

① - (All changes on this page) except as noted

PAM Instrumentation  
B 3.3.3

BASES

LCO (continued)

valve and prior knowledge of a passive valve, or via system boundary status. If a normally active CIV is known to be closed and deactivated, position indication is not needed to determine status. Therefore, the position indication for valves in this state is not required to be OPERABLE.

Table 3.3.3-1 provides a list of variables typical of those identified by the unit specific Regulatory Guide 1.97 (Ref. 1) analyses. Table 3.3.3-1 in unit specific TS should list all Type A and Category I variables identified by the unit specific Regulatory Guide 1.97 analyses, as amended by the NRC's SER.

Type A and Category I variables are required to meet Regulatory Guide 1.97 Category I (Ref. 1) design and qualification requirements for seismic and environmental qualification, single failure criterion, utilization of emergency standby power, immediately accessible display, continuous readout, and recording of display.

INSERT 1A

Listed below are discussions of the specified Instrument Functions listed in Table 3.3.3-1. These discussions are intended as examples of what should be provided for each Function when the unit specific list is prepared.

1. Power Range and Source Range Neutron Flux

Category-1 variable

Power Range and Source Range Neutron Flux indication is provided to verify reactor shutdown. The ~~wide~~ ranges are necessary to cover the full range of flux that may occur post accident.

INSERT 1B

Neutron flux is used for accident diagnosis, verification of subcriticality, and diagnosis of positive reactivity insertion.

INSERT 2

3, 4. Reactor Coolant System (RCS) Hot and Cold Leg Temperatures

Wide Range

RCS Hot and Cold Leg Temperatures are Category I variables provided for verification of core cooling and long term surveillance.

Type A<sub>1</sub>

RCS hot and cold leg temperatures are used to determine RCS subcooling margin. RCS subcooling margin will allow termination of safety injection (SI), if still in progress, or reinitiation of SI if it has been stopped. RCS subcooling margin is also used for unit stabilization and cooldown control.

OK but insert CNP specific basis.

1 INSERT 1A

, except for approved deviations, as described in References 1 and 2.

1 INSERT 1B

of each of the two neutron flux instruments (10E-8 to 200% power)

1 INSERT 2

2. Steam Generator Pressure

Steam Generator Pressure is a Type A, Category 1 variable provided for determination of required core exit temperature. Three steam generator pressure channels per steam generator are provided. Each channel has a range of 0 psig to 1200 psig. However, only two steam generator pressure channels per steam generator are required to satisfy the guidance in Reference 3.

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LCO (continued)

~~whether to terminate SI if still in progress.~~

8. Containment Pressure (Wide Range) ~~(Wide Range)~~ Narrow

INSERT  
Containment Pressure (Wide Range) is provided for verification of RCS and containment OPERABILITY.  
Containment pressure is used to verify closure of main steam isolation valves (MSIVs) and containment spray Phase B isolation when High-3 containment pressure is reached.

9. Containment Isolation Valve Position

Penetration Flow Path  
Containment Isolation Valve  
(including check valves)  
does this conform to RB 197?  
(CIV) Position is provided for verification of Containment OPERABILITY, and Phase A and Phase B isolation.

~~When used to verify Phase A and Phase B isolation~~, the important information is the isolation status of the containment penetrations. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each active CIV in a containment penetration flow path, i.e., two total channels of CIV position indication for a penetration flow path with two active valves. For containment penetrations with only one active CIV having control room indication, Note (b) requires a single channel of valve position indication to be OPERABLE. This is sufficient to redundantly verify the isolation status of each isolable penetration either via indicated status of the active valve, as applicable, and prior knowledge of a passive valve, or via system boundary status. If a normally active CIV is known to be closed and deactivated, position indication is not needed to determine status. Therefore, the position indication for valves in this state is not required to be OPERABLE. Note (a) to the Required Channels states that the Function is 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. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed for each inoperable penetration flow path.

Penetration flow path is isolated  
in an isolated penetration flow path.

requiring post-accident valve position indication

about the CIVs

10. Containment Area Radiation (High Range)

(High Range)  
Containment Area Radiation is provided to monitor for the potential of significant radiation releases and to provide release assessment.

