

2.0 LIMITING CONDITIONS FOR OPERATION

2.15 Instrumentation and Control Systems

Applicability

Applies to plant instrumentation systems.

Objective

To delineate the conditions of the plant instrumentation and control systems necessary to assure reactor safety.

Specifications

The operability of the plant instrument and control systems shall be in accordance with Tables 2-2 through 2-6.

In the event the number of channels of a particular system in service falls one below the total number of four channels, the inoperable channel shall be placed in either the bypassed or tripped condition within eight hours. For the purpose of testing and maintenance, the inoperable channel may be bypassed for up to 48 hours from time of initial loss of operability; however, if the inoperability is determined as the result of malfunctioning RTD's or nuclear detectors supplying signals to the high power level, thermal margin/low pressurizer pressure, axial power distribution, and high rate trip-wide log trip units, these channels may be bypassed for up to 7 days from time of initial loss of operability. If the inoperable channel is not restored to operable status after the allowable times for bypass, it shall be placed in the tripped position. If required for active maintenance and surveillance testing to establish operability and place a channel back in service, the trip unit may be installed and bypassed after the 48 hour or 7 day period, whichever is applicable.

In the event the number of channels of a particular system in service falls to the limits given in the column entitled "Minimum Operable Channels", one of the inoperable channels must be placed in the tripped position at the time of initial loss of operability. The second inoperable channel, for purposes of testing and maintenance, may be bypassed for up to 48 hours. If the channel has not been restored to operable status after 48 hours, the reactor shall be placed in a hot shutdown condition within 12 hours; however, operation can continue without containment isolation signals available if the ventilation isolation valves are closed. If after 24 hours from time of initiating a hot shutdown procedure the inoperable channel has not been restored to operable status, the reactor shall be placed in a cold shutdown condition within 24 hours.

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In the event the number of channels of a particular system in service falls below the limits given in the columns entitled "Minimum Operable Channels" or "Minimum Degree of Redundancy", except as conditioned by the column entitled "Permissible Bypass Conditions", the reactor shall be placed in a hot shutdown condition within 12 hours; however, operation can continue without containment isolation signals available if the ventilation isolation valves are closed. If minimum conditions are not met within 24 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.

If, during power operation, the rod block function of the secondary CEA position indication system and rod block circuit are inoperable for more than 24 hours, or the plant computer PDIL alarm, CEA group deviation alarm and the CEA sequencing function are inoperable for more than 48 hours, the CEA's shall be withdrawn and maintained at fully withdrawn and the control rod drive system mode switch shall be maintained in the off position except when manual motion of CEA Group 4 is required to control axial power distribution.

Basis

During plant operation, the complete instrumentation systems will normally be in service. Reactor safety is provided by the reactor protection system, which automatically initiates appropriate action to prevent exceeding established limits. Safety is not compromised, however, by continuing operation with certain instrumentation channels out of service since provisions were made for this in the plant design. This specification outlines limiting conditions for operation necessary to preserve the effectiveness of the reactor control and protection system when any one or more of the channels are out of service.

All reactor protection and almost all engineered safety feature channels are supplied with sufficient redundancy to provide the capability for channel test at power, except for backup channels such as derived circuits in engineered safeguards control system.

When one of the four channels is taken out of service for maintenance, the protective system logic can be changed to a two-out-of-three coincidence for a reactor trip by bypassing the removed channel. If the bypass is not effected, the out-of-service channel (Power Removed)

TABLE 2-2

Instrument Operating Requirements for Reactor Protective System

<u>No.</u>	<u>Functional Unit</u>	<u>Minimum Operable Channels</u>	<u>Minimum Degree of Redundancy</u>	<u>Permissible Bypass Condition</u>	<u>Test, Maintenance & Inoperable Bypass</u>
1	Manual (Trip Buttons)	1	None	None	N/A
2	High Power Level	2(b)(c)	1(c)	Thermal Power Input Bypassed Below 10 ⁻⁴ % of Rated Power(a)(d)	(e)(f)
3	Thermal Margin/Low Pressurizer Pressure	2(b)	1	Below 10 ⁻⁴ % of Rated Power(a)(d)	(e)(f)
4	High Pressurizer Pressure	2(b)	1	None	(e)
5	Low R.C. Flow	2(b)	1	Below 10 ⁻⁴ % of Rated Power(a)(d)	(e)
6	Low Steam Generator Water Level	2/Steam Gen ^(b)	1/Steam Gen	None	(e)
7	Low Steam Generator Pressure	2/Steam Gen ^(b)	1/Steam Gen	Below 550 psia (a)(d)	(e)
8	Containment High Pressure	2(b)	1	During Leak Test	(e)
9	Axial Power Distribution	2(b)(c)	1(c)	Below 15% of Rated Power	(e)(f)
10	High Rate Trip-Wide Range Log Channels	2	1	Below 10 ⁻⁴ % and Above 15% of Rated Power(a)	(e)(f)
11	Loss of Load	2(b)	1	Below 15% of Rated Power	(e)

a Bypass automatically removed.

b One of the inoperable channels must be in the tripped condition at time of initial loss of operability. If second channel is inoperable after 48 hours a unit shutdown must be initiated.

c If two channels are inoperable, load shall be reduced to 70% or less of rated power.

d For low power physics testing this trip may be bypassed up to 10⁻¹% of rated power.

e Channel may be in bypass for up to 48 hours from time of initial loss of operability.

TABLE 2-2
(Continued)

- f If inoperable channel determined to be caused by malfunctioning RTD's or nuclear detectors the channel may be bypassed for up to 7 days from time of initial loss of operability.

