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SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards marked-up revision of FSAR Chapter 7.5,addressing Reg Guide 1.97.Revised pages will be included in Amend 23 to FSAR.

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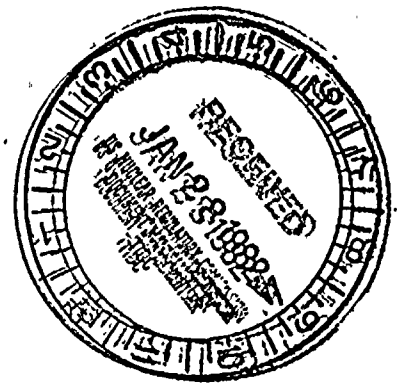

Docket No. 50-397

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
CHAPTER 7.5 REWRITE

Enclosed are sixty (60) copies of the WNP-2 revised FSAR Section 7.5, which addresses Regulatory Guide 1.97 on an item-by-item basis. This issue was identified as ICSB-2 at the branch meeting September 25, 1981 and closes the open SER issue.

These revised FSAR pages will be included in Amendment 23 to the WNP-2 FSAR.

Very truly yours,

G. D. Bouchey, Deputy Director
Safety & Security

CDT/ct
Enclosure

cc: R. Auluck - NRC
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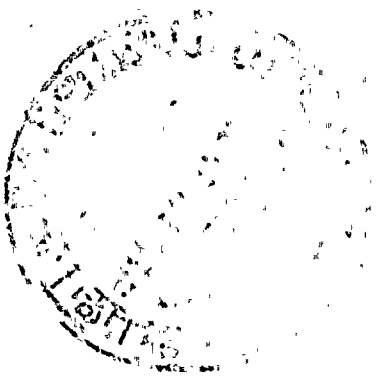

7.5 SAFETY-RELATED DISPLAY INSTRUMENTATION

7.5.1 SUMMARY DESCRIPTION

7.5.1.1 General

Section 7.5 describes the instrumentation which provides information to the operator to enable him to assess the status of safety-related systems, and the need to perform required safety functions.

The safety-related display instrumentation is listed in Table 7.5-1. It tabulates equipment illustrated on the various system P&IDs, IEDs, and FCDs located in 7.2, 7.3, 7.4, and 7.6.

The instrumentation and ranges shown in Table 7.5-1 are selected on the basis of giving the reactor operator the necessary information to perform normal plant operations and yet the capability to track process variables pertinent to safety following design basis accidents.

The following information is provided to the control room operator to monitor reactor conditions and allow assessment of safety system status following a design basis accident.

The power sources to the instrumentation described in this section originate from either the Division 1, Division 2, or Division 3 safety-related emergency AC and/or DC busses unless indicated otherwise.

7.5.1.1.1 Reactor Water Level

There are two ranges of water level instrumentation provided, wide range and fuel range.

Wide range water level is sensed by ~~three~~ two divisionally separated differential pressure transmitters. ~~These are fully compensated to correct for errors caused by primary and secondary containment atmospheric temperature differences.~~ The compensated signals are displayed in the control room on two recorders. ~~and one indicator.~~ Wide range instruments cover the level from +60" to -150".

Fuel range water level overlaps ~~and~~ the wide range to provide water level in the actual core region. Level is sensed by two ~~three~~ divisionally separated, ~~fully compensated~~ differential pressure transmitters. The level is displayed in the control room on two recorders, ~~and one indicator~~. The fuel range covers from -117.5" to -317.5".

The two ranges provide continuous level indication from 60" above the bottom of the dryer skirt to 150" below the top of the active fuel. Both ranges have a common zero reference at 527.5".

7.5.1.1.2 Reactor Pressure

Reactor pressure is sensed by three divisionally separated pressure transmitters. Two of these pressure transmitters are recorded in the control room; the third is used for reactor level compensation only.

7.5.1.2 Reactor Shutdown Indication

The following information is provided to the control room operator to monitor reactor shutdown.

Add

1. Control rod status lamps indicating each rod fully inserted. Power is supplied from highly reliable non-1E (UPS) system.
2. Control rod scram pilot valve position status lamps indicating open valves.
3. Neutron monitoring power range channels and recorders downscale. The power sources are from RPS MG sets.
4. Source range neutron monitoring channels and recorders on scale. When fully withdrawn from the core, the range covered is aproximately 10% to 10^{-3}% power. When fully inserted, the range is 10^{-3}% to - 10^{-7}% power.
5. Annunciators for RPS variables and trip logic in the tripped state. Power is supplied from a 1E power source.
6. The process computer provides logging of trips and control rod position log and provides thermal hydraulic information to the operator which he uses to keep the plant operating within technical specification limits. Power is supplied by a non-1E (UPS) power source.
7. Reactor water sample analysis to determine soluble boron concentration via the post-accident sample station.

7.5.1.3 Primary Containment and Reactor Vessel Isolation Indication

The following information is provided to the control room operator to monitor the integrity of the primary containment.

1. Primary containment isolation valve position indication is displayed by ~~the~~ transient data acquisition system (TDAS) (See 7.7), also and is displayed at valve controls which are 1E. delete. non-1E
2. Main steam line flow indication.
3. Annunciators for the primary containment and reactor vessel isolation system variables and trip logic in the tripped state. Power is supplied by 1E power.
4. Process computer logging of trips. Powered from a non-1E (UPS) power supply.

7.5.1.4 ECCS and RCIC Indication

The following information is provided to the control room operator to monitor ECCS and RCIC system status.

1. Annunciators for HPCS, LPCS, RHR, ADS and RCIC sensor initiation logic trips.

2. Flow and/or pressure indications for each ECCS and RCIC are provided.

3. ECCS and RCIC valve position indication.

4. Process computer logging of trips in the ECCS and RCIC. Power is provided from the UPS, a highly reliable non-1E power supply.
5. ~~Transit~~ Transient data aquisition system display of RCIC and ECCS functions. Power is provided from the UPS, a highly reliable non-1E power supply.
6. Relief valve position indication (accoustic monitors and discharge pipe temperature montiors).

7.5.1.5 Containment Indictations

The following information is provided to the control room operator to monitor primary containment status.

1. Primary Containment Pressure Monitoring

There are two divisions of drywell pressure monitoring instruments. Each division consists of three pressure transmitters. The first has a range of -5 to +3 psig; the second, 0 to 25 psig; and the third, 0 to 180 psig. Each range is either recorded or indicated in the control room.

2. Primary Containment Temperature

Containment temperature is monitored continuously by redundant indicators and recorders in the control room. Points of measurement are as follows:

No. of Points	Description	Range	Type of Readout
4(*)	Air inlet vicinity recirculation pump motors	50-170°F	Recorders
5(*)	Fan coil inlets	50-170°F	Recorders
5(*)	Fan coil outlets	50-170°F	Recorders
3	Sacrificial shield space (lower area)	50-170°F	Indicators
3	Sacrificial shield space (upper area)	50-400°F	Indicators & Computer
3	Control drive area	50-400°F	Indicators
3(*)	Reactor pressure vessel head flange area	50-400°F	Indicators & Recorders

No. of Points	Description	Range	Type of Readout
5(*)	Upper drywell area	50-400°F	Recorders
2	Return duct from head area	50-400°F	Indicators
5	Upper return ring header	50-400°F	Indicators
5	Safety and relief valve area	50-400°F	Indicators
3	Suppression Chamber Atmospheric temperature	50-400°F	Indicators

3. Primary Containment Moisture

Containment moisture level is monitored by five (5) dew point sensors located immediately outside of the primary containment.