WOG STS

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for determination of adverse containment conditions

like post-accident type adverse conditions?

stef

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LCO (continued)

stet

~~INSERT 9~~

for use by operators in determining the need to invoke site emergency plans. Containment radiation levels used to determine if a high energy line break (HELB) has occurred, and whether the event is inside or outside of containment.

11. Hydrogen Monitors

(Type A) Category 1 Instrument

uncontrolled burn

Hydrogen Monitors are provided to detect high hydrogen concentration conditions that represent a potential for containment breach from a hydrogen explosion. This variable is also important in verifying the adequacy of mitigating actions.

~~INSERT 10~~

12. Pressurizer Level

a Type A, Category 1 Variable

and manually reduce ECCS flow.

~~INSERT 11~~

Pressurizer Level is used to determine whether to terminate SI, if still in progress, or to reinitiate SI if it has been stopped. Knowledge of pressurizer water level is also used to verify the unit conditions necessary to establish natural circulation in the RCS and to verify that the unit is maintained in a safe shutdown condition.

13. Steam Generator Water Level (Wide Range)

Category 1 Variable

~~INSERT 12~~

SG Water Level is provided to monitor operation of decay heat removal via the SGs. The Category 1 indication of SG level is the extended startup range level instrumentation. The extended startup range level covers a span of  $\geq 6$  inches to  $\leq 394$  inches above the lower tube sheet. The measured differential pressure is displayed in inches of water at 68°F.

provide like replacement for W/P licensing basis.

Temperature compensation of this indication is performed manually by the operator. Redundant monitoring capability is provided by two trains of instrumentation. The uncompensated level signal is input to the unit computer, a control room indicator, and the Emergency Feedwater Control System.

SG Water Level (Wide Range) is used to:

- identify the faulted SG following a tube rupture,
- verify that the intact SGs are an adequate heat sink for the reactor.

① (All changes on this page)

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LCO (continued)

- determine the nature of the accident in progress (e.g., verify an SGTR), and
- verify unit conditions for termination of SI during secondary unit HELBs outside containment.

At some units, operator action is based on the control room indication of SG level. The RCS response during a design basis small break LOCA depends on the break size. For a certain range of break sizes, the boiler condenser mode of heat transfer is necessary to remove decay heat. Extended startup range level is a Type A variable because the operator must manually raise and control SG level to establish boiler condenser heat transfer. Operator action is initiated on a loss of subcooled margin. Feedwater flow is increased until the indicated extended startup range level reaches the boiler condenser setpoint.

14. Condensate Storage Tank (CST) Level

CST Level is provided to ensure water supply for auxiliary feedwater (AFW). The CST provides the ~~ensured safety grade~~ water supply for the AFW System. ~~The CST consists of two identical tanks connected by a common outlet header.~~ Inventory is monitored by a ~~14 inch to 14.5 inch level indication for each tank.~~ CST Level is displayed on a control room indicator, strip chart recorder, and unit computer. In addition, a control room annunciator alarms on low level.

INSERTION

Qualified

At some units, CST Level is considered a Type A variable because the control room meter and annunciator are considered the primary indication used by the operator.

The DBAs that require AFW are the loss of electric power, steam line break (SLB), and small break LOCA.

The CST is the initial source of water for the AFW System. However, as the CST is depleted, manual operator action is necessary to replenish the CST or align suction to the AFW pumps from the hotwell.

Why does this not apply to AWP

1 INSERT 13

from essentially the top of the CST to the bottom of the CST (95% total volume) by a single channel provided to satisfy the guidance of Reference 3, as described in Reference 1.

*See RAT*

① (All changes on this page)

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BASES

LCO (continued)

15, 16, 17, 18. Core Exit Temperature

INSERT 14

Core Exit Temperature is provided for verification and long term surveillance of core cooling.

