, core components, and core are not being adversely affected by the Cycle 9 core design and COLR. Therefore, this activity (based on the new COLR values) does not adversely affect any UFSAR described design functions.

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification: The design function of the CERPI Rod Insertion Limit Monitor is to ensure sufficient core reactivity shutdown margin. While at power, the Rod Insertion Limits also bound 1) worth inserted due to an ejected rod and 2) power distribution. The CERPI Rod Insertion Limit Monitor compares the COLR Control Bank insertion limits to the actual Control Bank positions and provides an alarm if the actual bank positions approach their COLR limits. The design function of the bank overlap unit is to automatically select the proper Control Bank for movement and to overlap the Control Banks being moved according to a preset pattern which is defined in the COLR. Control Bank overlap is required to keep the incremental changes in reactivity relatively constant while the Control Banks are being moved. The changes being made to the CERPI Rod Insertion Limits and Control Bank overlap values due to the changes in the COLR may require changes to surveillance or operating limits contained in plant procedures. Updating these procedures for each operating cycle is expected and they will receive their own 50.59 reviews based on the Westinghouse RSE. This activity does not require any additional procedure changes that will affect how design functions are performed or controlled.

SCREENING REVIEW FORM

Page 4 of 5

Document No. & Rev: **DCN 52265-A** SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

   Yes ☐ No ☒

   Justification: Per the Westinghouse RSE, there were no changes made to the methods that were used in the analyses and evaluations for the cycle 9 limits in the COLR (rod insertion limits and bank overlap values).

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification: The changes being made to the COLR for cycle 9 (rod insertion limits and control bank overlap changes) are permanent changes to the plant required to allow cycle 9 to operate at rated power for the entire cycle. These changes are not part of a test or experiment.

5. Does the proposed activity require a change to the Technical Specifications?

   Yes ☐ No ☒

   Justification: The COLR is being revised to implement the limits required for operation of Cycle 9. As documented in the Westinghouse RSE, the cycle 9 limits in the COLR were calculated using NRC-approved methodology as required and identified by Technical Specification 5.9.5, Core Operating Limits Report (COLR). The Technical Specifications (TS) have been reviewed and no additional changes to the TS are required as a result of this activity.

SCREENING REVIEW FORM

Page 5 of 5

Document No. & Rev: **DCN 52265-A** SR Rev: 0

IV. **If** all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

NOTE If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

UFSAR Sections
3.1.2.3 Protection and Reactivity Control Systems
4.2.3 Reactivity Control System
4.3 Nuclear Design
7.7 Control Systems
15.2 Condition II - Faults of Moderate Frequency
15.3.6 Single Rod Cluster Control Assembly Withdrawal at Full Power
15.4.6 Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control Assembly Ejection)

TS Sections
3.1.5/B3.1.5 Rod Group Alignment Limits
3.1.7/B3.1.7 Control Bank Insertion Limits
5.9.5 Core Operating Limits Report (COLR)

System Descriptions
N3-85-4003, R9

Vendor Manual Documents
VM-W120-3015
VD-W120-3015

Westinghouse Documents
Watts Bar Nuclear Plant Unit 1 Cycle 9 Reload Safety Evaluation (RSE)
Core Operating Limits Report (COLR) for Watts Bar Unit 1 Cycle 9

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 5

Document No. & Rev: DCN 52331-A
SR Rev: 0
50.59 Eval Rev.

Screening Review Only ☒
Screening Review/50.59 Evaluation ☐
Procedure Change Evaluation ☐
Screening Review/Procedure Change Evaluation ☐
(Check only one box)

Plant **WBN**
Affected Unit(s) **1**
Preparing Group **SE-DE**

Activity	Number (Include Revision No.)	
☒ Design Change	DCN No.	**52331-A**
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (if applicable)	
	Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comment: **Tracking No. WBPLEE-09-007**

Replace obsolete Hagan Optimac 100 recorders on 1-M-5 (1-TR-68-1, 1-TR-68-43 & 1-TR-68-65) with Thermo Westronics recorders.

Distribution:
cc: EDM
Preparer - Return original to originating document

Reviews and Approvals

	Name	Signature	Date
Preparer:	**Roger P. Foster**	Roger P. Foster	2-5-09
Reviewer:	JOHN W. BRADLEY	J. W. B	2-5-09
Reviewer: (PORC)			
Other Reviewers: (as appropriate)			

SCREENING REVIEW FORM

Page 2 of 5

Document No. & Rev: DCN 52331-A SR Rev: 0

I. For a Screening Review provide a brief description of the change or test. If an 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

DCN 52331-A will replace 3 Hagan Controls model Optimac 100 recorders in the Main Control Room (MCR) on panel 1-M-5, UNIDs 1-TR-68-1, 1-TR-68-43, and 1-TR-68-65. One or both pens on these recorders have quit working and repair is not possible since the Optimac 100 is an obsolete recorder model. These recorders will be replaced with Thermo Westronics Model SV100 video graphic recorders.

Each of the above recorders monitors Reactor Coolant System (RCS) hot and cold leg temperatures. Recorder 1-TR-68-1 monitors RCS loop 1 temperatures, 1-TR-68-43 monitors loop 3 temperatures, and 1-TR-68-65 monitors loop 4 temperatures. Each recorder has two inputs; one input to monitor the loop hot leg and one to monitor the loop cold leg. The inputs for each recorder are listed below.

LOOP		1	3	4
Recorder	**PEN**	1-TR-68-1	1-TR-68-43	1-TR-68-65
Hot Leg Input	**P001**	1-TE-68-1	1-TE-68-43	1-TE-68-65
Cold Leg Input	**P002**	1-TE-68-18	1-TE-68-60	1-TE-68-83

Process signals from the above temperature elements are processed through Eagle 21 protection set loops and provide 10 – 50 ma current loops through qualified E/I isolators. A dropping resistor at each input to each recorder converts the current loop output of 10 to 50 ma to the required DC voltage input for the recorder. Instrument loops 1-LPT-68-1, 1-LPT-68-18, 1-LPT-68-43, 1-LPT-68-60, 1-LPT-68-65, and 1-LPT-68-83 are compliance loops; however, the Eagle 21 D/A and isolator channel output for the MCR compliance indicators are separate channels from the channels that provide the inputs to the recorders. These recorders are also designated as Quality Related, seismic 1(L) B, and the individual recorder points are PAM Category C2.

The Thermo Westronics model SV100 recorder is a multiple channel paperless video graphic recorder which utilizes thin-film transistor (TFT) liquid crystal display (LCD) technology. This recorder is capable of supporting a minimum of six analog inputs; however, this change will not add any additional inputs for recording to these new recorders. The new recorders will be located in the same location as the old recorders and will use the same cutout and cabling. The cutout size requirement for the SV100 is smaller than the existing Optimac 100 recorders (5.43"-SV100 vs. 6.06"-Optimac 100) and therefore, each new recorder will require installation of the Westronics adapter panel kit. This includes mounting hardware and a bezel to accommodate the larger cutout size.

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

Initial Issue

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SCREENING REVIEW FORM

Page 3 of 5

Document No. & Rev: **DCN 52331-A** SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   The design function of recorders 1-TR-68-1, 1-TR-68-43, and 1-TR-68-1 is to provide information for use by the operator to control coolant temperature during startup and shutdown. More specifically, RCS cold leg and hot leg temperature indication is used for maintaining an adequate reactor heat sink, maintaining the proper relationship between RCS pressure and temperature, verifying vessel Nil-Ductility Temperature (NDT) criteria, establishing correct conditions for RHR operations, ensuring proper cool down rate, determining whether SI should be terminated or reinstated and determining core Ductility Temperature (DT) during natural circulation. The recorders are also the trending recorders for Post Accident Monitoring (PAM) category 2 variable RCS hot/cold leg temperature.

   The RCS is discussed in UFSAR section 5.0 and PAM instrumentation is discussed in UFSAR Section 7.5.1.

   The change under DCN 52331-A is not adverse because the replacement of three obsolete recorders with current generation video graphic recorders is considered "like for like" replacements; there is no change in the function of the devices that are replaced and no change in the SSC in which the devices operate. Thus, the DCN change does not affect any UFSAR described design function.

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   The design function of recorders 1-TR-68-1, 1-TR-68-43, and 1-TR-68-1 is to provide information for use by the operator to control coolant temperature during startup and shutdown. More specifically, RCS cold leg and hot leg temperature indication is used for maintaining an adequate reactor heat sink, maintaining the proper relationship between RCS pressure and temperature, verifying vessel Nil-Ductility Temperature (NDT) criteria, establishing correct conditions for RHR operations, ensuring proper cool down rate, determining whether SI should be terminated or reinstated and determining core Ductility Temperature (DT) during natural circulation. The recorders are also the trending recorders for Post Accident Monitoring (PAM) category 2 variable RCS hot/cold leg temperature.

   The change under DCN 52331-A does not involve procedures that affect system operational characteristics described in the UFSAR or impact compliance with the Technical Specification. Also this change does not conflict with or affect processes or procedures outlined, summarized, or described in the UFSAR.

SCREENING REVIEW FORM

Page 4 of 5

Document No. & Rev: **DCN 52331-A** SR Rev: **0**

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

Yes ☐ No ☒

Justification:
There is no UFSAR described evaluation methodology associated with the hardware replacement to be implemented under DCN 52331-A.

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

Yes ☐ No ☒

Justification:
The proposed change under DCN 52331-A does not involve a test or experiment either described or not described in the UFSAR.

5. Does the proposed activity require a change to the Technical Specifications?

Yes ☐ No ☒

Justification:
The proposed DCN modification does not affect or contradict any requirements or statements in Tech Spec section 3.3.3, Post Accident Monitoring (PAM) instrumentation, or section 3.2, Reactor Coolant System (RCS). Other sections of the Tech Specs were reviewed and found not to be affected by this change. Therefore, the proposed activity will not require a change to the Technical Specifications.

SCREENING REVIEW FORM

Page 5 of 5

Document No. & Rev: DCN 52331-A SR Rev: 0

IV. **If** all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

NOTE If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

System Description
N3-68-4001 R26, Reactor Coolant System

Design Criteria
WB-DC-30-7 R2, Post Accident Monitoring

UFSAR Sections
5.0 – RCS System
7.5.1 – PAM Instrumentation

Technical Specification Sections
3.2 – RCS
3.3.3 - PAM

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 5

Document No. & Rev: DCN 52389-A
SR Rev: 0
50.59 Eval Rev.

Screening Review Only ☒
Screening Review/50.59 Evaluation ☐
Procedure Change Evaluation ☐
Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant WBN
Affected Unit(s) 1
Preparing Group WBPLEE

Activity	Number (Include Revision No.)	
☒ Design Change	DCN No.	52389-A
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (if applicable)	
	Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comment: Tracking No. WBPLEE-08-006-0
Replace Hagan Optimac 100 recorders, 1-PR-1-2 & 1-PR-1-23, with Thermo Electron recorders.

Distribution:
cc: EDM
Preparer - Return original to originating document

SJP 8/4/08

Reviews and Approvals

Preparer:	JOHN N. BRADLEY ~~R. K. Hall~~ Name	J. N. B Signature	8/4/08 Date
Reviewer:	R. P. Foster Name	R. P. Signature	8-1-08 Date
Reviewer: (PORC)	Name	Signature	Date
Other Reviewers: (as appropriate)	Name	Signature	Date

Document No. & Rev: DCN 52389-A

SR Rev: 0

I. For a Screening Review provide a brief description of the change or test. If a 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

DCN 52389-A replaces the Hagan Controls model Optimac 100 recorders in the Main Control Room (MCR) on panel 1-M-4, UNIDs 1-PR-1-2 and 1-PR-1-23. These recorders are obsolete and cannot be maintained. Each of these recorders will be replaced with a Thermo Electron (formerly Thermo Westronics) model SV100.