A containment air sample is circulated through the sensor units and returned to containment.

Readout is on recorders in the control room with a range of 0-~~150~~100 relative humidity.

4. Primary Containment Radiation

The # atmosphere of the primary containment is monitored for low levels (leak detection) and high-levels (LOCA) of radioactivity and recorded in the control room on two redundant recorders.

The leak detection monitoring system consists of two identical divisionally separated off-line sample racks located with in the reactor building sample rooms. Each sample rack has a two-channel unit containing a particulate, and a noble gas scintillation detectors. The detectors are of high sensitivity to detect the presence or increase of radioactivity in the atmosphere indicating small leaks in the reactor coolant pressure boundary. The ~~ouput~~ output signals from the detectors are sent to panels in the main control room, which contain count ratemeters, recorders and controls.

(*) Those points are summed to provide average drywell temperature on the same display as the suppression pool water temperature; Item 7 below.

An air Sample ~~gas~~ is piped from the containment returned to the local leak detector racks and ~~vent gas is pumped back~~ to atmosphere ~~the~~ containment. The control room operator has complete control of the operation and checking of the monitor system from the main control room.

The LOCA detection coolant system provides a means to detect a rupture of the reactor pressure boundary which ~~could potentially~~ has released large amounts of radioactive material into ~~the~~ primary containment. The leak detection channels, described above, are isolated when a LOCA occurs because they would rapidly be saturated by the high levels of radioactivity.

The LOCA detection system consists of two divisionally separated redundant subsystems. Each subsystem contains ~~three~~ two ionization chamber type detectors, ~~and~~ One ~~low range~~ detectors is located inside the primary containment. The second, ~~a high range detector,~~ set is located in ~~a~~ pipe sleeve ~~which is~~ embedded in the ~~concrete of the~~ primary containment wall. The pipe sleeve ~~is attached to, though~~ & not penetrating, the ~~inner~~ steel ~~lining of the~~ primary containment vessel. ~~The third channel is in the elevated release stack.~~ This arrangement ~~of over~~ provides for overlapping ranges ~~provides~~ the wide range necessary to monitor ~~for~~ of activities a LOCA. The LOCA monitors provide signals to panels in the main control room, which contain count ratemeters and recorders.

does

potentially present from

5. Primary Containment Hydrogen and Oxygen Concentration

Atmosphere samples from three locations inside the primary containment and one location in the suppression chamber are sequentially monitored for hydrogen and oxygen percentage levels by each of two redundant analyzers.

Each gas analyzer cabinet contains a hydrogen and an oxygen analyzer with sample conditioning and sample programming means. The programmer also admits standardizing gases periodically to calibrate the analyzers. Vent gases are pumped back to the primary containment at all times.

The analyzers are single range, i.e., 0-30% hydrogen and 0-10% oxygen. The output signal from each analyzer is sent to two redundant recorders in the main control room. Each analyzer has two adjustable alarm contacts which annunciate abnormal conditions in the main control room.

6. Suppression Chamber Pressure

Suppression chamber pressure is recorded in the control room from two separate pressure transmitter systems. Range of recording is from ~~0-100~~ 0-60 psig.

7. Suppression Pool Temperature Monitoring.

Suppression pool temperature is monitored by 16 thermocouples located approximately 11 inches below the surface of the water, and 8 more located at a depth of approximately 18 feet below the surface. These are evenly divided into two separated divisions. See 7.6.1.7 for more detail.

8. Suppression Pool Water Level Monitoring.

Suppression pool water level is monitored by two redundant sensors. Each sensor consists of one level transmitter which provides a signal to a recorder in the control room. The range of this sensor is ±5" from normal water level in the pool.

7.5.1.6 Monitoring for Radioactive Release to the Environment

1. Building ~~Exhaust~~ Gaseous Effluent Monitors

~~The gaseous activity in the reactor building, the offgas system, the condenser vacuum pump system, and the air removal system is monitored by sampling the elevated release stack. A sample is withdrawn through an isokinetic nozzle and pumped to a detector sample rack. The sample is filtered to remove the particulate matter and then passes by a low range and a high range radiation detector~~ ventilation exhaust effluent from the stack array of then through particulate and charcoal filters and into

Insert attached

Insert to Page 7.5-5:

The effluent gaseous activity in the reactor building ventilation exhaust, the condenser offgas system, the condenser vacuum pump system, and the SGT system is monitored by sampling the elevated release stack. A sample is withdrawn from the stack through an array of isokinetic nozzles then through particulate and charcoal filters and into a low range and an intermediate range set of gas monitors. Each of the effluent stacks or ducts have continuous vent flow rate monitoring system.

~~assembly.~~ Signals from these detectors are sent to a ratemeter, alarm unit, and recorder located in the control room. Similar systems are installed to monitor the radwaste building and the turbine building ventilation.

~~2. Building Exhaust Particulate Monitors~~

~~The particulate radioactivity monitors sample the exhaust from the above buildings. The samples are taken from the exhaust air stream prior to exiting the buildings, and upstream of any exhaust filtration systems. There is one particulate monitor for the elevated release stack, one for the turbine building, and two for the radwaste building. The particulate matter is collected on a filter which is monitored by a radiation detector. The level of activity is displayed on a ratemeter and recorder in the control room. See 11.5.2.2.1.~~

2. Meteorological Conditions

The wind speed, wind direction, and stratified atmospheric temperature information is sensed by the meteorological tower instrumentation, and is recorded in the meteorological building and the control room. Indicated meteorological conditions are used to calculate doses downwind due to a radiation release.

7.5.1.7 Radiation Exposure Rates (Post-Accident) following an accident.

High range area radiation monitors are located inside the reactor building to monitor the exposure rates at ~~critical~~ entry points to that building. These also serve to provide indication of any radioactive releases from the primary containment and provide trend monitoring during accident conditions. Signals from the detectors are recorded in the control room. into the reactor building.

7.5.1.8 Post-Accident Sampling System

~~The post accident sampling system provides a means for~~ obtaining ~~grab~~ samples of highly radioactive liquid samples ~~of~~ primary coolant directly from the reactor or ~~from the~~ RHR loops. Additionally, liquid ~~samples of the~~ suppression pool water and atmospheric ~~samples of the drywell~~, wetwell, and reactor building ~~may~~ also be taken. All samples ~~may~~ either be ~~analyzed in~~ the onsite facilities or transported off site ~~for more detailed analysis.~~

Insert attached

Insert to Page 7.5-6:

The post-accident sampling system provides a means for obtaining grab samples of highly radioactive liquid samples of primary coolant directly from the reactor vessel, the RHR loops, or the suppression pool and atmospheric samples of the drywell, wetwell, and reactor building. All samples may be transported for analysis in the onsite or offsite facilities.

7.5.1.9 Primary System Relief Valve Position Indication

An acoustic monitoring system is used to determine the SRV position. Sensors placed on the SRV piping just downstream of each SRV, monitor percent of valve opening by detecting vibrations produced when steam passes through the valve. This information is sent to the control room to provide an analog and digital (open-closed) valve position display. Thermocouples located downstream from the relief valves provide redundant and diverse valve indication due to temperature. increase in the SRV discharge piping due to steam passage.

7.5.1.10 Power Supply Status Monitoring

Voltage indication for standby power buses of 4160 V AC and 480 V AC ~~and above~~ are provided in the control room. Voltage and amperage indication is also provided for all batteries, battery chargers, inverters, and DC and UPS buses.