INSERT 15

An evaluation was made of the minimum number of valid core exit thermocouples (CET) necessary for measuring core cooling. The evaluation determined the reduced complement of CETs necessary to detect initial core recovery and trend the ensuing core heatup. The evaluations account for core nonuniformities, including incore effects of the radial decay power distribution, excore effects of condensate runback in the hot legs, and nonuniform inlet temperatures. Based on these evaluations, adequate core cooling is ensured with two valid Core Exit Temperature channels per quadrant with two CETs per required channel. The CET pair are oriented radially to permit evaluation of core radial decay power distribution. Core Exit Temperature is used to determine whether to terminate SI, if still in progress, or to reinitiate SI if it has been stopped. Core Exit Temperature is also used for unit stabilization and cooldown control.

Replace w/ CNP discussion

Two OPERABLE channels of Core Exit Temperature are required in each quadrant to provide indication of radial distribution of the coolant temperature rise across representative regions of the core.

with one core exit thermocouple per channel.

Power distribution symmetry was considered in determining the specific number and locations provided for diagnosis of local core problems. Therefore, two randomly selected thermocouples are not sufficient to meet the two thermocouples per channel requirement in any quadrant. The two thermocouples in each channel must meet the additional requirement that one is located near the center of the core and the other near the core perimeter, such that the pair of Core Exit Temperatures indicate the radial temperature gradient across their core quadrant. Unit specific evaluations in response to Item II.F.2 of NUREG-0737 (Ref. 3) should have identified the thermocouple pairings that satisfy these requirements. Two sets of two thermocouples ensure a single failure will not disable the ability to determine the radial temperature gradient.

Core exit temperature channels per quadrant

INSERT 16

19. Auxiliary Feedwater Flow

AFW Flow is provided to monitor operation of decay heat removal via the SGs.

INSERT 17

1 INSERT 14

a Type A, Category 1 variable used to determine whether to manually reduce Emergency Core Cooling System (ECCS) flow. This variable is also

1 INSERT 15

In addition, core exit temperature is used for determining RCS subcooling margin.

1 INSERT 16

Each core exit temperature channel has a range of 200°F to 2300°F.

1 INSERT 17

a Type A, Category 1 variable used to determine whether to manually reduce ECCS flow. This variable is also



BASES

LCO (continued)

*INSERT 18* →

*replace with CAP discussion* ↓

*INSERT 19* →

The AFW Flow to each SG is determined from a differential pressure measurement calibrated for a range of 0 gpm to 1200 gpm. Redundant monitoring capability is provided by two independent trains of instrumentation for each SG. Each differential pressure transmitter provides an input to a control room indicator and the unit computer. Since the primary indication used by the operator during an accident is the control room indicator, the PAM specification deals specifically with this portion of the instrument channel.

1

AFW flow is used three ways.

- to verify delivery of AFW flow to the SGs,
- to determine whether to terminate SI if still in progress, in conjunction with SG water level (narrow range), and
- to regulate AFW flow so that the SG tubes remain covered.

1

At some units, AFW flow is a Type A variable because operator action is required to throttle flow during an SLB accident to prevent the AFW pumps from operating in runout conditions. AFW flow is also used by the operator to verify that the AFW System is delivering the correct flow to each SG. However, the primary indication used by the operator to ensure an adequate inventory is SG level.

APPLICABILITY

The PAM instrumentation LCO is applicable in MODES 1, 2, and 3. These variables are related to the diagnosis and pre-planned actions required to mitigate DBAs. The applicable DBAs are assumed to occur in MODES 1, 2, and 3. In MODES 4, 5, and 6, unit conditions are such that the likelihood of an event that would require PAM instrumentation is low; therefore, the PAM instrumentation is not required to be OPERABLE in these MODES.

ACTIONS

Note 1 has been added in the ACTIONS to exclude the MODE change restriction of LCO 3.0.4. This exception allows entry into the applicable MODE while relying on the ACTIONS even though the ACTIONS may eventually require unit shutdown. This exception is acceptable due to the passive function of the instruments, the operator's ability to respond to an accident using alternate instruments and methods, and the low probability of an event requiring these instruments.