Recorder 1-PR-1-2 has two inputs; one input to Steam Generator # 1 Header Pressure from pressure transmitter 1-PT-1-2B, and one input to monitor Steam Generator # 2 Header Pressure from pressure transmitter 1-PT-1-9B. Recorder 1-PR-1-23 also has two inputs; one input to monitor Steam Generator # 3 Header Pressure from pressure transmitter 1-PT-1-23 and one input to monitor Steam Generator # 4 Header Pressure from pressure transmitter 1-PT-1-27A.

Process signals from the pressure transmitter's 1-PT-1-2B, 1-PT-1-9B, 1-PT-1-23 and 1-PT 1-27A are processed through Eagle 21 protection set loops and provide 10 – 50 ma current loops through qualified E/I isolators. A dropping resistor at each input to each recorder coverts the current loop output of 10 to 50 ma to the required DC voltage input for the recorder. The process signals from the pressure transmitter loop for 1-PT-1-2B (Steam Generator # 1 Header Pressure), 1-PT-1-9B (Steam Generator # 2 Header Pressure), 1-PT-1-23 (Steam Generator # 3 Header Pressure) and 1-PT-1-27A (Steam Generator # 4 Header Pressure) provide signals for input to the Integrated Computer System (ICS) Log points P0401A, P0421A, P0442A and P0460A, respectively. Instrument loops 1-LPP-1-2B, 1-LPP-1-9B, and 1-LPP-1-27A are compliance loops; however, the Eagle 21 D/A and isolator channel output for the MCR compliance indicators are separate channels from the channels that provide the inputs to the recorders.

The replacement recorders are Thermo Electron Model SV100. The new recorders will be multiple channel paperless video graphic recorders which utilize Thin-Film Transistor (TFT) Liquid Crystal Display (LCD) technology. The recorders meet plant requirements for EMI/RFI qualification. The new recorder will be capable of supporting a minimum of six analog inputs; however, this change will not add any additional inputs for recording to the new recorders. The new recorder will be located on the same panel and use the same panel cutouts and cabling as the existing recorders.

The subject recorders as designated as Quality Related, seismic 1(L) B. The new Thermo Westronics recorders have been tested and qualified by the vendor for position retention requirements, reference TVA WBN NE Civil Engineering approval memo T71 010702 800. Mounting hardware will be supplied by the vendor to mount the new recorders. The new recorder weight 7.5 pounds; the weight of the Optimac 100 is un-available, but it is assumed that it weighs at least as much as the Westronics since it is larger. The SV100 is shorter in cantilever length than the existing Optimac 100 recorders (9 1/4" versus 24"). Therefore, this recorder change out will not impact the panel's seismic qualification.

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

SCREENING REVIEW FORM

Page 3 of 5

Document No. & Rev: DCN 52389-A

SR Rev: 0

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

Yes ☐ No ☒

Justification:

The main steam system is designed to conduct steam from the steam generator outlets to the high pressure turbine and to the condenser steam dump system. This system also supplies steam to the feedwater pump turbines, an auxiliary feedwater pump turbine, moisture-separator reheaters, and the turbine seals. The design function of recorders 1-PR-1-2 and 1-PR-1-23 is to provide information for use by the operator to monitor steam generator 1 through 4 header pressure. The recorders are the trending recorders for PAM category 2 variable. The design function of Post Accident Monitoring (PAM) instruments is to enable the Main Control Room (MCR) operating staff (operators) to take preplanned manual actions, provide information on whether critical safety functions are being accomplished, provide information for potential or actual breach of the barriers to fission product release, provide information of individual safety systems, and provide information on the magnitude of the release of radioactive materials. The main steam system is discussed in UFSAR section 10.3 and PAM instrumentation is discussed in UFSAR Section 7.5.1.

This change, replacing recorders 1-PR-1-2 and 1-PR-1-23 under DCN 52389-A is not adverse because the replacement of two obsolete recorders with current generation video graphic recorders is considered "like for like" replacements; there is no change in the function of the devices that are replaced and no change in the SSC in which the devices operate. Thus, the DCN change does not affect any UFSAR described design functions.

2. *Does the proposed activity involve a change to a procedure that adversely affects an UFSAR described SSC design functions are performed or controlled?* (See Section 4.2.1.2 of NEI 96-07)

Yes ☐ No ☒

Justification:

The main steam system is designed to conduct steam from the steam generator outlets to the high pressure turbine and to the condenser steam dump system. This system also supplies steam to the feedwater pump turbines, an auxiliary feedwater pump turbine, moisture-separator reheaters, and the turbine seals. The design function of recorders 1-PR-1-2 and 1-PR-1-23 is to provide information for use by the operator to monitor steam generator 1 through 4 header pressure. The recorders are the trending recorders for PAM category 2 variable. The design function of Post Accident Monitoring (PAM) instruments is to enable the Main Control Room (MCR) operating staff (operators) to take preplanned manual actions, provide information on whether critical safety functions are being accomplished, provide information for potential or actual breach of the barriers to fission product release, provide information of individual safety systems, and provide information on the magnitude of the release of radioactive materials. The main steam system is discussed in UFSAR section 10.3 and PAM instrumentation is discussed in UFSAR Section 7.5.1.

The change under DCN 52389-A does not involve procedures that affect system operational characteristics described in the UFSAR or impact compliance with the Technical Specification. Also the change does not conflict with or affect processes or procedures outlined, summarized, or described in the UFSAR.

SCREENING REVIEW FORM

Page 4 of 5

Document No. & Rev: DCN 52389-A

SR Rev: 0

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

Yes ☐ No ☒

Justification: There is no UFSAR described evaluation methodologies associated with the hardware replacement to be implemented under DCN 52389-A.

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

Yes ☐ No ☒

Justification: The proposed change under DCN 52389-A does not involve a test or experiment either described or not described in the UFSAR.

5. Does the proposed activity require a change to the Technical Specifications?

Yes ☐ No ☒

Justification: The proposed DCN modification does not affect or contradict with requirements and statements in Tech Spec section 3.3.3 Post Accident Monitoring (PAM) instrumentation and section 3.7 Plant Systems. Therefore, the proposed activity will not require a change to the Technical Specifications.

SCREENING REVIEW FORM

Page 5 of 5

Document No. & Rev: DCN 52389-A

SR Rev: 0

IV. **If** all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

NOTE If an FSAR change is involved process that change per NADP-7, FSAR Management.

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

System Descriptions
N3-1-4002 Rev. 14 – Main Steam System

Design Criteria
WB-DC-30-7 Rev. 21 – Post Accident Monitoring Instrumentation

UFSAR Sections
7.5.1 – PAM Instrumentation
10.3 – Main Steam

Technical Specification Sections
3.3.3 - PAM
B-3.2 – Plant Systems

PIC NO. 54248
PAGE 38

DCN 52957 PAGE 37

SCREENING REVIEW/50.59 EVALUATION COVERSHEET

Page 1 of 8

Document No. & Rev: DCN 52957A SR Rev: 1 | R1

50.59 Eval Rev.

Screening Review Only ☒ Screening Review/50.59 Evaluation ☐

Procedure Change Evaluation ☐

Screening Review/Procedure Change Evaluation ☐ **(Check only one box)**

Plant WBN

Affected Unit(s) 1

Preparing Group SE-EE

Activity		Number (Include Revision No.)
☒ Design Change	DCN No.	**52957A**
☐ Engineering Document Change	EDC No.	
☐ Temporary Alteration	TACF No.	
☐ Special Test/Experiment	Special Test No.	
☐ Temporary Shielding Request	TSRF No.	
☐ Procedure Change	Procedure No.	
☐ New Procedure	PCF No. (if applicable) Procedure No.	
☐ Maintenance	WR/WO No.	
☐ Other (Identify)		

Comment:
WBLEE-09-10

Distribution:
cc: EDM
Preparer - Return original to originating document

David L Podey 9/16/09

Reviews and Approvals

Preparer: Samuel J. Tyus 9-16-09
Name Signature Date

Reviewer: Tyson D. Washburn Tyson 9-16-09
Name Signature Date

Reviewer: (PORC) N/A
Name Signature Date

Other Reviewers: (as appropriate) N/A
Name Signature Date

50.59 EVALUATION FORM -

Page 2 of 8

Document No. & Rev: DCN 52957 A

50.59 Eval Rev: ______

I. For a Screening Review provide a brief description of the change or test. If a 50.59 Evaluation is required provide a detailed description of the change, test, or experiment; including design basis accidents involved, and credible failure modes of the activity.

The operability, including position indication, of the shutdown and control rods is an initial assumption in all safety analyses that assume rod insertion upon reactor trip. Rod Position Indication (RPI) is required to assess operability and misalignment (Technical Specification Bases Section B 3.1.8). PER 147132 documents a condition where all three forms of RPI, indication on 1-M-4, Maintenance Test Panel (MTP) in the Auxiliary Instrument Room (AIR) and the Integrated Computer System (ICS), was lost due to a communications path failure while the alternate path was out of service for testing. A simultaneous failure of all indications of the Rod Position Indication System (RPIS) places the plant in LCO 3.0.3. CERPI components do not perform a primary safety function defined in N3-85-4003 Section 2.1.1; it does support Instrumentation and Control Requirements in Section N3-85-4003 2.2.8 and in TS LCO 3.1.8. The simultaneous failure of both CERPI channels A and B would prevent the compliance with the actions in LCO 3.1.8 which would require entry into LCO 3.0.3.

The RPIS provides continuous rod position information for each Shutdown and Control Rod. This system provides rod position information independent of the Rod Control System. The equipment associated with rod position monitoring does not perform a safety-related function and is only required to be qualified to Seismic Category I(L), position retention only, in accordance with WB-DC-40-31.13. (System Description N3-85-4003)

The System Description is changed as indicated in this package. No changes to the FSAR or Technical Specifications are required by this DCN.

DCN 52957 performs modifications to the RPIS to make the system more reliable. The modification is accomplished by adding components to the existing system that will provide physical independence leading to two redundant communication paths between each PLC, in the AIR, and the flat panel displays on Panel 1-M-4 in the Main Control Room (MCR). The Westinghouse portion of the system is known as the Computer Enhanced Rod Position Indication System (CERPI). The three terms, RPIS, CERPI, and ARPI, are used interchangeably and will be treated as such in this document.

The new system will have redundant independent communication paths for each PLC between the AIR and MCR; L1 and L2 for each PLC. This configuration allows complete failure in one PLC communication path while continuing to provide RPI in the MCR (1-M-4), AIR (MTP), and ICS.

An additional power cable will be added from 1-M-7, 120V Instrument Power A Rack, to a new redundant power strip in the AIR CERPI panels to provide a secondary power source. This will provide two independent power sources, one for each PLC and MTP, in order to provide a separate communications path to each flat panel display in the MCR. The existing power strip is supplied from 1-M-7, 120V Instrument Power B Rack. Instrument Power A Rack is the alternate source for B Rack via a transfer switch. This minimizes the impact to the system since the alternate path already was considered for the entire load; the existing load is split between the sources and additional redundant components added in the CERPI panels. In addition, the existing spare breaker in 1-M-7(A & B) are replaced with new like for like breakers for the CERPI panel feeds.