7.5.1.11 Primary Water Source Indication

The amount of feedwater flow to the reactor is detected by flow transmitters located on the feedwater lines. The flow rate is recorded in the control room. The reserve of water available in the condensate storage tanks is monitored and transmitted to the control room for operator information.

7.5.1.12 Residual Heat Removal System (RHR)

Two loops of the RHR system may function in several different modes. The flow for each of these modes, except for the reactor vessel head spray, is indicated by a single flow meter for each loop. The flow rate for each mode is determined by observing both indicated flow and valve position. The head spray has its own individual flow meter. All flow information is displayed in the control room.

The third RHR loop functions only in one mode. The flow rate for this mode is also displayed in the control room.

Heat from the RHR loops is removed via heat exhangers. The outlet temperature of the heat exchangers is recorded in the control room. The RHR service water flow is also indicated in the control room.

7.5.1.13 Standby Liquid Control System (SLCS)

The SLCS flow into the reactor is monitored and displayed in the control room. Additionally, the SLCS tank level is displayed in the control room as a backup indication to the flow.

7.5.1.14 Main Steam Line Leakage Control System

Each division of MSLC provides system pressure indication. The inboard system also provides flow indication.

7.5.1.15 High Radioactive Liquid Tank Levels

Each tank used to hold or collect radioactive liquids is equipped with a level indicating system. The level is recorded on local panels in the radwaste building.

7.5.1.16 Emergency Ventilation Damper Position Indication

Damper position indication is provided in the control room for all dampers necessary to prevent release of radioactive gases to the environment or for the protection of operating personnel during accident conditions.

7.5.1.17 Standby Service Water System (SSW)

The water level in the SSW spray ponds is detected by level monitoring instrumentation providing signals to indicators in the control room. Flow rate in each loop is detected by a flow transmitter providing signals to indicators in the control room. The spray pond temperature is indicated in the control room. The spray pond provides the source of cooling water to ESF components.

7.5.1.18 Spent Fuel Pool Cooling System (FPC)

The temperature of the spent fuel pool is monitored for each FPC division and indicated in the control room.

7.5.1.19 Main Control Room HVAC

Redundant temperature indications are provided in the control room to monitor control room temperature.

7.5.1.20 Standby Gas Treatment System (SGTS)

Each division of the SGTS is provided with loop flow indication in the control room.

7.5.1.21 Containment Instrument Air (CIA)

Each division of the CIA provides system line pressure indication in the control room.

Insert attached

7.5.2 ANALYSIS AND DESIGN BASIS

7.5.2.1 Design Basis

The safety-related display instrumentation is designed to provide the operator with all necessary information to assess the status of transients or accidents from their onset to a safe cold shutdown condition, to assess the status of safety related systems used to mitigate the event, and to allow timely operator actions as necessary.

Chapter 15, "Accident Analysis," identifies and evaluates events that jeopardize the fuel barrier and reactor coolant pressure boundary. The methods of assessing barrier damage and radioactive material releases, along with the methods by which abnormal events are identified, are presented in that chapter.

Variables monitored are listed in Table 7.5-1. These variables have been selected using the methodology established in Regulatory Guide 1.97, Revision 2, NUREG-0737, and the Emergency Procedure Guidelines (EPG).

The safety-related display instrumentation are categorized into types in accordance with R.G. 1.97 and according to their primary function during a transient or accident condition. These types are as follows:

1. Type A Variables

Those variables to be monitored that provide the primary information required to permit the control room operator to

Insert to Page 7.5-9:

7.5.1.22 Containment Atmosphere Control System (CAC)

Each division of the CAC is provided with loop flow indication in the control room. There are two loops per division.

take specific manually controlled actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for design basis accident events. Primary information is information that is essential for the direct accomplishment of the specified safety functions; it does not include those variables that are associated with contingency actions that may also be identified in written procedures. A variable included as Type A does not preclude it from being included as Type B, C, D, or E or vice versa.

2. Type B Variables

Those variables that provide information to indicate whether plant safety functions are being accomplished. Plant safety functions are (1) reactivity control, (2) core cooling, (3) maintaining reactor coolant system integrity, and (4) maintaining containment integrity (including radioactive effluent control).

3. Type C Variables

Those variables that provide information to indicate the potential for being breached or the actual breach of the barriers to fission product releases. The barriers are (1) fuel cladding, (2) primary coolant pressure boundary, and (3) containment.

4. Type D Variables

Those variables that provide information to indicate the operation of individual safety systems and other systems important to safety. These variables are to help the operator make appropriate decisions in using the individual systems important to safety in mitigating the consequences of an accident. These variables are grouped into the subgroups: (1) Condensate and Feedwater System, (2) Primary Containment Related systems, (3) Safety systems, (4) Residual Heat Removal systems, (5) Cooling Water System, (6) Radwaste Systems, (7) Ventilation Systems, (8) Power Supplies, and (9) Main Steam System.

5. Type E Variables

Those variables to be monitored as required for use in determining the magnitude of the release of radioactive materials and continually assessing such releases. Variables monitored are: (1) Containment Radiation, (2) Area Radiation, (3) Airborne Radioactive Materials Released from the Plant, (4) Meterology and (5) Post Accident Sampling.

Accident Conditions

Information readouts are designed to accommodate all credible accidents for operator actions, information, and event tracking requirements, and cover all other design basis events or incident requirements.

Post-accident monitoring instrumentation provides the operator with plant status information during and following an accident. The information is needed to follow the progress of an accident, assist the operator to safely shut down the reactor, assess the extent and type of damage, if any, and to monitor critical parameters for extended periods of time if extensive damage has occured.

7.5.2.2.1 Conformance To 10 CFR 50 Appendix A - General Design Criteria

The following is a discussion of conformance to those general design criteria which apply specifically to the safety-related display instrumentation. Refer to 7.1.2.2 for a discussion of General Design Criteria which apply equally to all safety-related systems.

a. General Design Criterion 13, "Instrumentation and Control"

   Instrumentation is provided to monitor variables and systems over their anticipated ranges for accident conditions as appropriate to ensure adequate safety.

b. General Design Criterion 19, "Control Room"

   The safety-related instrumentation meets the requirements that a control room be provided from which actions can be taken to maintain the nuclear power unit in a safe condition under accident conditions, including loss-of-coolant accidents, and that equipment, including the necessary instrumentation, at appropriate locations outside the control room be provided with a design capability for prompt hot shutdown of the reactor.

c. General Design Criterion 64, "Monitoring Radioactivity Releases"

   The safety-related instrumentation includes the capability of monitoring the reactor containment

atmosphere, spaces containing components for recirculation of loss-of-coolant accident fluid, effluent discharge paths, and the plant environs for radioactivity that may be released from postulated accidents.

7.5.2.2.2 Conformance To IEEE Standards

The following is a discussion of conformance to those IEEE Standards which apply specifically to the safety-related display instrumentation. Refer to 7.1.2.3 for a discussion of IEEE Standards which apply equally to all safety-related systems.

a. IEEE Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations".

The safety-related display instrumentation is part of the protection systems and provides information to the reactor operator during and after accident conditions, allowing assessment of reactor status, safety system status, and allowing the operator to control safety systems when necessary.

1. General Functional Requirements (IEEE 279-1971, Paragraph 4.1)

The safety-related display instrumentation, in addition to providing the reactor operator the necessary information to perform normal plant operations, also provides information that allows assessment of plant and safety system status during and after transient and design basis accidents.

2. Single Failure Criteria (IEEE 279-1971, Paragraph 4.2)

The safety-related display instrumentation that is reguired by Regulatory Guide 1.97, Revision 2, to be redundant is designed to meet the single failure criteria.

