2. With less than the minimum number of explosive gas monitoring instrumentation channels OPERABLE, take the action shown in Table 3.7-5(a). Exert best efforts to return the instruments to operable status within 30 days and, if unsuccessful, prepare and submit a Special Report to the Commission (Region II) to explain why the inoperability was not corrected in a timely manner.

E. Prior to the Reactor Coolant System temperature and pressure exceeding 350°F and 450 psig, respectively, the accident monitoring instrumentation listed in Table 3.7-6 shall be OPERABLE in accordance with the following:

1. With one required channel inoperable, either restore the inoperable channel to OPERABLE status within 30 days or submit a report to the NRC within the next 14 days. The report shall outline the cause of inoperability and the plans and schedule for restoring the inoperable channel to OPERABLE status.

2. With two required channels inoperable, either:

   a. Restore an inoperable channel(s) to OPERABLE status within 7 days or initiate the preplanned alternate method of monitoring the appropriate function and submit a report to the NRC within the next 14 days. The report shall outline the preplanned alternate method of monitoring the function, the cause of inoperability, and the plans and schedule for restoring an inoperable channel to OPERABLE status.

   b. If no preplanned alternate method of monitoring the function is available, restore an inoperable channel(s) to OPERABLE status within 7 days or be in HOT SHUTDOWN within the next 6 hours and be less than 350°F and 450 psig within the following 12 hours.

steam line pressure setting limit is set below the full load operating pressure. The safety analysis shows that these settings provide protection in the event of a large steam line break.[3]

Accident Monitoring Instrumentation

The primary purpose of accident monitoring instrumentation is to display unit parameters that provide information required by the control room operators during and following accident conditions. In response to NUREG-0737 and Regulatory Guide (RG) 1.97, Revision 3, a programmatic approach was developed in defining the RG 1.97-required equipment for Surry. The Surry RG 1.97 program review examined existing instrumentation with respect to the RG 1.97 design and qualification requirements. The operability of RG 1.97 instrumentation ensures that sufficient information is available on selected unit parameters to monitor and assess unit status and response during and following an accident. The availability of accident monitoring instrumentation is important so that the consequences of corrective actions can be observed and the need for and magnitude of further actions can be determined.

RG 1.97 applied a graded approach to post-accident indication by using a matrix of variable types versus variable categories. RG 1.97 delineates design and qualification criteria for the instrumentation used to measure five variable types (Types A, B, C, D, and E). These criteria are divided into three separate categories (Categories 1, 2, and 3), providing a graded approach that depended on the importance to safety of the measurement of a specific variable. Category 1 variables, listed in Table 3.7-6, are defined as follows:

Category 1 - are the key variables deemed risk significant because they are needed to:

- Determine whether other systems important to safety are performing their intended functions,
- Provide information to the operators that will enable them to determine the likelihood of a gross breach of the barriers to radioactivity release, and
- Provide information regarding the release of radioactive materials to allow early indication of the need to initiate action necessary to protect the public and to estimate the magnitude of any impending threat.

The RG 1.97 criteria on redundancy requirements apply to Category 1 variables only and address single-failure criteria and supporting features, including power sources. Failures of the instrumentation, its supporting features, and/or its power source resulting in less than the required number of channels necessitate entry into the required actions.

The 30 day allowed outage time applies when one (or more) function(s) in Table 3.7-6 has one required channel that is inoperable. The 30 day allowed outage time to restore one inoperable required channel to OPERABLE status is appropriate considering the remaining channel is OPERABLE, the passive nature of the instrument (i.e., no automatic action is assumed to occur from this instrumentation), and the low probability of an event requiring accident monitoring instrumentation during this interval. The 7 day allowed outage time applies when one (or more) function(s) in Table 3.7-6 has two required channels that are inoperable. The 7 day allowed outage time to restore one of the two inoperable required channels to OPERABLE status is appropriate based on providing a reasonable time for the repair and the low probability of an event requiring accident monitoring instrument operation. Long-term operation with two required channels inoperable in a function and with an alternate indication is not acceptable because the alternate indication may not fully meet the performance qualification requirements applied to the accident monitoring instrumentation. Requiring restoration of one of the two inoperable channels limits the risk that the accident monitoring instrumentation function could be in a degraded condition should an accident occur. If there is no preplanned alternate, the 7 day allowed outage time is followed by a requirement to be in HOT SHUTDOWN within the next 6 hours and be less than 350°F and 450 psig within the following 12 hours. If the 30 day allowed outage time or 7 day allowed outage time to restore an inoperable channel to OPERABLE status is exceeded and either a redundant channel or a preplanned alternate method of monitoring is OPERABLE, a report to the NRC within the next 14 days is required. The report to the NRC in lieu of a shutdown is appropriate because the instrument functional capability has not been lost and given the low likelihood of unit conditions that would require the information provided by the accident monitoring instrumentation.

Note that the Categories 2 and 3 RG 1.97 variables are addressed in a licensee controlled document and are defined as follows:

Category 2 - provides less stringent requirements and generally applies to instrumentation designated for indicating system operating status.

Category 3 - is the least stringent and is applied to backup and diagnostic instrumentation.

Explosive Gas Monitoring

Instrumentation is provided for monitoring (and controlling) the concentrations of potentially explosive gas mixtures in the Waste Gas Holdup System. The operability and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63 and 64 of Appendix A to 10 CFR Part 50.