Redundancy is also added to further enhance CERPI reliability with regards to connection to the Plant Computer System (ICS). The existing ICS connection to CERPI AIR Panel 1-R-41 is via Panel 1-R-174 in the AIR. Due to the addition of the new redundant equipment in the CERPI AIR Panels, a redundant ICS connection is added. This requires a new fiber optic cable to be pulled. Due to the location of the CERPI panels in relation to the ICS main connection in the Computer Room and the fact that the new fiber optic cables are hybrid cables with 12 multimode and 6 single mode fibers, it

is more efficient to pull a new fiber directly to the ICS panels, 1-R-153 & 1-R-154, in the Computer Room. The existing fiber cable, 1C1170, between 1-R-41 and 1-R-174 is left in place for future connection to ICS. To support new Cyber Security requirements new Ethernet switches, Firewalls, and line sensing equipment are added to Panels 1-R-153 & 1-R-154. Existing connections to ICS from 1-R-174 and CERPI are routed to these new switches which are connected to the Data Acquisition Network via new fire walls, one layer below ICS to provide improved security. R1

This modification will require changes to annunciator panel 1-XA-55-4A & 4B; windows 64F (C-II Bank D Auto Withdrawal Blocked), 86C (RPI Trouble), 87A (Rod Insertion Limit LO), 87B (Rod Insertion Limit LO LO), and 87D (Rods At Bottom) are engraved for re-flash. These alarm changes meet the requirement of DS-E18.1.24, section 3.7. ARI-64-70 & ARI-81-87 requires revision to reflect the re-flash function. R1

UFSAR Described System Functions

RPIS, ICS (Plant Computer), and Annunciation

7.7.1.3.2 Main Control Room Rod Position Indication

Two separate systems are used to indicate rod position information in the main control room. One system measures the actual drive rod position as part of the Rod Position Indicator System (RPIS). The second system counts and displays the pulses for rod movement generated in the logic cabinet.

1. Rod Position Indication System

The position of each rod (57) [Shutdown and Control banks] is displayed on main control room (MCR) displays. These RPIS receives analog signals from sensors mounted on the rod drive mechanism, calculates rod position from these signals, and displays this information on the MCR displays. The scale is in units of steps and covers the entire range of travel. Additionally, a rod bottom indicator light for each rod (57) is shown on the MCR displays to indicate a rod is near the fully inserted position.

2. Rod Position Step Counter

The position demand signal for each rod group (14) is displayed on a 3-digit, add-subtract step counter. The input signal is supplied from the logic cabinet circuitry. The demand position and rod position indication systems are separate systems; the rod position indication system is described in detail in References [3] and [17].

Unit Operation with an Inoperable RPIS Indicator

The malfunction of an indicator in the RPIS is addressed by controls established in the technical specifications. The controls include requirements to use the moveable incore detectors to verify the position of the affected rod whenever an indicator is inoperable. This action may be periodically repeated for the duration of the period the indicator is inoperable. A second action is available in the technical specifications to address the malfunction of an indicator for an extended period of time (referred to as the extended action in this discussion). The options provided by the extended action allows for continued operation in a situation where the component causing the indicator to be inoperable is inaccessible due to operating conditions (adverse radiological or temperature environment). In this situation, repair of the indicator cannot occur until the unit is in an operating mode that allows access to the failed components.

The primary purpose for this option is to prevent unnecessary wear on the incore detectors due to repeated use over an extended period. During the use of the extended action signal cables are connected to the CRDM circuitry test points on a temporary basis to monitor the operation and timing of the lift coil and the stationary gripper coil and to provide instrumentation for the monitoring of the position of the affected rod in the MCR. As indicated previously, the initial position of the affected rod (control or shutdown) is verified by use of the incore detectors. Once the position is known and the monitoring circuits required for use of the extended action are in place, the position of the rod is programmed into the *plant computer*. The program displays the position of the rod on the *plant computer* or on a recorder located in the MCR.

Once the extended action is implemented, the parameters of the rod control system must be monitored until the failed indicator is repaired. The monitoring function is assisted by a series of alarms controlled by the *plant computer* that address unintended movement of the rod. Alarms are initiated if the affected rod steps in a direction other than what was demanded, if the affected rod stepped with no demand and if the monitoring circuitry fails. Receipt of any alarm requires the verification of the position of the rod by use of the incore detectors. The technical specifications that govern the use of the extended action contains the following provisions to ensure the temporary circuit is functioning properly and the position of the affected rod is periodically verified:

1. Verification of the position of the rod every 31 days using the incore movable detectors.
2. Verification of the position of the rod with the inoperable analogy rod position indication (ARPI) by use of the moveable incore detectors, whenever the rod is moved greater than 12 steps in one direction.

During the period the extended action is implemented, actions required by the technical specifications that address rod group alignment limits, heat flux hot channel factor and nuclear enthalpy rise hot channel factor may serve to verify the correct operation of the temporary circuit. Provisions are also provided in the technical specifications that address operation of the unit under the extended action when reactor thermal power (RTP) is less than or equal to 50% RTP and the unit is to be returned for full power operation. Implementation of the extended action and the installation of the temporary circuit include a review of the modification for impact on plant procedures and training. This ensures that changes are initiated for key issues like the monitoring requirements in the MCR, and operator training on the temporary equipment.

7.7.1.3.5 Rods At Bottom

A "Rods At Bottom" annunciation is actuated in the main control room when any of the shutdown and control bank rods are near the fully inserted position. The RPIS monitors the analog signal from the rod position detectors and actuates this alarm when the rods are positioned below the setpoint. (The RPIS blocks this alarm signal for control banks B, C, and D).

50.59 EVALUATION FORM -

Document No. & Rev: DCN 52957 A

Page 5 of 8
50.59 Eval Rev:

7.7.2.2 Response Considerations of Reactivity

The control rod drive system is designed to minimize the effects of a single electrical or mechanical failure in the rod control system that could cause the accidental withdrawal of a single rod cluster control assembly from the partially inserted bank at full power operation. The operator could deliberately withdraw a single rod cluster control assembly in the control bank; this feature is necessary in order to retrieve a rod, should one be accidentally dropped. In the extremely unlikely event of simultaneous electrical failures which could result in single rod cluster control assembly withdrawal, rod deviation would be displayed on the plant annunciator, and the rod position displays would indicate the relative positions of the rods in the bank.

The rod position indication system provides direct visual displays of each control rod assembly position. The *plant computer* alarms for deviation of rods from their banks. In addition, the RPIS provides a rod insertion limit monitor which provides an alarm to warn the operator of an approach to an abnormal condition due to dilution. The low-low insertion limit alarm alerts the operator to follow immediate boration procedures. The facility reactivity control systems are such that acceptable fuel damage limits will not be exceeded even in the event of a single malfunction of either system.

15.3.6.1 Identification of Causes and Accident Description

The current WBN design basis for the single rod cluster control assembly (RCCA) withdrawal at full power event assumes no single electrical or mechanical failure in the rod control system could cause the accidental withdrawal of a single RCCA from the inserted bank at full power operation. The operator could deliberately withdraw a single RCCA in the control bank since this feature is necessary in order to retrieve an assembly should one be accidentally dropped. In the extremely unlikely event of simultaneous electrical failures which could result in single RCCA withdrawal, rod deviation and rod control urgent failure would both be displayed on the plant *annunciator*, and the rod position indicators would indicate the relative positions in the assemblies in the bank. The urgent failure alarm also inhibits automatic rod withdrawal. Withdrawal of a single RCCA by operator action would result in activation of the same alarm and the same visual indications.

Other sections of the SAR address RPIS (see reference section) but the above reflects the major description of RPIS and the remaining sections only restate what is described here.

II. Revision: (Provide a brief summary of the reason for the revision to the SR, or 50.59 Evaluation)

Revision 0: Initial Issue
Revision 1: Incorporation of PIC 54248

Document No. & Rev: DCN 52957 A
50.59 Eval Rev:

III. 50.59 Screening Questions (Check correct response) (See Section 4.2 of NEI 96-07 for additional guidance):

1. Does the proposed activity involve a change to an SSC that adversely affects an UFSAR described *design function*? (See Section 4.2.1.1 of NEI 96-07)

   Yes ☐ No ☒

   Justification:

   The design function of the RPIS is to receive signals from sensors mounted on the rod drive mechanism, calculates rod position from these signals, and displays this information on the MCR displays. This DCN does not change the original design function of the RPIS system. DCN 52957 performs modifications to the RPIS/ CERPI to make the system more reliable. The modification is accomplished by adding components to the existing system that will provide physical independence leading to two redundant communication paths between each PLC and flat panel display; in addition ICS communication path redundancy is added between the AIR CERPI Node Boxes and the Computer Room ICS connections. (The terms, RPIS, CERPI and ARPI, are used interchangeably.) R1

   With the existing configuration, PLC A and B provide inputs to both MCR monitors. Each monitor can display data from both PLC A and B. With the new configuration implemented by this DCN, monitor A can only display data from PLC A and monitor B can only display data from PLC B. While this improves system reliability by removing a single failure point that could in-op the data to both MCR displays, the MCR displays are no longer able to display data from either PLC. If a PLC fails operators will no longer be able to use both displays to see the data from the remaining PLC. This is acceptable because the remaining operable PLC/MCR monitor pair can display all rod positions.

   Firewalls are installed so that a network failure (data storm) in the other CERPI channel or the plant computer system (ICS) will not adversely impact both the A and B CERPI channels. A Cyber Security Assessment was performed by TVA Corporate. Based on this assessment a new Cyber Security Intrusion Detection computer is added to this equipment to insure compliance with the Cyber Security requirement of SS E18.15.01. R1

   The CERPI software code has had a long successful operating history on various plants. The changes to the CERPI software will have Verification and Validation testing performed including factory acceptance testing (FAT) and post modification testing (PMT). This minimizes the potential for software failures including common mode failures. Note that this is not a protection system or an injection system so the requirement in BTP-19 that a common mode software failure must be assumed is not applicable.

   Site Evaluations for Electrical, Civil, and Mechanical, including calculations as referenced, prove no adverse impact to the site electrical system, structures, or fire protection due to the modifications by DCN 52957.

   Equipment that is replaced / added by Westinghouse is considered like for like or identical to that previously evaluated and installed for EMI/RFI considerations. The new power supplies, which are more efficient, are FCC Class A compliant and therefore approved by TVA for EMI/RFI considerations in accordance with SPP-4.1 and TVA Corporate Engineering. Operating history at WBN with existing CERPI equipment shows no EMI/RFI related issues. R1

   Therefore the UFSAR described functions are not adversely affected.

RIC NO. 54248
PAGE 49

DCN 52957 PAGE 43

50.59 EVALUATION FORM -

Document No. & Rev: DCN 52957 A

Page 7 of 8
50.59 Eval Rev:

2. Does the proposed activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 4.2.1.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   This DCN does not issue any plant procedures. However, changes to plant operating procedures are required due to the modification are controlled in accordance with the impact review process in SPP-9.3. The justifications utilized in this document may be applied to plant procedures changes in accordance with SPP-9.4.

3. Does the proposed activity involve revising or replacing an UFSAR described evaluation methodology that is used in establishing the *design bases* or used in the *safety analyses*? (See Section 4.2.1.3 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   The modification implemented by this DCN does not involve any new or revised evaluation methodology. This activity does not result in a departure from or impact to a method of evaluation described in the UFSAR used in establishing the design bases or in the safety analysis.