3. Quality of Components and Modules (IEEE 279-1971, Paragraph 4.3)

For a discussion of the quality of components and modules refer to 3.2, 3.10 and 3.11.

4. Equipment Qualification (IEEE 279-1971, Paragraph 4.4)

   For a discussion of equipment qualification refer to ~~7.5.2.2.b~~ 7.5.2.2.2.6 (IEEE 323-1974), 3.10, 3.11, and Regulatory Guide 1.100 for conformance ~1.89 and

5. Channel Integrity (IEEE 279-1971, Paragraph 4.5)

   The safety-related display instrumentation is designed to provide information to the reactor operator under extreme conditions. Refer to 3.10, 3.11, 8.2.1, and 8.3.1.

6. Channel Independence (IEEE 279-1971, Paragraph 4.6)

   Safety-related display instrumentation independence is maintained through the application of separation criteria as described in 8.3.1.4.

7. Control and Protection System Interaction (IEEE 279-1971, Paragraph 4.7)

   There is no interaction between control systems and that safety-related display instrumentation which is part of this protection system.

8. Derivation of System Inputs (IEEE 279-1971, Paragraph 4.8)

   The safety-related display instrumentation, where feasible and practical, are direct measures of the desired variable.

9. Capability for Sensor Checks (IEEE 279-1971, Paragraphh 4.9)

   The safety-related display instrumentation input sensors can be either perturbed, inputs substituted, or cross checked for proper operability. Refer to Regulatory Guide 1.22 compliance in each of the sections in Chapter 7 for a discussion of sensor check capability.

10. Capability for Test and Calibration

Refer to the compliance discussion of Regulatory Guide 1.22 in each section of Chapter 7.

11. Channel Bypass or Removal from Operation (IEEE 279-1971, Paragraph 4.11)

Removal from service, of sensors which provide inputs to the safety-related display instrumentation are in most cases governed by the individual systems section of Chapter 7 and are discussed in their respective discussions of compliance to IEEE 279.

12. Operating Bypasses (IEEE 279-1971, Paragraph 4.12)

This paragraph does not apply as the safety-related display instrumentation does not incorporate operating bypasses.

13. Indication of Bypasses (IEEE 279-1971, Paragraph 4.13)

This paragraph does not apply as the safety-related display instrumentation does not incorporate bypasses.

14. Access to Means for Bypassing (IEEE 279-1971, Paragraph 4.14)

Access to instrument valves are administratively controlled. Access to other means of bypassing are located in the control room and are also under administrative control.

15. Multiple Setpoints (IEEE 279-1971, Paragraph 4.15)

This paragraph does not apply as the safety-related display instrumentation does not incorporate multiple setpoints.

16. Completion of Protective Action Once it is Initiated (IEEE 279-1971, Paragraph 4.16)

This paragraph does not apply as the safety-related display instrumentation does not provide protective action.

17. Manual Initiation (IEEE 279-1971, Paragraph 4.17)

This paragraph does not apply as the safety-related display instrumentation does not provide manual initiation.

18. Access to Setpoint Adjustments, Calibration, and Test Points (IEEE 279-1971, Paragraph 4.18)

Access to calibration adjustments are under administrative control.

19. Identification of Protective Actions (IEEE 279-1971, Paragraph 4.19)

The safty-related display Instrumentation is not specifically designed to identify protective actions but provides the reactor operator the necessary information to identify plant and safety system status.

20. Information Read-Out (IEEE 279-1971, Paragraph 4.20)

The safety-related display instrumentation is designed to provide the operator with accurate, complete, and timely information to determine plant status, and avoids anomalous indications which could confuse the reactor operator.

21. System Repair (IEEE 279-1971, Paragraph 4.21)

The operator can identify and repair most failed sensors, recorders, or indications during plant operation. However, there are sensors such as neutron monitoring (LPRM & IRM) which cannot be replaced or repaired during plant operation and must be repaired or replaced during plant shutdown.

22. Identification (IEEE 279-1971, Paragraph 4.22)

The safety-related display instrumentation will be specifically identified on the control panels so that the operator can easily discern that they are intended for use under accident conditions.

b. IEEE Standard 323-1974, "Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations".

Safety-related display instrumentation as specified by Regulatory Guide 1.97, Revision 2 are purchased as follows:

1. Equipment purchased through May 23, 1980 is evaluated and considered environmentally qualified if it satisfies IEEE Standard 323-1971 and NUREG-0588 Category II positions as a minimum.

2. Equipment purchased after May 23, 1980 is evaluated and accepted to IEEE Standard 323-1974 and NUREG-0588 Category I positions, where possible. If such equipment is not available and cannot be made available, equipment is evaluated and considered environmentally qualified if it satisfied IEEE Standard 323-1971 and NUREG-0588, Category II positions as a minimum.

7.5.2.2.3 NRC Regulatory Guide Conformance

a. Regulatory Guide 1.32, "Criteria for Safety-Related Power Systems for Nuclear Power Plants".

Safety-related display instrumentation as required by Regulatory Guide 1.97, Revision 2, are powered from vital buses and, if necessary, with battery backup where momentary interruption is intolerable.

b. Regulatory Guide 1.75, Revision 1, "Physical Independence of Electrical Systems".

Redundant or diverse channels are provided where necessary as specified by Regulatory Guide 1.97, Revision 2. These channels are electrically independent and physically separated from each other ~~, and from non-safety related equipment.~~ as discussed in 8.3.

c. Regulatory Guide 1.89, "Environmental Qualification of Electric Equipment for Nuclear Power Plants".

Safety-related display instrumentation is qualified to Regulatory Guide 1.89 as specified by Regulatory Guide 1.97, Revision 2.

ed. Regulatory Guide 1.97, Revision 2, "Instrumentation for Light Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident"

display instrumentation

~~Safety-related display instrumentation meets the intent of Regulatory Guide 1.97.~~ An item by item general discussion of ~~these displays~~ and the degree of conformance to guide requirements is provided below. All references to Regulatory Guide 1.97 are to the most recent revision of the guide (i.e., Revision 2). See Table 7.5-1 for instrument ranges, Regulatory Guide 1.97 category, accuracy, and other specific information

and 7.5.1.1

the

de. Regulatory Guide 1.100, "Seismic Qualification of Electric Equipment for Nuclear Power Plants"

~~Safety-related display instrumentation as specified by Regulatory Guide 1.97,~~ Revision 2 are purchased to the requirements of Regulatory Guide 1.100 which states that instrumentation should continue to read within the required accuracy following, but not necessarily during, a safe shutdown earthquake.

Stet

1. Neutron Flux (Table 7.5-1 Item 3)

Regulatory Guide 1.97 requires neutron flux be monitored from 10^{-6}% to 100% power by Category 1 instrumentation.

The existing source range and intermediate range detectors are powered from Class 1E power; the average power range instruments are powered from the reactor protection bus which is a

indent as part of e

highly reliable source backed up by a diesel generator. There are 43 strings of local power range detectors, 8 intermediate range detectors and 4 source range detectors. These are divided into two redundant divisions. The source and intermediate range detectors are inserted or retracted from the core by non-Class 2 drive units; however, the drive units will be supplied from reliable power supplies and failure of all drive units simultaneously is extremely remote even under accident conditions. The drive units are only required to drive the detector into the core, any failure after insertion is inconsequential. If all drive units did fail and the source range monitors could not be inserted, the range of indicated power would still be sufficient to insure that the reactor was sub-critical since the source range instruments monitor a range of 10^{-3}% to 10% power even in the fully withdrawn position. Indication is provided by recorders in the control room.