1

INSERT 18

One auxiliary feedwater flow channel per steam generator is provided. Each channel is capable of measuring from 0 lbm/hr to 250,000 lbm/hr. Due to the similarity of the Steam Generator Water Level (Narrow Range) Function (Table 3.3.3-1 Function 22) and the Auxiliary Feedwater Flow Function (Table 3.3.3-1, Function 19), Note (d) to Table 3.3.3-1 provides the allowance to credit OPERABLE Steam Generator Water Level (Narrow Range) channel(s) to satisfy the corresponding Auxiliary Feedwater Flow channel(s) OPERABILITY requirements of Table 3.3.3-1.

→ see  
RA1

1

INSERT 1920. Centrifugal Charging Pump Flow

Centrifugal Charging Pump Flow is a Type A, Category 1 variable provided for verification that pressurizer level is maintained during a Steam Generator Tube Rupture. Four charging pump flow channels (one channel per cold leg injection line) are provided. Each channel is capable of measuring from 0 gpm to 200 gpm.

21. Safety Injection Pump Flow

Safety Injection Pump Flow is a Type A, Category 1 variable used as criteria to manually trip the reactor coolant pumps. Two safety injection pump flow channels (one channel per safety injection line) are provided. Each channel is capable of measuring from 0 gpm to 500 gpm.

22. Steam Generator Water Level (Narrow Range)

Steam Generator Water Level (Narrow Range) is a Type A, Category 1 variable used to determine whether to manually reduce ECCS flow. This variable is also provided to monitor operation of decay heat removal via the SGs. Three steam generator water level (narrow range) channels per steam generator are provided. Each channel is capable of measuring from below the first stage separator to the second stage separator. However, only two steam generator water level (narrow range) channels per steam generator are required to satisfy the guidance in Reference 3.

23. Containment Pressure (Wide Range)

Containment Pressure (Wide Range) is a Category 1 variable provided for verification of RCS and containment OPERABILITY. Two containment pressure (wide range) channels are provided. Each channel is capable of monitoring from -5 psig to +36 psig.

Insert Page B 3.3.3-11a

BASES

ACTIONS (continued)

④  
INSERT 19A

Note 2 has been added in the ACTIONS to clarify the application of Completion Time rules. The Conditions of this Specification may be entered independently for each Function listed on Table 3.3.3-1. The Completion Time(s) of the Inoperable channel(s) of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function.

④  
INSERT 19B

or within a Function (as applicable)

A.1

Condition A applies when one or more Functions have one required channel that is inoperable. Required Action A.1 requires restoring the inoperable channel to OPERABLE status within 30 days. The 30 day Completion Time is based on operating experience and takes into account the remaining OPERABLE channel or in the case of a Function that has only one required channel, other non-Regulatory Guide 1.97 instrument channels to monitor the Function), the passive nature of the instrument (no critical automatic action is assumed to occur from these instruments), and the low probability of an event requiring PAM instrumentation during this interval.

①  
INSERT 20

repeat of parenthetical statement that follows

B.1

immediate

Condition B applies when the Required Action and associated Completion Time for Condition A are not met. This Required Action specifies initiation of actions in Specification 5.6.0, which requires a written report to be submitted to the NRC immediately. This report discusses the results of the root cause evaluation of the inoperability and identifies proposed restorative actions. This action is appropriate in lieu of a shutdown requirement since alternative actions are identified before loss of functional capability, and given the likelihood of unit conditions that would require information provided by this instrumentation.

④ ⑥  
④  
into the cause

awkward language

C.1

Condition C applies when one or more Functions have two inoperable required channels (i.e., two channels inoperable in the same Function). Required Action C.1 requires restoring one channel in the Function(s) to OPERABLE status within 7 days. The Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrument operation and the availability of alternate means to obtain the required information. Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance qualification requirements

4

INSERT 19A

In addition, separate Condition entry is allowed within a Function as follows: (a) for Functions 2, 13, 19, and 22 on a steam generator basis; (b) for Function 20 on a cold leg injection line basis; and (c) for Functions 26, 27, and 28 on a pump basis.

4

INSERT 19B

or steam generator basis for Functions 2, 13, 19, and 22, cold leg injection line basis for Function 20, and pump basis for Functions 26, 27, and 28

1

INSERT 20

or remaining isolation barrier in the case of containment penetrations with only one CIV