4. Does the proposed activity involve a *test or experiment not described in the UFSAR*, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 4.2.2 of NEI 96-07)

   Yes ☐ No ☒

   Justification:
   This modification does not involve a new test or experiment not described in the UFSAR, nor does it impact any test or experiment described in the UFSAR.

5. Does the proposed activity require a change to the Technical Specifications?

   Yes ☐ No ☒

   Justification:
   The Technical Specifications and their Bases were reviewed and no change is needed to implement this DCN.

IV. **If** all questions are answered NO, **then** implement the activity per the applicable plant procedure for the type of activity without obtaining a License Amendment.
If screen question 5 is answered YES, **then** request and receive a License Amendment prior to implementation of the activity.
If screen question 5 is answered NO and question 1, 2, 3 or 4 is answered YES, **then** a 50.59 Evaluation shall be performed.
If only screen question 3 is answered YES, **then** only question 8 in the 50.59 Evaluation is required to be answered.
If screen question 3 is answered NO, **then** question 8 in the 50.59 Evaluation may be left unanswered.

NOTE If an FSAR change is involved process that change per NADP-7, FSAR Management.

50.59 EVALUATION FORM -

Page 8 of 8

Document No. & Rev: DCN 52957 A

50.59 Eval Rev: ______

V. List the documents (UFSAR, Technical Specifications, and other documents) reviewed where relevant information was found, including section numbers:

Design Criteria

WB-DC 40-31-13, Seismic Qualification of Category 1(L) Fluid System Components and Electrical or Mechanical Equipment.
WB-DC-40-31-2 , Qualification of Category 1 Fluid System Components and Electrical or Mechanical Equipment.
WB-DC-30-29 Plant Intergrated Computer System (ICS)
WB-DC-30-27 AC and DC Control Power System

System Descriptions

N3-85-4003 Control Rod Drive System
N3-99-4003 Reactor Protection System

UFSAR Amendment 7

Chapter 7.5
Chapter 7.7
Chapter 8.1
Chapter 8.3
Chapter 9.3
Chapter 15.2
Chapter 15.3

Technical Specifications Amendment 70 and Bases

Tech Spec 3.1 Reactivity Control Systems
Tech Spec 3.2 Power Distribution Limits
Tech Spec 3.3 Instrumentation
Tech Spec 3.4 Reactor Coolant System
Tech Spec 3.5 ECCS
Tech Spec 3.6 Containment Systems
Tech Spec 3.7 Plant Systems
Tech Spec 3.8 Electrical Power Systems

Other Documents

Electrical Calculations: WBNEEBMSTI120016, WBNEEBMSTI060017, WBPEVAR9509001
Mechanical Calculation: EPMDOM012990
I & C Calculation: TI49

Enclosure 2
TVA Letter Dated October 29, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

Attachment 9

Cross Reference Between The Unit 2 and Unit 1 PAMS Variable Sources For Unique WBN Unit 2 Variables Within The Scope Of The Foxboro Spec 200, Common Q PAMS And Foxboro I/A changes.

Reg Guide 1.97 Unit 1 Variable Source NRC RAI Item 303

Var. #	Variable Name	U2 Variable Source	Unique to U2?	Unit 1 Variable Source
1	Auxiliary Feedwater Flow	Foxboro Spec 200	Y	Robertshaw Controls Co./Bailey Meter Company
2	Containment Lower Compartment Atmosphere Temperature	Foxboro Spec 200	Y	Robertshaw Controls Co.
6	Core Exit Temperature	Common Q PAMS	Y	ICCM-86
16	Subcooling Margin Monitor	Common Q PAMS	Y	ICCM-86 & Analogic digital panel meter
22	Reactor Vessel Level	Common Q PAMS	Y	ICCM-86
23	Containment Pressure (Wide Range)	Foxboro Spec 200	Y	Bailey Meter Company
29	Accumulator Tank Level	Foxboro IA	Y	Foxboro H-Line
30	Accumulator Tank Pressure	Foxboro IA	Y	Foxboro H-Line
31	Annulus Pressure	Foxboro IA	Y	Robertshaw Controls Co.
37	CCS Surge Tank Level	Foxboro Spec 200	Y	Robertshaw Controls Co./Bailey Meter Company
38	Centrifugal Charging Pump Total Flow	Foxboro IA	Y	Foxboro H-Line
39	Charging Header Flow	Foxboro IA	Y	Foxboro H-Line
40	Component Cooling Water To ESF Flow	Foxboro Spec 200	Y	Robertshaw Controls Co./Bailey Meter Company
41	Component Cooling Water Supply Temperature	Foxboro Spec 200	Y	Robertshaw Controls Co./Bailey Meter Company
46	Containment Spray HX Outlet Outlet Temperature	Foxboro IA	Y	Foxboro H-Line
47	Containment Sump Water Level (Narrow Range)	Foxboro IA	Y	Robertshaw Controls Co.
52	ERCW Header Flow	Foxboro Spec 200	Y	Bailey Meter Company
60	Letdown Flow	Foxboro IA	Y	Foxboro H-Line
64	Normal Emergency Boration Flow	Foxboro IA	Y	Foxboro H-Line
68	Pressurizer Relief Tank Level	Foxboro IA	Y	Foxboro H-Line
69	Pressurizer Relief Tank Pressure	Foxboro IA	Y	Foxboro H-Line
70	Pressurizer Relief Tank Temperature	Foxboro IA	Y	Foxboro H-Line
71	RCP Seal Injection Flow	Foxboro IA	Y	Foxboro H-Line
72	RCS Head Vent Valve Status	Foxboro Spec 200	Y	Veritrak
73	RHR Heat Exchanger Outlet Temperature	Foxboro IA	Y	Foxboro H-Line
74	RHR Pump Flow (RHR System Flow)	Foxboro IA	Y	Foxboro H-Line
77	Safety Injection Pump Flow	Foxboro IA	Y	Foxboro H-Line
85	Volume Control Tank Level	Foxboro IA	Y	Foxboro H-Line
94	Condenser Vacuum Pump Exhaust Vent (Flow Rate)	Foxboro IA	Y	Robertshaw Controls Co.

Enclosure 2
TVA Letter Dated October 29, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

Attachment 10

TVA Design Criteria Document WB-DC-40-57, Watts Bar Nuclear Plant Unit 1/Unit 2, "Anticipated Transients Without Scram Mitigation System Actuation Circuitry (AMSAC)," Revision 4, dated August 11, 2008 and WITEL Open Items Report

DESCRIPTION	PUNCHLIST NO	DISPOSITION	REFERENCE DOCUMENT
WB-DC-40-57 SECTION 1.2 STATES "AMSAC WILL BE A SINGLE BAY CABINET CONTAINING ELECTRONIC EQUIPMENT WHICH SHALL BE INSTALLED IN THE AUXILIARY INSTRUMENT ROOM. THE UNIQUE IDENTIFICATION CODE FOR UNIT 1 IS 1-R-178.	PL-08-0751	EVALUATE WB-DC-40-57 SECTION 1.2 FOR UNIT 2 UNIQUE CODE AND LOCATION FOR THE AMSAC	WB-DC-40-57 SECTION 1.2
WB-DC-40-57 SECTION 3.3 STATES "THE ENVIORMENTAL REQUIREMENTS FOR AMSAC EQUIPMENT LOCATIONS ARE AS FOLLOWS: LOCATION *REQUIREMENT MAIN CONTROL ROOM: 47E235-16*, AUXILIARY INSTRUMENT ROOM: 47E235-17, TURBINE BUILDING: 47E235-20	PL-08-0752	EVALUATE WB-DC-40-57 SECTION 3.3 FOR *ENVIORMENTAL REQUIREMENTS FOR AMSAC* EQUIPMENT LOCATIONS FOR UNIT 2	WB-DC-40-57 SECTION 3.3
WB-DC-40-57 SECTION 3.5.10.1 STATES " A TWO STATE PUSHBUTTON SWITCH SHALL BE MOUNTED ON THE MAIN CONTROL ROOM 1-M-3 PANEL TO PROVIDE THE TEST/BLOCK AND OPERABLE FUNCTION"	PL-08-0753	EVALUATE WB-DC-40-57 SECTION 3.5.10.1 FOR TEST/BLOCK SWITCH MOUNTING LOCATION FOR UNIT 2	WB-DC-40-57 SECTION 3.5.10.1
WB-DC-40-57 SECTION 8.1.1.1 LISTS 1-45W600-1-3 DRAWINGS DESIGNATED AS UNIT 1WBN2-30AB-4001 SECTION 7.1.13 LISTS THE 45W600 - SERIES DRAWINGS	PL-08-0755	EVALUATE 1-45W600-1-3 DRAWINGS FOR UNIT 2 APPLICABILITYEVALUATE 45W600-SERIES DRAWINGS FOR UNIT 2 SYSTEM 30AB APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.1 1-45W600-1-3 DRAWINGS WBN2-30AB-4001 SECTION 7.1.13 45W600 - SERIES DRAWINGS
WB-DC-40-57 SECTION 8.1.1.2 LISTS 1-45W600-46-6 DRAWINGS DESIGNATED AS UNIT 1	PL-08-0756	EVALUATE 1-45W600-46-6 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.2 1-45W600-46-6 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.3 LISTS 1-45W600-47-2 DRAWINGS DESIGNATED AS UNIT 1	PL-08-0757	EVALUATE 1-45W600-47-2 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.3 1-45W600-47-2 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.4 LISTS 1-45W600-57-8 DRAWINGS DESIGNATED AS UNIT 1	PL-08-0758	EVALUATE 1-45W600-57-8 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.4 1-45W600-57-8 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.5 LISTS 1-45W760-3-1 DRAWINGS DESIGNATED AS UNIT 1	PL-08-0759	EVALUATE 1-45W760-3-1 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.5 1-45W760-3-1 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.6A LISTS 1-45W600-3-15 DRAWINGS DESIGNATED AS UNIT 1	PL-08-0760	EVALUATE 1-45W600-3-15 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.6A 1-45W600-3-15 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.6B LISTS 1-47W611-3 DRAWINGS DESIGNATED AS UNIT 1	PL-08-0762	EVALUATE 1-47W611-3 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.6B 1-47W611-3 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.7 LISTS 1-47W610-1 DRAWINGS DESIGNATED AS UNIT 1	PL-08-0763	EVALUATE 1-47W610-1 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.7 1-47W610-1 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.8 LISTS 1-47W610-3 DRAWINGS DESIGNATED AS UNIT 1	PL-08-0764	EVALUATE 1-47W610-3 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.8 1-47W610-3 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.9 LISTS 1-47W803-1 DRAWINGS DESIGNATED AS UNIT 1	PL-08-0765	EVALUATE 1-47W803-1 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.9 1-47W803-1 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.10 LISTS 1-47W803-2 DRAWINGS DESIGNATED AS.UNIT 1	PL-08-0766	EVALUATE 1-47W803-2 DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.10 1-47W803-2 DRAWINGS
WB-DC-40-57 SECTION 8.1.1.11 LISTS 47W200-SERIES DRAWINGS DESIGNATED AS UNIT 1	PL-08-0767	EVALUATE 47W200-SERIES DRAWINGS FOR UNIT 2 APPLICABILITY	WB-DC-40-57 SECTION 8.1.1.11 47W200-SERIES DRAWINGS
WB-DC-40-57, SECTION 3.8, "A LICENSING POSITION WILL BE PREPARED CLEARLY STATING COMPLIANCE WITH THE REQUIREMENTS OF THE AMSAC SER USING THE ABOVE DOCUMENTS FOR GUIDANCE. RESOLUTION OF NRC COMMENTS ON THE AMSAC LISCENSING POSITION IS A PREREQUISITE FOR PREPARING THE FSAR CHANGE. CHAPTERS 4, 7, 8, AND 10 OF THE FSAR WILL BE AFFECTED. NO CHANGES TO THE TECHNICAL SPECIFICATION ARE ANTICIPATED".	PL-08-0792	EVALUATE WB-DC-40-57, SECTION 3.8 (LAST PARAGRAPH) FOR NEED FOR LICENSING POSITION FOR UNIT 2	WB-DC-40-57, SECTION 3.8
WB-DC-40-57, SECTION 8.1.2.2 REFERENCES N3-47-4002	PL-08-0801	ADD REFERENCE 8.1.2.2.A WBN2-47-4002 FOR TRACKING OF ISSUANCE FOR UNIT 2.	WB-DC-40-57