2. Coolant level in the Reactor (Table 7.5-1 Item 2)

Regulatory Guide 1.97 requires that reactor level be monitored from below the core support plate to the centerline of the main steam lines by Category 1 instruments.

~~In order to prevent the possibility of information ambiguity caused by loss of one vessel level channel, a third division of instrumentation is provided. This provides three divi~~sionally separated ranges of level instrumentation to cover the full range of reactor water level. ~~Each division is provided with three level indicators. One division of instrumentation will cover a range from the centerline of the main steam line or above (+120") to a level of 0". The second division of instrument detects level from +60" to -150" and the third instrument from -117" to -317". All level instruments are fully compensated to reduce level errors.~~

There are two as discussed in 7.5.1.1.

3. RCS Soluble Boron Concentration

Regulatory Guide 1.97 requires measurement of the soluble boron concentration in the circulating primary coolant.

Grab samples of the circulating primary coolant will be analyzed at either the onsite or offsite facilities for determination of soluble boron concentration. These facilities will have capability to analyze 0-1000 ppm of soluble boron concentration in RCS.

4. BWR Core Thermocouples

Regulatory Guide 1.97 requires the installation of incore thermocouples.

Insert attached

The incore thermocouples have a high degree of error and could, under some accident conditions, provide misleading information to the operator. The additionn of the third channel of level instrumentation and the compensation of all level channels eliminates the need for incore thermocouples as stated in paragraph 1.3.1.b of Regulatory Guide 1.97. The incore thermocouples will not be installed on WNP-2.

5. Primary System Pressure (Table 7.5-1 Item 1)

Regulatory Guide 1.97 requires that primary system pressure be monitored from 15 to 1500 psig by Category 1 instruments.

1 psia

Redundant Class 1E pressure indicators with a range of 0 to 1500 psig are provided.

6. Control Rod Position Indication

Regulatory Guide 1.97 requires that Category 3 indication be provided to indicate when a rod is in or not in.

A rod position display of full-in and full-out position provides this information.

7. Drywell Pressure (Table 7.5-1 Item 43)

Regulatory 1.97 requires Category 1 redundant instruments covering a range from 10 psia to 3 times design pressure.

Redundant channels are provided, each having 3 indicators, one indicator for range -5 to +3 psig, a second range of 0 to 25 psig, and the third to monitor 0 to 180 psig.

8. Drywell Sump Level

Regulatory Guide requires that the drywell sump level be measured by Category 1 instruments.

The drywell equipment and floor drain sumps drain by gravity to their respective sumps in the reactor building. On a LOCA, the containment isolation values for drywell sumps close, isolating these sumps. Any major drywell flooding at this time will overflow these sumps and spill into the suppression pool via the downcomers.

9. Primary Containment Valve Position Indication

Regulatory Guide 1.97 requires Category 1, closed-not closed indication on all primary containment isolation valves.

Insert to Page 7.5-20:

WNP-2 concurs with LRG and BWR Owners' Group that core thermocouples do not provide adequate indication of approach to or existence of inadequate core cooling. WNP-2 is participating in BWR utility efforts to resolve this issue generically with NRC. (Reference: Appendix B, WNP-2 Response to Regulatory Issues From TMI-2, Item II.F.2)

Valve position for each containment isolation valve is provided at the valve controls.

Redundancy requirements are met by the two valve criteria required for ~~CTMT~~ containment isolation.

10. Radioactivity Concentration or Radiation Level in Circulating Primary Coolant

Regulatory Guide 1.97 requires that Category 1 redundant detection systems be installed to measure this parameter. The range is 1/2 tech spec limit to 100 times tech spec limit in R per hour.

Insert A

There is presently no instrument available which will accomplish this task. The off-gas system main steam radiation monitors and post-accident sample systems monitor this parameter and give early warning of fuel failure.

11. Analysis of Primary Coolant

Regulatory Guide 1.97 requires provisions be made to analyze the primary coolant to determine extent of core damage. This is a Category 3 system.

A system ~~allowing~~ providing for grab samples of the primary coolant, suppression pool water, drywell atmosphere, wetwell atmosphere, and reactor building atmosphere is provided. ~~These grab~~ Small samples will be analyzed in onsite facilities ~~or~~ shipped to offsite facilities for more detailed analysis. Grab samples of the reactor building equipment and floor drain sumps may also be taken with the same equipment or offsite Large samples may be

12. Primary Containment Area Radiation (Table 7.5-1 Item 11)

Regulatory Guide 1.97 requires that the radiation levels in the primary containment be monitored by redundant Category 1 instruments.

Insert B

Existing monitors have a range of 0.01 R/hr to 10^4R/hr. Since this detector is located outside CTMT and views the background through the CTMT skin, the detector can be adjusted so that a reading of 10^4R/hr is equivalent to 10^7R/hr inside CTMT. Two additional monitors are located inside CTMT with a range of 0.01 R/hr to 10^4R/hr. These monitors will be pegged high if the background inside CTMT is $>10^4$R/hr; however, better coverage is achieved in the lower range after the background decays to $<10^4$R/hr. The high range radiation monitors display on recorders located in the control room

Insert A to Page 7.5-21:

There is presently no instrument available which will accomplish this task. Prior to isolation of main steamlines, the condenser off-gas system and the main steamline radiation monitors will give immediate warning of fuel failure. The post-accident sampler provides monitoring and a measure of primary coolant activity after an accident. For details about off-gas system and main steamline radiation monitors, see 11.5.

Insert B to Page 7.5-21:

Existing monitors have a range of 0.01 R/hr to 10^4 R/hr. Since this detector is located outside containment and views the radioactive gases through the containment shell, the detector will be adjusted so that a reading of 10^4 R/hr is equivalent to 10^7 R/hr inside containment. Two additional detectors are located inside containment that have a range 10^0 R/hr to 10^8 R/hr. These monitors respond to gamma radiation of 60 KeV as required by Regulatory Guide 1.97 to see the Xe-133 gases. These radiation monitors display on recorders located in the control room.

13. Suppression Pool Water Level (Table 7.5-1 Item 17)

Regulatory Guide 1.97 requires suppression pool level indication on redundant Category 1 instruments. The range is from below the ECCS suction to 5 feet above normal level.

Insert A

Two bubbler type level systems are provided to transmit signals to redundant recorders in the control room.

14. Drywell Hydrogen and Oxygen Concentrations (Table 7.5-1 Items 13 & 14)

Regulatory Guide 1.97 states that it is advisable to monitor the containment hydrogen and oxygen concentrations with Category 1 equipment. Ranges should be 0-30% for hydrogen and 0-10% for oxygen.

H_2/O_2 analyzers are provided and are capable of operating from 12 psig to 45 psig. The H_2/O_2 levels are recorded in the control room.

15. Noble Gas Effluent Radioactivity Monitors (Table 7.5-1 Item 18)

Insert B

Regulatory Guide 1.97, in an effort to monitor radioactive noble gases vented to the atmosphere, requires off-line sampling systems on all building exhausts where releases may occur. These sampling systems would be category 2 with ranges from 10^{-6} μCi/cc to as high as 10^{5} μCi/cc for some release points.

Off-line sampling systems with low range and high range detectors are provided. These systems are provided for the turbine building exhaust and the radwaste building exhaust with a range of 10^{-6} to 10^{4} Ci/cc. The reactor building exhaust is monitored by a system which monitors a range of 10^{-6} to 10^{5} uCi/cc. All of these instruments are recorded in the control room.