TABLE 2-3

Instrument Operating Requirements for Engineered Safety Features

<u>No.</u>	<u>Functional Unit</u>	<u>Minimum Operable Channels</u>	<u>Minimum Degree of Redundancy</u>	<u>Permissible Bypass Conditions</u>	<u>Test, Maintenance & Inoperability Bypass</u>
1	<u>Safety Injection</u>				
A	Manual	1	None	None	N/A
B	High Containment Pressure A	2(a)(d)	1	During Leak Test	(f)
	B	2(a)(d)			
C	Pressurizer Low/ Low Pressure A	2(a)(d)	1	Reactor Coolant	(f)
	B	2(a)(d)	1	Pressure Less Than 1700 psia ^(b)	
2	<u>Containment Spray</u>				
A	Manual	1	None	None	N/A
B	High Containment Pressure A	2(a)(c)(d)	1	During Leak Test	(f)
	B	2(a)(c)(d)	1		
C	Pressurizer Low/ Low A	2(a)(c)(d)	1	Reactor Coolant	(f)
	B	2(a)(c)(d)	1	Pressure Less Than 1700 psia ^(b)	
3	<u>Recirculation</u>				
A	Manual	1	None	None	N/A
B	SIRW Tank Low Level A	2(a)(d)	1	None	(f)
	B	2(a)(d)	1		
4	<u>Emergency Off-Site Power Trip</u>				
A	Manual	1(e)	None	None	(f)
B	Emergency Bus Low Voltage (Each Bus)				
	- Loss of Voltage	2(d)	1	Reactor Coolant	(f)
	- Degraded Voltage	2(a)(d)	1	Temperature Less Than 300°F	

a A and B actuation circuits each have 4 channels.

b Auto removal of bypass above 1700 psia.

c Coincident high containment pressure and pressurizer low/low pressure signals required for initiation of containment spray.

TABLE 2-3
(Continued)

- d One of the inoperable channels must be in the tripped condition at time of initial loss of operability. If second channel is inoperable after 48 hours a unit shutdown must be initiated.
- e Control switch on incoming breaker.
- f Channel may be bypassed for up to 48 hours from time of initial loss of operability.

DISCUSSION

A review of the four channel RPS and ESFAS for four channel independence was requested by the NRC to determine if long term operation of a 2-out-of-3 logic configuration is acceptable. The investigation was to determine independence based on both physical and electrical separation. If the review revealed that sufficient channel independence did not exist, a change to the Technical Specifications (TS) should be initiated.

As a result of the review at the Fort Calhoun Station, the proposed change to the TS is being submitted. The proposed TS change would allow for a channel to be bypassed for up to 48 hours for the purposes of testing and maintenance. If the inoperable channel is due to malfunctioning of the hot and cold leg RTD's or nuclear detectors, the channel may be bypassed for up to 7 days from time of initial loss of operability.

The Fort Calhoun Station RPS and ESFAS are composed of four channels. These channels are powered from a two battery-two bus system with each channel having a separate AC power inverter. The RPS cabinets in the main control room panels are separated by partitions for fire protection; however, the panel allows for an associated circuit to be routed with another protective channel. Cabling from the panels is routed with maintained separation by trays through the cable spreading room initially and then through separate trays or conduit to the destination site. Within containment, a possibility exists that a high energy line break could disable two redundant safety-related transmitters; however, outside of containment the cables are not routed near high energy lines.

The TS changes are broken into the 48-hour and 7-day bypass categories. These were chosen because of the following:

1. Bypassing of a channel for up to 48 hours for the purpose of testing and maintenance has been approved for other four channel CE systems because they exhibit some independence. Since the Fort Calhoun Station is a four channel CE system similar to the other units, the 48-hour bypass should be justified by precedent.
2. The 7-day bypass is for the channels with inputs from the RTD's in the main coolant piping and the nuclear detectors. A review of each revealed the following:
 - a. The RTD's in the main coolant piping could only be lost in the unlikely event of the main coolant line breaking. There are no other high energy lines located near the main coolant piping.
 - b. The nuclear detectors are housed in receptacles imbedded in concrete housing the core with maximum separation being maintained as shown in the FSAR Figure 7.5-1. The cables from the detectors are separately routed from each other, including separation at the containment penetration areas.

With these elements being located in inaccessible areas during operation, the 7-day bypass would allow for thorough coordination and preparation for their repair or replacement. Because of the previous demonstrated reliability of the DC batteries, a failure of the batteries during this 7 day period would be highly unlikely. Therefore, it is the opinion of the District that because of the increased separation and high reliability of these parameters, there would be no increased probability of accident during this 7 day period.

Due to the hardware installation, 8 hours is allowed to place channels into the tripped condition. Since some channels do not have bypass keys and bypass or trip of those channels must be effected by wiring changes, 8 hours is allowed for safe bypassing or tripping of the channels.

Provision is made to place a trip unit in bypass for active maintenance or surveillance testing after the 48 hours or 7 days has expired to prove operability. Hardware restrictions require channels to be bypassed to energize test functions.

The proposed change does not constitute an unreviewed safety question. Since there are no equipment or setpoint changes being implemented by the proposed license changes, there is:

1. No probability of increased occurrence or consequences of an accident or malfunction of equipment important to safety previously evaluated.
2. No possibility of an accident or malfunction of a different type than any evaluated previously in the safety analysis report being created.
3. No reduction in the margin of safety as defined in the basis for any Technical Specifications.

FEE JUSTIFICATION

The proposed amendment is deemed to be Class III, within the meaning of 10 CFR 170.22. It addresses a single safety issue and does not involve a significant hazard consideration.