TENNESSEE VALLEY AUTHORITY

Division of Nuclear Engineering

N
E

RIMS
QA RECORD

N/A
DESIGN CRITERIA DOCUMENT

No. WB-DC-40-57

WATTS BAR
NUCLEAR PLANT
UNIT 1 / UNIT 2

TITLE: ANTICIPATED TRANSIENTS WITHOUT SCRAM MITIGATION SYSTEM ACTUATION CIRCUITRY (AMSAC)

*Signatures on Original

REVISION	R0	R1	R2	R3	R4	
DATE:	6/17/88	11/18/92	9/9/99	10-23-2000	8-11-2008	
PREPARED	*	*	R.K.Hall	R.K.Hall	H.A.Germany	
CHECKED	--------	-----------	---------	----------	J.N.Rapp	
VERIFIED	*	*	R.T.Graham	R.T.Graham	J.N.Rapp	
APPROVED	*	*	B.G.Briody	B.G.Briody	K.O.Larssen	
TVA MGMT	------------	-----------	-------------	------------	W.D.Crouch	

TVA

Title:	ANTICIPATED TRANSIENTS WITHOUT SCRAM MITIGATION SYSTEM ACTUATION CIRCUITRY (AMSAC)	REVISION LOG WB-DC-40-57
REVISION NO.	DESCRIPTION OF REVISION	DATE APPROVED

0	*Initial issue. This revision incorporates applicable* commitments and requirements through May 16, 1986.	6/17/88
1	Incorporate: DIM-WB-DC-40-57-1 (B26 890306 021): DIM-WB-DC-40-57-2 (B26 890602 302); and DIM-WB-DC-40-57-3 (B26 890622 523). Revise DIM-3 Section 3.7 DELETE the last sentence in the paragraph which is, "The mounting of these transmitters shall be seismically qualified 1(L) by analysis." Revise Section 3.9 DELETE because DIM 3 removed Figure from the design criteria. Revise Section 1.1, delete third paragraph. Revise Sect. 1.2, remove Unit 1 & 2 and Unit 2 CID No. Revise Sect. 3.1.1, third paragraph first sentence revise. Remove per Unit and Unit 1 and Unit 2. Revise Sect. 3.1.2, A second sentence revise. B third sentence revise. Revise Sect. 3.5.2, revise paragraph. Revise Sect. 3.5.4, first paragraph delete (Reference Westinghouse Owner's Group WCAP 11436). Revise Sect. 3.5.6.1.1, revise section. Revise Sect's 3.5.8.1, 3.5.8.2 and 3.5.8.3 & 3.5.8.5. Revise Sect. 3.5.9. Revise Sect. 3.5.13. Revise Sect. 3.7, second paragraph, delete - on panels 1-L-109 and 1-L110. Revise Section 3.8, delete item 7) and renumber 8) & 9). Add to Sect. 3.9, see Section 3.5.2 through 3.5.4 and reference 8.1.1.6. Revise Sect 5.2.2, second paragraph, delete second sentence. Revise Sect. 8.0, add reference numbers to each line and revise drawing numbers. Revised Section 8.1.2 changed FROM: TVA Nuclear Quality Assurance Manual (NQAM) TO: TVA Nuclear Quality Assurance Plan (NQAP) (TVA-NQA-PLN89-A). And last procedure FROM: WBEP-EP-DB-.02, Preparation of Design Basis Document, Rev 3. TO: EAI-3.08, Maintenance of Design Basis Document.	11/18/92

TVA

Title:	ANTICIPATED TRANSIENTS WITHOUT SCRAM MITIGATION SYSTEM ACTUATION CIRCUITRY (AMSAC)	REVISION LOG WB-DC-40-57
REVISION NO.	DESCRIPTION OF REVISION	DATE APPROVED

REVISION NO.	DESCRIPTION OF REVISION	DATE APPROVED
1 (Con't)	Justification: The justification for this revision of the design criteria is to incorporate the outstanding DIM's 1, 2, and 3 and to remove the requirement to seismically qualify transmitters located in the Turbine Building which is a non seismic building and to correct the TVA documentation callouts for the NQAP and EAI-3.08.	
DCN M-21462-A	DCN RIMS NO. T56 930525 900 Revised Sections 3.5.4, 3.5.8.3 and 3.5.9 to reflect new AMSAC actuation set point (12% of narrow range level span. Also deleted references to 80% power level. Removed "Inhibit" from Section 3.5.9. Justification: New Westinghouse evaluation WCAP-12096 requires that RPS SG level setpoint be changed to 17%. WCAP-10858 requires that AMSAC be set at 5% below RPS SG level. Also, this actuation level is constant for turbine power level above 40% thru 100%. Therefore, references to 80% are superfluous. Pages affected: iia, 9, 11, 12	5/24/93
DCN S-32449-A	DCN RIMS NO. T56 940902 807 Revise accuracy requirements of Paragraph 3.5.4.1 to reflect the requirements of WCAP 12096, Rev. 6, WCAP-10858P-A, Rev. 1, and calculation WBPEVAR9301002, Rev. 0. Pages Affected: iia, 9	9/2/94
2	• DCN M-39911-A (T56 981215 803): Modification M-39911-A replaces the obsolete Unit 1 Westinghouse P2500 Plant Process Computer with a new Plant Integrated Computer System. This Plant Computer System provides an operator friendly, state of the art, real time process computer system for the WBN plant operators. After this modification, the new Plant Computer will be operational and performing all the functions of the existing Plant Computer (WB-DC-30-29) and Emergency Response Facilities Data System (ERFDS) (WB-DC-30-8). Therefore, Design Criteria's WB-DC-30-8 and WB-DC-30-29 have been combined into one Design Criteria WB-DC-30-29, "Plant Integrated Computer System." Design Criteria WB-DC-40-57 has been revised to incorporate this change by removing references to the Emergency Response Facilities Data System (ERFDS) and replacing them with Plant Computer references. • Incorporates DCNs M-21462-A, S-32449-A, and M-39911-A. • Deleted Coordination Log, which is not required per NEDP-10. • Renumbered entire document, which changed page numbers on the Table of Contents (pages iv-v). Pages Revised: All Total Pages: 26 (includes pages i-vi and 1-20)	9/9/99

TVA

Title:	ANTICIPATED TRANSIENTS WITHOUT SCRAM MITIGATION SYSTEM ACTUATION CIRCUITRY (AMSAC)	REVISION LOG WB-DC-40-57

REVISION NO.	DESCRIPTION OF REVISION	DATE APPROVED
3	Incorporates DCN as follows: • DCN D-50475-A (T56 000217 802) replaces the PLC based AMSAC System with relay logic circuitry. This revision to the design criteria reflects the requirements for the new instrumentation. Revisions to Table of Contents, Abbreviations and Acronyms, Sections 1.2, 3.1.1, 3.2, 3.5.1, 3.5.2, 3.5.4, 3.5.7, 3.5.8, 3.5.9, 3.5.10, 3.5.12, 3.10, 5.1, 5.2, 5.3, 6.1, and 8.1. • Administrative change to correct Reference 8.1.1.6 (two Reference 8.1.1.6 existed with the addition by DCN D-50475-A). Reference 8.1.1.6a is added by DCN D-50475-A, and Reference 8.1.1.6b is the reference added by Revision 1. Revisions to 3.9 and 8.1. • Renumbered entire document, which changed page numbers on the Table of Contents (page v-vi). Total Pages: 25 (includes pages i-vii and 1-18)	10-23-2000
4	This DCD has been reviewed and determined to be fully applicable to both Unit 1 and Unit 2. Outstanding WITEL punchlist items are listed below: • PL-08-0751, see Section 1.2 • PL-08-0752, see Section 3.3 • PL-08-0753, see Section 3.5.10.1 • PL-08-0792, see Section 3.8 • PL-08-0755, see Section 8.1.1.1 • PL-08-0756, see Section 8.1.1.2 • PL-08-0757, see Section 8.1.1.3 • PL-08-0758, see Section 8.1.1.4 • PL-08-0759, see Section 8.1.1.5 • PL-08-0760, see Section 8.1.1.6a • PL-08-0762, see Section 3.9 and 8.1.1.6b • PL-08-0763, see Section 8.1.1.7 • PL-08-0764, see Section 8.1.1.8 • PL-08-0765, see Section 8.1.1.9 • PL-08-0766, see Section 8.1.1.10 • PL-08-0767, see Section 8.1.1.11 • PL-08-0801, see Section 8.1.2.2a Editorial change to 8.1.2.1, 8.1.2.2, add 8.1.2.1a and 8.1.2.2a. Pages Revised: Coversheet, iv, 1, 6, 10, 13, 16 Total Pages: 25 (includes pages i-vii and 1-18)	8-11-2008

TABLE OF CONTENTS

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS

AFW	Auxiliary Feedwater
AMSAC	ATWS Mitigation System Actuation Circuitry
AMSAC SER	Safety Evaluation of Topical Report (WCAP-10858) "AMSAC Generic Design Package," dated July 7, 1986
ASME	American Society of Mechanical Engineers
ATWS	Anticipated Transients Without Scram
CFR	Code of Federal Regulations
CRT	Cathode Ray Tube
DNE	Division of Nuclear Engineering
EMI	Electro-Magnetic Interference
FSAR	Final Safety Analysis Report
FW	Feedwater
GL	Generic Letter
LOL/ATWS	Loss of Load accompanied by an ATWS event
LONF/ATWS	Loss of Normal Feedwater accompanied by an ATWS event
MCR	Main Control Room
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
PAM	Post Accident Monitoring
PSIG	Pounds per Square Inch Gauge
PWRs	Pressurized Water Reactors
QA	Quality Assurance
RCS	Reactor Coolant System
RG	Regulatory Guide
RPS	Reactor Protection System

1.0 SCOPE

1.1 Scope

This document defines the functional and design requirements of the Anticipated Transient Without SCRAM (ATWS) Mitigating System Actuating Circuitry (AMSAC) of the Watts Bar Nuclear Plant.

An ATWS event is a postulated severe accident sequence which is initiated by an anticipated operational occurrence as defined in Appendix A of 10CFR50 followed by the failure of the reactor trip portion of the reactor protection system to shut down or scram the reactor. The NRC on June 26, 1984, issued the ATWS Final Rule as 10CFR50.62 (Reference 8.1.3.1). The ATWS Final Rule required of all Westinghouse pressurized water reactors to install equipment that is diverse from sensor output to final actuation device to automatically initiate auxiliary feedwater flow and turbine trip under conditions indicative of an ATWS. This equipment (AMSAC) must be reliable and independent from the existing reactor trip system. An ATWS event will be detected by AMSAC whenever three out of the four steam generators have low-low level and the turbine is at or above 40 percent load. Consequently, the applicable plant features are: Feedwater System, Auxiliary Feedwater System, Process Instrumentation and Turbogenerator Control System. The Auxiliary Instrument Room and the Main Control Room will be affected by hardware additions and/or modifications.