16. Radiation Exposure Rate (Table 7.5-1 Item 22)

Insert C

Regulatory Guide 1.97 recommends that area radiation detectors be provided to indicate major releases from the primary containment. These detectors would have a range of 10^{-1} to 10^{4} R/hr and be category 2 instruments.

Insert A to Page 7.5-22:

A narrow range instrumentation is provided as discussed in 7.5.1.5 (item 8). To our knowledge, a wide range instrumentation satisfying all Category I requirements of Regulatory Guide 1.97 is not commercially available. However, various design options are being investigated to satisfy Regulatory Guide 1.97 requirements. Simultaneously, WNP-2 is participating in BWR Owners' Group subcommittee addressing Regulatory Guide 1.97 requirements, to resolve this issue generically with NRC.

Insert B to Page 7.5-22

Regulatory Guide 1.97, in an effort to monitor radioactive noble gases vented to the atmosphere, requires off-line sampling systems and radioactive gas monitoring systems on all building exhausts where releases may occur. These monitoring systems would be Category 2 with ranges from 10^{-6} μCi/cc to a high of between 10^3 and 10^5 μCi/cc depending on the release points.

Off-line monitoring systems with low range and intermediate range detectors are provided. These systems are provided for the turbine building exhaust and the radwaste building exhaust with a range of 10^{-6} to 10^3 μCi/cc. The elevated release duct which can receive primary containment purge has an in-line monitor consisting of redundant ion chambers set into the duct to cover the high range up to 10^5 μCi/cc. All of these instruments are recorded in the control room. The flow rates are continuously monitored on each building's exhaust.

Insert C to Page 7.5-22:

Regulatory Guide 1.97, under Type C, recommends that area radiation detectors be provided to indicate major releases from the primary containment.

There are three detectors which have a range of 10^{-2} to 10^4 R/hr and are located at specified reactor building entry points and inside the building to provide the required coverage.

~~To provide~~ These monitors provide coverage for these ~~in all~~ areas, ~~as~~ described by Regulatory Guide 1.97, ~~would require detectors being located on virtually each elevation and in each quadrant. Other systems are provided which adequately monitor for breach such as radioactivity effluent monitors described in Item 14 above and Item 37 following~~. Additionally, grab samples of the ~~primary containment~~ reactor building atmosphere may be obtained from the post-accident sample system (Item 10). ~~Moreover, high range area monitors are~~ These provided for personnel access and long term surveillance. ~~These high range area monitors~~ They have a range of 10^{-1} to 10^4 R/hr, ~~and~~ are Category 2 instruments. ~~They~~ are recorded in the control room. (See item 38 below)

Coverage

They and

17. Main Feedwater Flow Rate (Table 7.5-1 Item 25)

Regulatory Guide 1.97 requires a Category 3 indicator to display the feedwater flow rate. Feedwater flow indication is provided in the control room.

18. Condensate Storage Tank Level (Table 7.5-1 Item 26)

Regulatory Guide 1.97 requires that the condensate storage tank levels be indicated on Category 3 instruments.

Instrumentation is provided for this parameter with display in the control room.

19. Suppression Chamber (Table 7.5-1 Item 15)

Regulatory Guide 1.97 requires that a Category 2 flow instrument be provided to indicate suppression pool spray flow. Suppression pool pressure is the key variable and pressure will indicate whether or not spray flow has been established. Knowing the actual amount of spray flow in GPM is of no value, valve position, RHR pump running indication, and suppression chamber pressure will indicate the presence or absence of spray flow.

20. Suppression Pool Water Temperature (Table 7.5-1 Item 16)

Regulatory Guide 1.97 requires temperature indication of the suppression pool water. This indication would be Category 2 and have a range of 30°F to 230°F. See 7.6.1.7 for the WNP-2 design.

21. Drywell Atmosphere Temperature (Table 7.5-1 Item 10)

Regulatory Guide 1.97 requires that the drywell atmosphere temperature be monitored with a range of 40-440°F on Category 2 instruments.

Twenty-two thermocouples are spaced inside the primary containment to obtain a temperature profile. These are divided into redundant sets and divisionally separated. Individual and bulk temperature is displayed in the control room.

22. Drywell Spray Flow (Table 7.5-1 Item 27)

Regulatory Guide 1.97 requires a drywell spray flow instrument capable of monitoring flow from 0-110% of flow. This instrument should be Category 2.

Drywell spray flow is provided by RHR pump flow indication. Valve position indication and drywell pressure will indicate proper flow path. RHR flow is indicated in the control room.

23. Main Steamline Isolation Valves Leakage Control System Pressure (Table 7.5-1 Items 38, 39, 40)

Regulatory Guide 1.97 requires a system to measure the M.S. isolation leakage pressure. A differential range of 0 to 15 psid is recommended; using Category 2 instruments.

Two range pressure monitoring with ranges of 0-8 psig and 0-50 psig for the inboard system and ranges of 0-2 psig and 0-50 psig for the outboard system is provided. These pressures are indicated in the control room.

24. Primary System Safety/Relief Valve Position (Table 7.5-1 Item 23)

Regulatory Guide 1.97 requires monitoring SRV position, closed or not closed, with Category 2 instruments.

SRV position is monitored by an acoustic monitoring system. Vibrations induced by flow through the valve is related to percent of valve opening. Analog and digital (full-open, full-closed) valve position displays are provided in the control room. In addition, thermocouples monitor the tailpipe of each SRV line to indicate when the valve is open or leaking.

25. RCIC Flow Rate (Table 7.5-1 Item 5)

Regulatory Guide 1.97 requires that RCIC flow be monitored from 0 to 110% of design flow with Category 2 instruments.

RCIC pump discharge flow monitoring is provided. This, in conjunction with RCIC pump suction and discharge pressures and verification of RCIC system valve lineup, provides indication of system operability. Flow indication and valve position are displayed in the control room.

26. HPCS Flow Rate (Table 7.5-1 Item 7)

Regulatory Guide 1.97 requires that HPCS flow be monitored from 0 to 110% of design flow with Category 2 instruments.

HPCS pump discharge flow monitoring is provided. This, in conjunction with the HPCS pump suction and discharge pressures and verification of HPCS system valve lineup, provides indication of system operability. Flow indication and valve position are displayed in the control room.

27. LPCI Flow Rate (Table 7.5-1 Item 27)

Regulatory Guide 1.97 requires that LPCI flow be monitored from 0 to 110% of design flow with Category 2 instruments.

~~WNP-2 position: Full compliance.~~

RHR (LPCI) pump discharge flow monitoring is provided. This in conjunction with RHR (LPCI) pump suction and discharge pressures and verification of RHR system valve lineup provides indication of system operability. Flow indication and valve position are displayed in the control room.

28. LPCS Flow Rate (Table 7.5-1 Item 9)

Regulatory Guide 1.97 requires that LPCS flow be monitored from 0 to 110% of design flow with Category 2 instruments.

LPCS pump discharge flow monitoring is provided. This, in conjunction with the LPCS pump suction and discharge pressures and verification of LPCS system valve lineup, provides indication of system operability. Flow indication and valve position are displayed in the control room.

29. Standby Liquid Control System Flow (Table 7.5-1 Item 29)

Regulatory Guide 1.97 requires that the flow rate in the SLCS be monitored by Category 2 instruments.

SLCS flow monitoring is provided. Display is provided in the control room.

30. Standby Liquid Control System Tank Level (Table 7.5-1 Item 30)

Regulatory Guide 1.97 requires SLCS tank level indication be monitored by Category 2 instruments.