Non-Essential Service Water Isolation System

The operability of this functional system ensures that adequate intake canal inventory can be maintained by the Emergency Service Water Pumps. Adequate intake canal inventory provides design service water flow to the recirculation spray heat exchangers and other essential loads (e.g., control room area chillers, charging pump lube oil coolers) following a design basis loss of coolant accident with a coincident loss of offsite power. This system is common to both units in that each of the two trains will actuate equipment on each unit.

Clarification of Operator Actions

The Operator Actions associated with Functional Units 10 and 16 on Table 3.7-1 require the unit to be reduced in power to less than the P-7 setpoint (10%) if the required conditions cannot be satisfied for either the P-8 or P-7 permissible bypass conditions. The requirement to reduce power below P-7 for a P-8 permissible bypass condition is necessary to ensure consistency with the out of service and shutdown action times assumed in the WCAP-10271 and WCAP-14333P risk analyses by eliminating the potential for a scenario that would allow sequential entry into the Operator Actions (i.e., initial entry into the Operator Action with a reduction in power to below P-8, followed by a second entry into the Operator Action with a reduction in power to below P-7). This scenario would permit sequential allowed outage time periods that may result in an additional 72 hours that was not assumed in the risk analysis to place a channel in trip or to place the unit in a condition where the protective function was not necessary.

References

(1) UFSAR - Section 7.5

(2) UFSAR - Section 14.5

(3) UFSAR - Section 14.3.2

TABLE 3.7-6
ACCIDENT MONITORING INSTRUMENTATION

NOTE: Separate entry into Specification 3.7.E is allowed for each Function.

	Function	Required Channels
1.	Auxiliary Feedwater Flow	2
2.	Inadequate Core Cooling	
	a. Reactor Vessel Coolant Level	2
	b. Reactor Coolant System Subcooling Margin	2
	c. Core Exit Temperature	2 (a)
3.	Containment Pressure (Wide Range)	2
4.	Containment Pressure	2
5.	Containment Sump Water Level (Wide Range)	2
6.	Containment Area Radiation (High Range)	2
7.	Power Range Neutron Flux	2 (b)
8.	Source Range Neutron Flux	2 (b)
9.	Reactor Coolant System (RCS) Hot Leg Temperature (Wide Range)	2
10.	RCS Cold Leg Temperature (Wide Range)	2
11.	RCS Pressure (Wide Range)	2
12.	Penetration Flow Path Containment Isolation Valve Position	2 per penetration flow path (c)(d)
13.	Pressurizer Level	2
14.	Steam Generator (SG) Water Level (Wide Range)	2
15.	SG Water Level (Narrow Range)	2 per SG
16.	SG Pressure	2 per SG
17.	Emergency Condensate Storage Tank Level	2
18.	High Head Safety Injection Flow to Cold Leg	2

(a) A minimum of 2 core exit thermocouples per quadrant are required for the channel to be OPERABLE.

(b) This indication is provided by the Gammametric channels.

(c) Not required for isolation valves whose associated penetration is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(d) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

Other channels are subject only to the "drift" errors induced within the instrumentation itself and, consequently, can tolerate longer intervals between calibration. Process systems instrumentation errors resulting from drift within the individual instruments are normally negligible.

During the interval between periodic channel tests and daily check of each channel, a comparison between redundant channels will reveal any abnormal condition resulting from a calibration shift, due to instrument drift of a single channel.

During the periodic channel test, if it is deemed necessary, the channel may be tuned to compensate for the calibration shift. However, it is not expected that this will be required at any fixed or frequent interval.

Thus, minimum calibration frequencies of once-per-day for the nuclear flux (power level) channels, and once per 18 months for the process system channels are considered acceptable.

Testing

The OPERABILITY of the Reactor Trip System and ESFAS instrumentation systems and interlocks ensures that 1) the associated ESF action and/or reactor trip will be initiated when the parameter monitored by each channel or combination thereof exceeds its setpoint, 2) the specified coincidence logic and sufficient redundancy are maintained to permit a channel to be out of service for testing or maintenance consistent with maintaining an appropriate level of reliability of the RTS and ESFAS instrumentation, and 3) sufficient system functional capability is available from diverse parameters.

TABLE 4.1-2
ACCIDENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

	INSTRUMENT	CHANNEL CHECK (1)	CHANNEL CALIBRATION
1.	Auxiliary Feedwater Flow	M	R
2.	Inadequate Core Cooling	M	R
3.	Containment Pressure (Wide Range)	M	R
4.	Containment Pressure	M	R
5.	Containment Sump Water Level (Wide Range)	M	R
6.	Containment Area Radiation (High Range)	M	R
7.	Power Range Neutron Flux	M	R (2)
8.	Source Range Neutron Flux	M	R (2)
9.	Reactor Coolant System (RCS) Hot Leg Temperature (Wide Range)	M	R
10.	RCS Cold Leg Temperature (Wide Range)	M	R
11.	RCS Pressure (Wide Range)	M	R
12.	Penetration Flow Path Containment Isolation Valve Position	M	R (3)
13.	Pressurizer Level	M	R
14.	Steam Generator (SG) Water Level (Wide Range)	M	R
15.	SG Water Level (Narrow Range)	M	R
16.	SG Pressure	M	R
17.	Emergency Condensate Storage Tank Level	M	R
18.	High Head Safety Injection Flow to Cold Leg	M	R

(1) Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.

(2) Neutron detectors are excluded from CHANNEL CALIBRATION.

(3) Rather than CHANNEL CALIBRATION, this surveillance shall be an operational test, consisting of verification of operability of all devices in the channel.

M - Monthly

R - Once per 18 months