Conceptual documents that establish the design features are:

°	10CFR50.62....................	ATWS Final Rule
°	Generic Letter 85-06...........	Quality Assurance Guidance for ATWS Equipment that is not Safety Related
°	Letter to S. A. White, TVA..... from T. J. Kenyon, NRC dated November 7, 1986	ATWS - Watts Bar Nuclear Plant AMSAC Safety Evaluation

No input document exceptions have been identified.

1.2 System and Component Identification

AMSAC will be a single bay cabinet containing electronic equipment which shall be installed in the auxiliary instrument room. The unique identification code for Unit 1 is 1-R-178. [PL-08-0751]

AMSAC will contain non-safety related equipment. All input signals to AMSAC are non-safety-related. AMSAC timing, coincidence logic, and outputs are non-safety related. The safety-related outputs to the auxiliary feedwater system are provided by interposing safety grade relays outside the AMSAC cabinet.

AMSAC will interface with the following pieces of equipment: Process Instrumentation steam generator blowdown valves, steam generator sampling valves, motor driven auxiliary feedwater pumps, turbine driven auxiliary feedwater pump, annunciator system, status lights, turbine trip circuits, and the 120V a-c distribution system.

Following is a list of the applicable System Description:

Number	Title
N3-3B-4002	Auxiliary Feedwater
N3-47-4002	Turbogenerator Control and Protection

1.3 Applicable Design Criteria

The following is a list of applicable Design Criteria:

Number	Title
WB-DC-30-4	Separation of Electrical Equipment and wiring
WB-DC-30-5	Power, Control, and Signal Cables for Use in Category I Structures
WB-DC-30-29	Plant Integrated Computer System (ICS)

The AMSAC System shall be designed in accordance with the design classifications as defined in WB-DC-40-64, "Design Basis Events Design Criteria."

2.0 NOMENCLATURE

2.1 ATWS - Anticipated Transient Without Scram - a postulated severe accident sequence which is initiated by an anticipated operational occurrence as defined in Appendix A of 10CFR50 followed by the failure of the reactor protection system as specified in General Design Criteria 20 of 10CFR50 Appendix A.

2.2 AMSAC - ATWS Mitigating System Actuating Circuitry - Equipment which is to function to mitigate the consequences of an ATWS event.

2.3 Class 1E - The safety classification of the electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling and containment and reactor heat removal, or are otherwise essential in preventing a significant release of radioactive material to the environment.

2.4 Design Basis Events - 10CFR50.49 defines design basis events as "conditions of normal operation, including anticipated operational occurance for which the plant must be designed to ensure (i) the integrity of the reactor coolant pressure boundary, (ii) the capability to shut down the reactor and maintain it in a safe shutdown condition, and (iii) the capability to prevent or mitigate the consequence of accidents that could result in potential off-site exposures comparable to the 10 CFR Part 100 guidelines.

2.5 Independence - The state in which there is no mechanism by which any single design basis event, such as a flood, can cause redundant equipment to be inoperable.

2.6 Isolation Device - A device in a circuit which prevents malfunctions in one section of a circuit from causing unacceptable influences in other sections of the circuit or in other circuits.

2.7 Redundant Equipment or System - Equipment or system that duplicates the essential function of another piece of equipment or system to the extent that either may perform the required function regardless of the state of operation or failure of the other.

2.8 Safety-Related - Those structures, systems, and components which are important to safety because they perform either a primary or a secondary safety function.

(A) Primary Safety Function - That function of a structure, system, or component which is necessary to assure: (1) integrity of the reactor coolant pressure boundary, (2) capability to shut down the reactor and maintain it in a safe shutdown condition, or (3) capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposure to a significant fraction of the guideline exposures of 10CFR100 (reference 8.2.3). Also included are supporting and auxiliary systems which must function to provide such assurance.

(B) Secondary Safety Function - That function of a portion of a structure, system, or component which must either: (1) retain limited structural integrity because its failure could jeopardize to an unacceptable extent the achievement of a primary safety function or because it forms an interface between Seismic Category I and non-Seismic Category I plant features or (2) perform a mechanical motion which is not required in the performance of a primary safety function but whose failure to act or unwanted action could jeopardize to an unacceptable extent the achievement of a primary safety function.

2.9 Seismic Category I - Those structures, systems, or components which perform primary safety functions. They are designed and constructed to assure achievement of their primary safety functions at all times including a concurrent Safe Shutdown Earthquake (SSE).

2.10 Seismic Category I(L) - Those portions of structures, systems, or components which perform secondary safety functions to the extent that only limited structural integrity is required. They are designated as Seismic Category I(L) (i.e., limited seismic requirements) and are designed and constructed to assure achievement of their limited structural integrity at all times including a concurrent SSE. The limited structural integrity requirements associated with these plant features are either retention (remain in place) or pressure boundary retention. This may be accomplished without meeting the full extent of the design, construction, QA, and other regulatory requirements normally specified for Seismic Category I structures, systems, or components wherein a primary safety function must be assured. The requirements and provisions should be determined on a case-by-case basis with regard for credible failure modes and circumstances and for the extent of jeopardy to the achievement of primary safety functions.

3.0 DESIGN REQUIREMENTS

3.1 Functional Requirements

3.1.1 Normal Functions

Section 10CFR50.62 of the Code of Federal Regulations, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water Cooled Nuclear Power Plants" (ATWS Final Rule) requires equipment from sensor output to final actuation device that is diverse from the reactor trip system to automatically initiate the auxiliary feedwater system and initiate a turbine trip under conditions indicative of an ATWS.

Since an ATWS type event results in a reactor coolant system pressure increase, it is essential to maintain a heat sink through control of steam generator level and to provide sufficient pressurizer relief capacity. Westinghouse PWRs are the least sensitive of light water reactors to ATWS because large relief capacity is an integral part of its design. Reduction of reactor coolant pressure is essential to allow the high pressure safety injection system to add borated water to bring the reactor into a shutdown condition. Failure to reduce reactor coolant system pressure could result in an unacceptable loss of coolant resulting in uncovering the core and challenging fuel integrity with the possibility of exceeding the release requirements of 10CFR100. The auxiliary feedwater system, through the steam generators, will be used to remove reactor heat and hence reactor coolant system pressure. High pressure safety injection will be used for boration to achieve a controlled shutdown.

To meet the ATWS Final Rule, Watts Bar will add equipment that is diverse from the existing reactor trip system. This additional equipment will consist of a free standing panel which will be installed in the Auxiliary Instrument Room of the Control Building. This modification will be diverse from sensor output to the final actuation device, and automatically initiates auxiliary feedwater and trips the main turbine under conditions indicative of an ATWS. An ATWS event will be detected by this equipment when low-low level in three out of the four steam generators are coincident with the turbine at or above 40 percent load.

If an ATWS event occurs below 40 percent turbine load, operator action is required to trip the main turbine and initiate auxiliary feedwater flow to control the reactor coolant system (RCS) pressure transient and remove reactor heat.

3.1.2 Safety Functions

A. Primary Safety Function

AMSAC has no primary safety function. The AMSAC cabinet will be seismically qualified 1(L). Class 1E interposing relays will be provided outside the AMSAC cabinet for interface to the auxiliary feedwater system.

B. Secondary Safety Function

AMSAC performs secondary safety functions. The primary purpose of AMSAC is to reduce the probability of unacceptable consequences following an ATWS event. This will be accomplished by requiring diversity to the existing RPS. AMSAC shall be of sufficient quality and reliability so that it can perform its intended function without contributing to transients which may challenge safety systems. Implementation of AMSAC shall not degrade the existing RPS.

ATWS events are a concern because of the potential to over pressurize the RCS with resulting core damage and a release of radioactivity to the environment.

3.2 Design Basis Events

For the definition of an ATWS Event, Reference WB-DC-40-64 "Design Basis Events Design Criteria".

The most severe ATWS scenarios have been determined to be those in which there is a complete loss of normal feedwater (Reference 8.1.4.1, WCAP-10858). The design basis events for the AMSAC are Loss of Normal Feedwater/ATWS (LONF/ATWS) and the Loss of Load/ATWS (LOL/ATWS). The scenarios of those two events are described below.

Loss of Normal Feedwater/ATWS (LONF/ATWS)

A complete loss of normal feedwater occurs as a result of a malfunction in the feedwater/condensate system or its control system from such causes as the simultaneous trip of all condensate pumps, the simultaneous trip of all main feedwater pumps or the simultaneous closure of all main feedwater control, pump discharge or block valves. Because if a postulated common mode failure in the RPS, the reactor is incapable of being automatically tripped when any of several plant process variables have reached their reactor trip setpoints.

Loss of Load/ATWS Transient (LOL/ATWS)

The most severe plant conditions that could result from a loss of load occur following a turbine trip from full power when the turbine trip is caused by a loss of main condenser vacuum. Because of a common mode failure in the protection system, the reactor is incapable of being automatically tripped as a result of the turbine trip or as the result of any several other reactor trip signals that occur later in time when several plant process variables reach their reactor trip setpoints.

Upon loss of the main condenser vacuum, the main feedwater turbine-driven pumps, which do not exhaust into the main condenser, are also tripped, thereby cutting off feedwater flow to the steam generators. Since there is a complete loss of normal feedwater during both of these transients (LONF/ATWS and LOL/ATWS), both transients assumed auxiliary feedwater (AFW) flow is started 60 seconds after the initiating event for long term reactor protection. Also the Complete Loss of Normal Feedwater transient assumed a turbine trip 30 seconds after the initiating event to maintain short term RCS pressures below 3200 psig. (The NRC has defined unacceptable pressure as exceeding ASME Service Level C pressure, or 3200 psig, in the preamble to the ATWS Final Rule, 10CFR50.62). Normally these features would be actuated by the Reactor Protection System (RPS).

The principle safety concern from these two transients is the potential for high pressure within the RCS. If a common mode failure in the RPS incapacitates AFW flow initiation and/or turbine trip in addition to prohibiting a scram, then an alternate method of providing AFW flow and a turbine trip is required to maintain the RCS pressure below 3200 psig. The ATWS Final Rule which was approved by the Commissioners on June 26, 1984, requires that Westinghouse designed plants install ATWS Mitigating System Actuation Circuitry (AMSAC) to automatically initiate a turbine trip and actuate AFW flow independent of the RPS (from the sensor output). These two functions, turbine trip and AFW flow actuation, are provided via AMSAC.

3.3 Environmental Requirements

Non-safety related AMSAC system equipment qualification shall be consistent with the non-safety-related equipment qualification licensing basis for the Watts Bar Nuclear Plant during normal operation and anticipated operational occurrences only. Accident environment qualification is not required for non-safety related equipment.

The environmental requirements for AMSAC equipment locations are as follows:

Location	**Requirement**
Main Control Room	**47E235-16**
Auxiliary Instrument Room	**47E235-17**
Turbine Building	**47E235-20**

[PL-08-0752]

3.4 External Events

AMSAC is not required for safe shutdown of the plant during external design basis events such as tornados, floods, rain, and transportation accidents.