SLCS tank level instruments are provided. Level indication is provided in the control room.

31. RHR System Flow Rate (Table 7.5-1 Item 27)

Regulatory Guide 1.97 requires that RHR system flow be monitored from 0 to 110% of design flow with Category 2 instruments.

RHR pump discharge flow monitoring is provided. This, in conjunction with RHR pump suction and discharge pressures and verification of RHR system valve lineup, provides indication of system operability. Flow indication and valve position are displayed in the control room.

32. RHR Heat Exchanger Outlet Temperature (Table 7.5-1 Item 28)

Regulatory Guide 1.97 requires that the RHR heat exchanger outlet temperature be monitored by Category 2 instruments with a range of 32°F to 350°F.

Existing instrumentation is not Class 1E but is adequate for monitoring this parameter. Indication is provided in the control room since other Class 1E indication of system performance such as RHR flow and ~~SWV~~ Standby Service Water flow are provided. to heat exchanger

33. Cooling Water Temperature to ESF System Components

Regulatory Guide 1.97 requires Category 2 instruments with a range of 32°F to 200°F.

Present instruments measure water temperature of the spray pond. This is the source of water for the ESF systems. The range of these instruments ~~is~~ is 0°F to 150°F.

Further temperature indication is provided on the outlet of each individual heat exchanger in the ESF systems. There is sufficient indication available to verify proper operation of the system.

34. Cooling Water Flow to ESF System Components (Table 7.5-1 Item 32)

Regulatory Guide 1.97 requires Category 2 flow instruments to monitor flow in the ESF cooling system.

The SSW return lines to the spray ponds are monitored by flow transmitters providing signals to indication in the control room.

35. High Radioactivity Liquid Tank Level (Table 7.5-1 Item 41)

Regulatory Guide 1.97 requires that all tanks containing radioactive liquids be provided with tank level indication (Category 3 instruments).

All tanks designed to handle radioactive liquids are equipped with remote reading tank level instruments. The indicators are located in the radwaste building which is accessible following a DBA.

36. Emergency Ventilation Damper Position

Regulatory Guide 1.97 requires Category 2 indication for the open-closed position of emergency ventilation dampers.

The position status on all emergency ventilation dampers is displayed in the control room.

37. Status of Standby Power and Other Energy Sources Important to Safety

Regulatory Guide 1.97 requires that status information be provided for all standby power and other energy sources such as pneumatic or hydraulic power.

Voltage indication for ~~all~~ standby electrical buses of 4.16 kV ~~and above~~ is displayed in the control room. Additionally, all vital 480 volt bus voltage readout is provided along with all battery, battery charger, and inverter voltage and amperage. The pneumatic pressure for the containment instrument air is also displayed in the control room.

38. Reactor Building or Secondary Containment Area Radiation (Table 7.5-1 Item 22)

Regulatory Guide 1.97 under Type E requires that area radiation monitors be placed inside buildings or areas where access is required to service equipment important to safety and in the reactor building. This is to monitor for significant releases, for release assessment, and for long-term surveillance.

Three high range area monitors with a range of 10^{-2} R/hr to 10^{4} R/hr are located in the reactor building. They are located to monitor specific entry points to the building. (To El. 471' via door R202, El. 501' via door R305, and El. 606' via door R702.), Portable equipment will be used whenever personnel enter a radiation area as required by entry procedures. These are the same monitors used in item 16 above.

39. Airborne Particulate and Halogen Materials Released from Plant ~~(Table 7.5-1 Item 19)~~

Regulatory Guide the 1.97 requires that particulates and halogens be sampled at ~~all~~ identified plant release points. Onsite analysis capabilities are required. This sampling equipment should be Category 3 equipment.

Particulate and halogen sampling systems are provided ~~in~~ for the reactor building, turbine building, and radwaste building effluents. ~~A detector monitors the particulate filter and is indicated and recorded in the control room.~~ The ~~halogen~~ filters ~~is~~ are removed and transported to the onsite radiation laboratory for analysis.

40. Radiation Exposure Meters at Various Locations Around the Plant

Insert attached

Regulatory Guide 1.97 requires that continuously monitoring samplers be located at various locations around the plant to assess releases from the plant.

Adequate release information is already available through ventilation release point monitoring and atmospheric conditions information available from the meteorological conditions information center located on site. Backup monitoring facilities are readily available on the Hanford Reservation from fixed and mobile units.

Insert to Page 7.5-28:

The sample system has a low flow, 0.1 cfm, pump and a shadow shield for the filter holder to protect personnel from the potential high dose rates from the filters.

Insert A →

44
41. Wind Direction and Speed (Table 7.5-1 Item 20)

Regulatory Guide 1.97 requires that wind speed and direction be available on Category 3 instruments. Wind speed should be monitored from 0 to 67 miles per hour and the direction from 0° to 360°.

Wind speed and direction is determined by instruments located on the meteorological tower and transmitted to the meteorological information center. This information is recorded in the control room.

45
42. Estimation of Atmospheric Stability (Table 7.5-1 Item 21)

Regulatory Guide 1.97, based on vertical temperature differences spaced at set intervals down the meteorological tower, requires that atmospheric stability (temperature inversion) be detected.

Vertical temperature stratification information is recorded in the control room.

Insert B

Insert A to Page 7.5-29:

41. Airborne Radiohalogens and Particulates (portable)

Regulatory Guide 1.97 requires portable sampling with onsite analysis capability for airborne halogens and particulates. Portable air samples and a radioanalytical laboratory are maintained by the plant health physics group capable of measuring concentrations from 10^{-9} μCi/cc to 10^{-3} μCi/cc.

42. Plant and Environs Radiation (portable)

Regulatory Guide 1.97 requires portable monitoring instrumentation capable of measuring gamma and beta dose rates from 10^{-3} R/hr to 10^{4} R/hr.

The plant health physics personnel maintain such portable instruments onsite.

43. Plant and Environs Radioactivity

Regulatory Guide 1.97 requires the availability of portable multichannel gamma-ray spectrometer.

These are maintained onsite for emergency preparedness.

Insert B to Page 7.5-29:

46. Post-Accident Sampling System

Onsite and/or offsite facilities are provided to analyze primary coolant and containment air grab samples for variables and ranges listed in Regulatory Guide 1.97.

TABLE 7.5-1

SAFETY-RELATED DISPLAY INSTRUMENTATION

Design Criteria	Type Readout	Number of Channels	Range	Type & Category[1]	Display Instrument Accuracy	Location
1. Reactor Vessel Pressure	Recorder	2	0-1500 psig	A,1	±2% FS	CR
2. Reactor Vessel Water Level	Recorder	2	-150"/0/+60"	A,1	±2% FS	CR
	~~Indicator~~	~~1~~	~~-150"/0/+60"~~	~~A,1~~	~~±2% FS~~	~~CR~~
	Recorder	2	-117" - -317"	A,1	±2% FS	CR
	~~Indicator~~	~~1~~	~~-117" - -317"~~	~~A,1~~	~~±2% FS~~	~~CR~~
3. Neutron Flux Power Level (SRM)	Recorder	4	10^{-7} - 10^{-3}% Power[2] 10^{-3} - .10 % Power[3]	A,1	±2%	CR
4. Main Steam Line Flow	Indicator	4	0 - 4.25 X 10^6 lb/hr	~~D,2~~	±2% FS	CR
5. RCIC Flow	Indicator	1	0 - 700 GPM	D,2	±2% FS	CR
6. RCIC Discharge Pressure	Indicator	1	0 - 1500 psig	~~D,2~~	±2% FS	CR
7. HPCS Flow	Indicator	1	0 - 8000 GPM	D,2	±2% FS	CR
8. HPCS Discharge Pressure	Indicator	1	0 - 1500 psig	~~D,2~~	±2% FS	CR
9. LPCS Flow	Indicator	1	0 - 10,000 GPM	D,2	±2% FS	CR
10. Drywell Atmos & Suppress ~~Pool~~ Atmos Temps	Indicator Print Out	2	50 - 400°F	D,2	±2% FS	CR
11. LOCA Radiation High Range Area Monitors	Recorder	2	10^2 - 10^4 R/hr	C,E,2	±2% FS	CR
		2	10^4 - 10^7 R/hr			
12. Leak Detection Radiation Monitors	Recorder	2	10^0 - 10^6 CPM	---	±2% FS	CR
		2	10^0 - 10^6 CPM	---	±2% FS	CR

NOTE[1]: The instruments meet the requirements required by the Category type as described in Regulatory Guide 1.97, Revision 2.