3.5 Instrumentation Requirements

3.5.1 Instrumentation Requirements

Equipment diversity to the extent reasonable and practicable to minimize the potential for common cause failures is required from the sensor output to, but not including, the final actuation device. The sensors need not be of a diverse design or manufacture. Existing protection system instrument sensing lines, sensors, and sensor power supplies may be used. Sensor and instrument sensing lines will be selected such that adverse interactions with existing control system are avoided.

1) Steam generator 1 narrow range level
2) Steam generator 2 narrow range level
3) Steam generator 3 narrow range level
4) Steam generator 4 narrow range level
5) Turbine impulse chamber pressure
6) Redundant turbine impulse chamber pressure

A failure tolerant relay logic based system shall compare these inputs with their setpoints and provide the logic and timing function to produce the required AMSAC output signals.

Output signals shall be provided for alarms and annunciators when the AMSAC has been actuated or is removed from service. AMSAC shall provide at least the following outputs to the Plant Computer: (1) AMSAC Tripped; (2) AMSAC Armed.

3.5.2 Permissives and Interlocks

AMSAC shall be designed to be automatically blocked at power levels below 40% as indicated by main turbine first stage pressure. A permissive signal shall be provided to arm the AMSAC system if two out of two turbine impulse chamber pressure setpoints are actuated which indicates that the plant is at or above 40% power. The removal of the permissive shall be delayed so that the AMSAC will stay armed and be capable of performing its function for 360 seconds (60-600 seconds adjustable) after turbine trip or power reduction below 40% power (Reference Westinghouse Owner's Group, WCAP-10858P-A, Rev. 1).

3.5.3 Trip and Actuations

A main turbine trip and startup of all AFW pumps shall occur upon generation of an AMSAC signal. The AMSAC signal shall be generated by low-low water level signals in the steam generators. The AMSAC coincidence logic will be 3 out of 4 (3/4) low-low level signals with one channel per steam generator and the main turbine at or above 40% load. Only one of the three narrow range level channels per steam generator shall be used for input to AMSAC coincidence logic.

3.5.4 Setpoints and Time Delay Requirements

AMSAC actuation is required at a setpoint that is less than the existing RPS steam generator low-low level setpoint. This requirement is intended to ensure the operation of the RPS before AMSAC. The steam generator narrow range level setpoints are defined as a function of main turbine load. Above 40 percent turbine load the setpoint should be 12 percent fixed of the narrow range SG level span.

Two main turbine first stage pressure signals shall be used to provide signals to AMSAC for establishing turbine load. The AMSAC has two time delays. The first is the actuation time delay which must be less than or equal to 30 seconds. This time delay must be reduced by the amount of time it takes to detect an ATWS and initiate turbine trip so as to trip the turbine within 30 seconds of the onset of ATWS. The span of the time delay should be 0-60 seconds. Upon loss of a signal to this time delay, the delay must reset to its initial state.

The second time delay retains the permissive signal, i.e., keeps AMSAC armed. This time retention provides AMSAC protection for turbine trip from full power ATWS event. The time retention is 360 seconds. The span of the time delay is 60-600 seconds (Reference WCAP-10858P-A, Rev. 1).

3.5.4.1 Accuracy Requirements - Based on the setpoint established for AMSAC, the RPS setpoint for low steam generator narrow range level (17% level) shall not be exceeded considering inaccuracy due to all instruments in the AMSAC loop, including the level sensor.

3.5.4.2 Response Time - When input conditions require an actuation signal output, the AMSAC shall respond within 1.0 seconds. This response time includes the logic and output relay actuation. A one time test to verify this 1.0 second response time requirement will be performed when AMSAC is installed.

3.5.5 Bypass Requirements

Maintenance of AMSAC at power shall be accomplished when the test/block, operable switch (Section 3.5.10.1) mounted in the Main Control Room is in the test/block state. The test/block switch is required to preclude the lifting of leads, pulling fuses, tripping breakers, or the physical blocking of relays which may initiate false actuation.

3.5.6 Steam Generator Level/Inputs

The AMSAC system shall use existing narrow range steam generator level transmitter inputs to sense an ATWS event. The TVA instrument loop number and steam generator are as follows:

Steam Generator	TVA Instrument Loop No.
1	LPL-3-174
2	LPL-3-173
3	LPL-3-172
4	LPL-3-175

3.5.6.1 Level Signal Characteristics

All level input signals are 10 to 50 ma from qualified current isolators.

3.5.6.1.1 Correlation of Transmitter to SG Level

% level	0	100
Transmitter ma	10	50

3.5.7 Turbine First Stage Impulse Pressure Inputs

Both turbine pressure signals are from AMSAC dedicated transmitters. The power supply for these transmitters shall be in the AMSAC cabinet.

3.5.8 AMSAC Outputs

The system shall process the given signal inputs and furnish discrete (digital) outputs to trip the main turbine, start auxiliary feedwater pumps and furnish status outputs to the Main Control Room and the Plant Computer. Each output shall functionally represent a set of normally open relay contacts. A separate relay contact output shall be furnished for each train of a trained system.

3.5.8.1 Turbine Trip Outputs

Trip B (250V DC Turbine Trip BUS 'B')

3.5.8.2 Auxiliary Feedwater Pumps

Motor Driven Pump 1A-A
Motor Driven Pump 1B-B
Turbine Driven Pump 1A-S

3.5.8.3 AMSAC Outputs to Control Room Annunciators

1. AMSAC Actuated (Located in the Turbine First Out Panel)
2. AMSAC Not Armed (Located in the Permissive Panel)

Status Indicators

1. AMSAC Blocked < 40% Power (Located on Switch Module) (Section 3.5.10.1)
2. AMSAC Armed > 40% Power (Located on Switch Module) (Section 3.5.10.1)

3.5.8.4 Status Outputs Contact Closure to the Plant Computer

- AMSAC Tripped
- AMSAC Armed

3.5.8.5 Class 1E Isolation Relay Outputs

Separate Class 1E qualified isolation relay outputs are provided for the auxiliary feedwater pump start signals. The isolation relays for each train are mounted in a relay panel separate from the AMSAC cabinet. The relay panel will make provisions to accept the Non-1E AMSAC relay (contact closure) actuation signals and provide for train 1E outputs to start the auxiliary feedwater pumps.

All other AMSAC outputs (turbine trip, control room status indication, annunciators and the Plant Computer) are to be transmitted directly from the non-1E relays mounted in the AMSAC cabinet.

3.5.9 Setpoints

VARIABLE	RANGE OF SETPOINT
Permissive Turbine Load > 40%	10 to 100% of Nominal
Low-Low Steam Generator Water Level Trip Setpoint 12% Steam Generator level	0-100%
Permissive Signal Time Delay Dropout (Turbine Trip ATWS)	60 to 600 Seconds
AMSAC Response (Turbine Trip and Auxiliary Feedwater Signal Initiation)	0 to 60 Seconds

3.5.10 Plant Input Power to AMSAC Logic

The system shall perform the specified functions when supplied, by one (1) instrument grade power source of 120VAC, ± 10%, 60Hz ± 5%. The source circuit breakers are rated at 15 amps.

3.5.10.1 TEST/BLOCK - Operable Switch

A two state pushbutton switch shall be mounted on the Main Control Room 1-M-3 panel to provide the test/block and operable function. [PL-08-0753] The test/block state shall completely disable the logic outputs to the output isolation relays so that any combination of plant inputs during an outage or testing cannot cause AMSAC actuation. The operable state will allow AMSAC logic to actuate the output relays.

To support this function a blocking relay shall be provided between the output logic and the output relays. The circuit shall be designed to energize the relay when the trip logic is made up. The relay shall provide normally open contacts (de-energized state) that will perform the following function:

a. Initiate turbine trip relay actuation signal
b. Initiate AFW start relay actuation signal
c. Initiate "AMSAC ACTUATED" to Annunciator & "AMSAC TRIPPED" to the Plant Computer

3.5.11 Power to Actuate (Fail Safe)

The output relays shall be energized to actuate in order to prevent spurious trips and false status indication on loss of power or logic.

3.5.12 Reset Function

AFW start and Turbine Trip go to completion when actuated by AMSAC and require operator action to reset. AMSAC resets automatically after a time delay of 60-600 seconds for turbine arming and Steam Generator setpoint signal to deenergize. This time delay to deenergize the arming function is intended to cover the ATWS event "Turbine Trip from full power". The AFW can be started when the 3/4 SG logic output is present before the arming signal de-energizes. After this drop-out delay the AMSAC resets since the output logic AND gate requires both SG level and turbine arming input signals for actuation output.

3.5.13 Diversity

Hardware diversity from the existing RPS to the extent reasonable and practicable to minimize the potential for common cause failures is required from sensor output to, but not including, the final actuation device, e.g., existing circuit breakers may be used for the auxiliary feedwater initiation. This diversity includes, but is not limited to, types of technology, (analog vs digital). Should the reactor protection hardware and the ATWS equipment be of the same technology, then diversity is fulfilled by using equipment of differing manufactures. The sensors, however, need not be of a diverse design or manufacturer. Existing protection system instrument sensing lines, sensors, and sensor power supplies may be used. Sensor and instrument sensing lines should be selected such that adverse interactions with existing control systems are avoided.

3.5.14 Separation From RPS

The non-safety related AMSAC equipment needs to be physically separated from the existing protection hardware. This requires that the cable routing be independent of protection system cable routing and the location of the non-safety related AMSAC equipment being in such a place that there is no interaction with the protection set cabinets.

3.5.15 Electrical Independence

Electrical Independence is required at the safety-related sensor output and at the input to the safety-related final actuation device at which point AMSAC input and output signals shall be isolated from the RPS, AFW system, and other safety-related systems with diverse isolation devices. The NRC, through the AMSAC SER, has established the following requirements for AMSAC input and output isolation devices.

A. For the type of device used to accomplish electrical isolation, describe the specific testing performed to demonstrate that the device is acceptable for its own application(s). This description should include elementary diagrams when necessary to indicate the test configuration and how the maximum credible faults were applied to the devices.

B. Data to verify that the maximum credible faults applied during the test were the maximum voltage/current to which the device could be exposed, and define how the maximum voltage/current was determined.

C. Data to verify that the maximum credible fault was applied to the output of the device in the transverse mode (between signal and return) and other faults were considered (i.e., open and short circuits).

D. Define the pass/fail acceptance criteria for each type of device.

E. Provide the commitment that the isolation devices comply with the environmental qualifications (10CFR50.49) and with the seismic qualifications which are the basis for the plant licensing.

F. Provide a description of the measures taken to protect the safety systems from electrical interference (i.e., Electrostatic Coupling, EMI, Common Mode and Crosstalk) that may be generated by the ATWS circuits.

G. Provide information to verify that the Class 1E isolator is powered from a Class 1E source.

3.6 Electrical Requirements

Power Supply - The AMSAC logic power supply must be a battery backed instrument grade supply independent of RPS supplies and capable of performing its function with loss of off-site power.

The power supply for the redundant dedicated turbine pressure transmitters is located in the AMSAC cabinet and receives power from this source. The steam generator level transmitters receive their power from Class 1E power supplies in the Auxiliary Feedwater System.

Appendix R to 10CFR50 will be affected due to cable additions in the Main Control Room, Auxiliary Instrument Room, Turbine Building and Control Building. The impact will be the increase in combustibles resulting from the cable jacket on the added cables.

3.7 Mechanical Requirements

Seismic Qualification - AMSAC logic cabinet is non-safety related but supported to Seismic Category 1(L) so that it does not become a hazard to safety-related equipment in the Auxiliary Instrument Room. The seismic 1(L) qualification may be performed by analysis.

The AMSAC dedicated pressure transmitters are located in the turbine building.

3.8 Regulatory Requirements

The design, installation, and operation of AMSAC shall comply with the following regulations and standards:

1) 10CFR50.62, "Requirements for Reduction of Risk from ATWS Events for Light Water Cooled Nuclear Power Plants."

2) Generic Letter 85-06, "Quality Assurance Requirements for ATWS Equipment that is not Safety-Related".

3) Letter to S. A. White, TVA, from T. J. Kenyon, NRC, dated November 7, 1986, Subject - ATWS Watts Bar Nuclear Plant, Unit 1 & 2, AMSAC Safety Evaluation.

4) Regulatory Guide 1.29, Seismic Design Classification.

5) Appendix R to 10CFR50, Fire Protection Program for Nuclear Power Facilities operating prior to January 1, 1979. (For consequence of additional combustibles in affected fire zones, i.e., cable insulation only.)

6) WOG letter to the NRC, OG-87-10, dated February 26, 1987, providing the basis for the C-20 permissive.

7) Topical Report, WCAP-10858P-A, AMSAC Generic Design Package, by M. R. Adler, dated October 1986.

8) Topical Report, WCAP-10858P-A Rev. 1, AMSAC Generic Design Package, by M. R. Adler, dated July 1987.

A licensing position will be prepared clearly stating compliance with the requirements of the AMSAC SER using the above documents for guidance. Resolution of NRC comments on the AMSAC licensing position is a prerequisite for preparing the FSAR change. Chapters 4, 7, 8 and 10 of the FSAR will be affected. No changes to the Technical Specification are anticipated. [PL-08-0792]

3.9 Logic for Operation

See Section 3.5.2 through 3.5.4 and reference 8.1.1.6b. [PL-08-0762]

3.10 Maintenance

AMSAC equipment shall be designed and constructed for ease of maintenance. The equipment shall be designed such that the removal of any piece of equipment or lifting of any wire which is associated with a finite number of signals or signal loops does not affect any loops or signals other than the associated ones and does not disable the rest of the system. Normal or scheduled maintenance shall not be required in an interval less than 24 months.

4.0 LAYOUT AND ARRANGEMENT

AMSAC will be installed in the Auxiliary Instrument Room, EL 708.0', of the Control Building. AMSAC will interface with the following equipment within the Control Building:

- Process Instrumentation System
- Turbine Generator Electro-Hydraulic Controller
- Main Control Board/Annunciator

5.0 TEST AND INSPECTION COMPONENT TEST FUNCTION MECHANIZATION

5.1 On-Line Test

An AMSAC control panel shall provide local operations and functional status indication. Hand-switches HS-3-172E, -173E, -174E and -175E are being installed which trip the AMSAC logic function for each steam generator low-low level switch. These hand-switches are located in the AMSAC panel, and will allow testing of system logic or maintenance activities to be performed for that level loop. Tripping a level switch with the hand-switch will makeup the associated relay in the three out of four logic.

5.1.1 On-Line Test/Manual

On-line manual testing capability shall be incorporated in the AMSAC system. The Control Room TEST/BLOCK - Operable switch in the TEST/BLOCK state shall prevent inadvertent actuation by inhibiting the output relays.

Relay actuation shall be fully checked during plant shutdown. When a process setpoint has been reached the associated bistable alarm unit has a indicating light which illuminates.

5.1.2 System Calibration and Accuracy

The system shall be designed to be maintainable and hold its accuracy in the time interval between calibrations. All components that require calibration shall specify the requirements and calibration interval. System calibrations which require the system to be out of service shall not be more frequent than once every 24 months.

5.2 System and Factory Acceptance Test Requirements

5.2.1 Electromagnetic Interference (EMI) Test

EMI tests are required in accordance with TVA E18.14.01 for the components procured and installed which perform the AMSAC logic functions. However, the contractor may substitute his standard EMI test in place of test requried by TVA E18.14.01. If this option is exercised, the contractor shall submit his EMI test parameters, procedures and pass/fail criteria to TVA for evaluation with his technical proposal.

5.3 System Testing

AMSAC system testing, i.e., the generation of turbine trip and auxiliary feedwater initiation, shall be performed in modes 5, 6 and no mode (core off loaded) only. It is imperative that the Turbogenerator Controls for the turbine generator be configured to receive a turbine trip signal and the auxiliary feedwater pumps are aligned so that they can receive a start signal. AMSAC system testing requires mandatory coordination to prevent personnel injury or equipment damage.

6.0 QUALITY ASSURANCE

The Watts Bar Nuclear Plant (WBN) will comply with the Quality Assurance guidance for ATWS equipment that is not safety-related as set forth in the generic letter 85-06.

6.1 Watts Bar shall consider the following to be within the scope of that Quality Assurance Guidance:

a. The AMSAC cabinet and hardware, including all internal instrumentation, internal power conditioners, internal wiring, relays, input/output modules and other miscellaneous parts within the AMSAC cabinet.

b. The main control room switch and status light module, all internal wiring and main control panel wiring associated with the test/block operable switch module.

c. The dedicated pressure transmitters and associated tubing.

d. The associated power cables and signal cables, including their conduit systems and their terminations.

6.2 Existing non safety-related interface points, power supplies, annunciators, and other equipment not included in the Appendix B quality assurance program will not be included in the scope of the AMSAC quality assurance guidance.

The non safety-related level indicator loops associated with the auxiliary feedwater level control system where the AMSAC steam generator level signals are acquired are not included in the scope of Appendix B or the Quality Assurance Guidance in Generic Letter 85-06. After initial installation of the AMSAC system any additional modifications to this portion of the level indicator loops shall be done according to the guidance as set forth in the Generic Letter 85-06.

The isolated AMSAC signals to start the auxiliary feedwater pumps will be divisional Class 1E outputs conforming to the QA requirements of 10 CFR 50 Appendix B.

7.0 EXCEPTIONS

None.

8.0 REFERENCES

8.1 Design Input

8.1.1 TVA Drawings

Schematic Diagrams

8.1.1.1	**1-45W600-1-3**	**Main Steam System [PL-08-0755]**
8.1.1.2	**1-45W600-46-6**	**Feedwater Pump and Turbines [PL-08-0756]**
8.1.1.3	**1-45W600-47-2**	**Turbo-Generator Auxiliaries [PL-08-0757]**
8.1.1.4	**1-45W600-57-8**	**Separation and Miscellaneous Auxiliary Relays [PL-08-0758]**
8.1.1.5	**1-45W760-3-1**	**Motor Driven Auxiliary Feedwater Pumps 1A-A and 1B-B [PL-08-0759]**
8.1.1.6a	**1-45W600-3-15**	**Aux Feedwater System [PL-08-0760]**

Electrical Logic Diagrams

8.1.1.6b 1-47W611-3 [PL-08-0762]

Electrical Control Diagrams

8.1.1.7	**1-47W610-1**	**Main Steam System [PL-08-0763]**
8.1.1.8	**1-47W610-3**	**Main and Auxiliary Feedwater [PL-08-0764]**

Flow Diagrams

8.1.1.9	**1-47W803-1**	**Feedwater [PL-08-0765]**
8.1.1.10	**1-47W803-2**	**Auxiliary Feedwater [PL-08-0766]**

Arrangement Drawing

8.1.1.11	**47W200-Series**	**Equipment Auxiliary Building and Turbine Building [PL-08-0767]**

8.1.2 TVA Documents

System Descriptions

8.1.2.1	**N3-3B-4002**	**Auxiliary Feedwater (Unit 1)**
8.1.2.1.a	**WBN2-3B-4002**	**Auxiliary Feedwater (Unit 2)**
8.1.2.2	**N3-47-4002**	**Turbo Generator Control and Protection (Unit 1)**
8.1.2.2.a	**WBN2-47-4002** **[PL-08-0801]**	**Turbo Generator Control and Protection (Unit 2)**

Design Criteria

8.1.2.3	WB-DC-30-4	Separation of Electrical Equipment and Wiring
8.1.2.4	WB-DC-30-5	Power, Control, and Signal Cables for Use in Category I Structures
8.1.2.5	WB-DC-30-29	Plant Integrated Computer System (ICS)
	WB-DC-40-64	Design Basis Events Design Criteria

8.1.2.6 Final Safety Analysis Report

8.1.2.7 Watts Bar Nuclear Plant Final Safety Analysis Report

Quality Assurance

8.1.2.8 TVA Nuclear Quality Assurance Plan (NQAP) (TVA-NQA-PLN89-A-R2)

8.1.2.9 Limited Quality Assurance Program Requirements, Generic Procedure, No. Part I, Section 1.3

8.1.2.10 Watts Bar Engineering project Manual, Project Procedure EAI-3.08, Maintenance of Design Basis Document.

8.1.3 NRC Documents

8.1.3.1 10 CFR 50.62 ATWS Final Rule
8.1.3.2 10 CFR 50 Appendix A General Design Criteria for Nuclear Power Plants
8.1.3.3 10 CFR 50 Appendix B Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
8.1.3.4 10 CFR 50 Appendix R Fire Protection Program
8.1.3.5 Generic Letter 85-06 "Quality Assurance requirements for ATWS Equipment That is Not Safety-related"
8.1.3.6 Regulatory Guide 1.75, "Physical Independence of Electrical Systems." Revision 2, (September 1978)

8.1.3.7 Regulatory Guide 1.38 "Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage and Handling of Items for Water-Cooled Nuclear Power Plants." Revision 2 (May 1977)

8.1.3.8 Letter to S. A. White from T. J. Kenyon dated November 7, 1986, Subject - ATWS Watts Bar Nuclear Plant Units 1 and 2

8.1.4 Westinghouse Documents

8.1.4.1 Topical Report, WCAP-10858, "AMSAC Generic Design Package," dated June 1985

8.1.4.2 Topical Report WCAP-10858P-A, "AMSAC Generic Design Package," dated October 1986

8.1.4.3 Topical Report WCAP-10858P-A, Rev. 1, "AMSAC Generic Package," dated July 1987

8.1.5 WOG Documents

8.1.5.1 Letter to the NRC, OG-87-10, dated February 26, 1987, providing the basis for the C-20 permissive.

8.2 Background

8.2.1 TVA Documents

8.2.1.1 Memorandum from G. Toto to H. B. Bounds, dated December 12, 1986, Subject - AMSAC

8.2.1.2 QIR from M. C. Brickey to P. D. Metcalf, dated May 7, 1987, Subject - AMSAC

8.2.1.3 Scope of Work Document No. WBNDCR607, not dated, Subject - AMSAC

8.2.1.4 E18.01 Electromagnetic Interference (EMI) Testing Required for Electronic Devices (Standard Specifications)

8.2.2 Westinghouse Documents

8.2.2.1 NS-TMA-2182, "Anticipated Transients Without SCRAM for Westinghouse Plants," dated December 1979

8.2.3 NRC Documents

8.2.3.1 10 CFR 100 - Reactor Site Criteria, Section 11, Determination of Exclusion Area, Low Population Zone, and Population Center Distance.

8.3 Design Criteria

8.3.1 Institute of Electrical and Electronic Engineers (IEEE)

8.3.1.1 IEEE-Standard 279-1971 "Criteria for Protection Systems for Nuclear Power Generating Stations (ANSI-N42.7-1972)

8.3.1.2 IEEE-Standard 323-1974 "Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"

8.3.1.3 IEEE-Standard 344-1975 "Standard for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"