2: Inserted

3: Withdrawn

TABLE 7.5-1 (Cont'd)

Design Criteria	Type Readout	Number of Channels	Range	Type & Category[1]	Display Instrument Accuracy	Location
13. Primary Containment Hydrogen Concentration	Recorder	2	0 - 30%	C,1	±2% FS	CR
14. Primary Containment Oxygen Concentration	Recorder	2	0 - 10%	C,1	±2% FS	CR
15. Suppression Chamber Pressure	Recorder	2	0 - 60 psig	D,2	±2% FS	CR
16. Suppression Pool Temperature	Print Out Indicator	2	30 - 230° ~~50 - 400°F~~	D,2	±2% FS	CR
17. Suppression Pool Water Level	Recorder	2	+25"/0/-25"	C,1	±2% FS	CR
18. Bldg. Gaseous Release Monitor	Recorder	3	10^1 - 10^6 CPM	E, C,2	±2% Span	CR
		3	$10^{\cancel{0}1}$ - 10^6 CPM	E, C,2	±2% Span	CR
		2	10^{-2} - 10^4 R/hr	C,2	±2% Span	CR
19. Bldg. Particulate Release Monitor	Recorder	4	~~10^0 - 10^6 CPM~~	~~E,3~~	~~±2% Span~~	~~CR~~
20. Wind Speed	Recorder	1	0 - 67 MPH	E,3	±2% FS	CR
Wind Direction	Recorder	1	0° - 360°	E,3	±2%	CR
21. Temperature Differential	Recorder	1	± 15° F	E,3	±2%	CR
22. Radiation Exposure Rate	Recorder	3	10^{-2} - 10^4 R/hr	C E,2	±2% Span	CR
23. SRV Position Indication	Indicator	18	Full Closed to Full Open	D,2	-----	CR
24. Power Supply Monitoring	Voltmeter	6	~~4.16 kVAC~~ 0-5.25 KVAC	D,2	±2% FS	CR
		4	~~480 VAC~~ 0-600 VAC	D,2	±2% FS	CR
		X3	~~240 VAC~~ 0-300 VAC	D,2	±2% FS	CR
		5	0-150 VDC	D,2	±2% FS	CR
		4	± 30 VDC	D,2	± 2% FS	CR
		29	DC Ammeters of various		ranges	CR

Containment Instrument Air | Indicator | 2 | 0-150 psig | D,2 | ± 2% FS | CR

TABLE 7.5-1 (Cont'd)

Design Criteria	Type Readout	Number of Channels	Range	Type & Category	Display Instrument Accuracy	Location
25. Feed Water Flow	Indicator	2	0 - 8.5 X 10^6 #/hr	D,3	±2% FS	CR
26. CST Level Indicator	Indicator	2	0 - 35 ft.	D,3	±2% FS	CR
27. RHR Flow (LPCI and Shutdown Cooling)	Indicator	3	0 - 10,000 GPM	D,2	±2% FS	CR
(Head Spray)	Recorder	1	0 - 600 GPM	D,2	±2% FS	CR
28. RHR HX Outlet Temperature	~~Indicator~~	2	0 - 600°F	D,23	±2% FS	CR
RHR Service Water Flow	Indicator	2	0 - 10,000 GPM	D,2	±2% FS	CR
29. SLCS Flow Rate	Indicator	2	0 - 50 GPM	D,2	±2% FS	CR
30. SLCS Tank Level	Indicator	2	0 - 5000 Gal	D,2	±2% FS	CR
31. SSW System Pump Discharge Line Pressure	Indicator	2	0 - 300 psig	---	±2% FS	CR
		1	0 - 100 psig	---	±2% FS	CR
32. SSW System Flow Rate	Indicator	2	0 - 12,000 GPM	D,2	±2% FS	CR
HPCS SS Flow Rate	Indicator	1	0 - 1320 GPM	D,2	± 2% FS	CR
33. SSW Pond. Water Level	Indicator	4	0 - ~~14~~ 20 ft.	~~D,2~~ ---	±2% FS	CR
34. Spent Fuel Pool Cooling	Indicator	3	0 - 212°F	---	±2% FS	CR
35. Main Control Room Temperature	Indicator	2	50 - 100°F	---	±2%	CR
36. SGTS Flow Rate	Indicator	4	0 - 6000 CFM	---	±2%	CR
37. CAC System Flow Rate	Indicator	4	0 - 300 CFM	---	±2%	CR

TABLE 7.5-1 (Cont'd)

SAFETY-RELATED DISPLAY INSTRUMENTATION

Design Criteria	Type Readout	Number of Channels	Range	Type & Category[1]	Display Instrument Accuracy	Location
38. MSIV-LCS Outboard Steam Line Header Pressure	Indicator	1 1	0 - 2 psig 0 - 50 psig	D,2	±2% FS ±2% FS	CR CR
39. MSIV-LCS Steam Line Pressure Between MSIVs	Indicator	1 1	0 - 8 psig 0 - 50 psig	D,2	±2% FS ±2% FS	CR CR
40. MSIV-LCS Leakage Flow	Indicator	4	0 - 1 CFM	---	±2% FS	CR
41. Radioactive Tank Levels	Recorder Indicator	6 5	0 - 100% 0 - 100%	D,3 D,3	±2% FS ±2% FS	RW Bldg. RW Bldg.
42. Primary Containment Moisture	Recorder	2	0 - ~~150~~ 100% RH	---	±2% FS	CR
43. Primary Containment Pressure	Recorder Recorder	2 2	Pen #1 0 - 25 psig Pen #2 0 - 180 psig -5 to +3 psig	A,B,1 A,B,1 A,B,1	±2% FS ±2% FS ±2% FS	CR CR CR
44. Emergency Ventilation Damper Position	Indicator	1 ea.	open-close	D,2	—	CR
45. Control Rod Position	Indicator	1 ea.	full in or not full in	B,3	—	CR
46. Primary Containment Isolation Valve Position	Indicator	1 ea.	closed or not closed	B,1	—	CR

Delete

TABLE 7.5-2

CONTAINMENT HYDROGEN AND OXYGEN MONITORING SYSTEM SAMPLE POINT LOCATIONS

SP	PENETRATION #	SAMPLE POINT AZIMUTH	SAMPLE POINT ELEVATION
74	72c	188°-24'	560'-0"
75	72d	191°-36'	560'-0"
76	72e	193°	531'-0"
77	82c	230°	479'-4"
78	85d	18°-12'	545'-2-1/4"
79	85e	13°-44'	545'-1-1/2"
80	73d	45°	531'-0"
81	84b	40°	479'-4"