PVNGS Technical Requirements Manual (TRM)
Revision 58
Replacement Pages and Insertion Instructions

The following LDCRs are included in this change:

LDCR 07-R002 removes the Technical Requirements Manual (TRM) Section 3.7.200, *Atmospheric Dump Valves (ADVs)*, requirement for two ADV lines per steam generator to be operable. This requirement had been included in the TRM as an interim action until the Technical Specifications were changed. Since License Amendment (LA) 191, dated April 11, 2013, has been issued by the NRC; this TRM requirement is no longer needed and is being deleted. LA 191 requires four ADV lines be OPERABLE when in Modes 1, 2, 3, and in Mode 4 when the steam generators are being used for heat removal.

LDCR 13-R002 removes TRM Sections 3.1.204, *Shutdown Control Element Assembly (CEA) Insertion Limits,* and TRM 3.1.205, *Regulating Control Element assembly (CEA) Groups Insertion Limits.* These sections of the TRM were added as an interim action until a non-conservative Technical Specification issue was resolved. LA 168 was issued by the NRC on July 25, 2007, which made the TRM sections unnecessary and as a result, they are being deleted. This is a corrective action from CRDR 4402533.

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Instructions

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# Technical Requirements Manual

Revision 58
July 03, 2013

PALO VERDE

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T3.7 PLANT SYSTEMS

## T3.7.200 Atmospheric Dump Valves (ADVs)

TLCO 3.7.200 Refer to PVNGS Technical Specification LCO 3.7.4.

APPLICABILITY: Refer to PVNGS Technical Specification LCO 3.7.4.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. Requirements of TSR 3.7.200.1 not met. | A.1 Document the condition in the corrective action program and initiate an operability determination, as necessary, to determine the impact on equipment in the technical specifications. | Immediately |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | FREQUENCY |
|---|---|
| TSR 3.7.200.1 Verify that the nitrogen accumulator tank is at a pressure ≥ 615 PSIG indicated. | 24 hours |

**TRM SPECIFICATION BASES**

T3.1.200 Shutdown Margin - Reactor Trip Breakers Closed
(See the ITS 3.1.2 Specification Bases.)

T3.1.201 This TRM specification is not used and is intentionally left blank.

T3.1.202 Control Element Assembly - Alignment
(See the ITS 3.1.5 Specification Bases.)

T3.1.203 Control Element Assembly - Drop Time
(See the ITS 3.1.5 Specification Bases.)

T3.2.200 Azimuthal Power Tilt - $T_q$

The limitations on the AZIMUTHAL POWER TILT are provided to ensure that design safety margins are maintained. An AZIMUTHAL POWER TILT greater than the limit specified in the CORE OPERATING LIMITS REPORT with COLSS in service or 0.03 with COLSS out of service is not expected and if it should occur, operation is restricted to only those conditions required to identify the cause of the tilt. The tilt is normally calculated by COLSS. A minimum core power of 20% of RATED THERMAL POWER is assumed by the CPCs in its input to COLSS for calculation of AZIMUTHAL POWER TILT. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The surveillance requirements specified when COLSS is out of service provide an acceptable means of detecting the presence of a steady-state tilt. It is necessary to explicitly account for power asymmetries because the radial peaking factors used in the core power distribution calculations are based on an untilted power distribution.

The AZIMUTHAL POWER TILT is equal to $(P_{tilt}/P_{untilt})-1.0$ where:

AZIMUTHAL POWER TILT is measured by assuming that the ratio of the power at any core location in the presence of a tilt to the untilted power at the location is of the form:

$P_{tilt}/P_{untilt} = 1 + T_q \; g \cos(\text{Theta} - \text{Theta}_0)$

where:

$T_q$ is the peak fractional tilt amplitude at the core periphery
g is the radial normalizing factor
Theta is the azimuthal core location

(continued)

$Theta_o$ is the azimuthal core location of maximum tilt

$P_{tilt}/P_{untilt}$ is the ratio of the power at a core location in the presence of a tilt to the power at that location with no tilt.

The AZIMUTHAL POWER TILT allowance used in the CPCs is defined as the value of CPC addressable constant TR-1.0.

T3.3.100 Supplementary Protection System (SPS) Instrumentation

The OPERABILITY of the reactor protective and Engineered Safety Features Actuation Systems instrumentation and bypasses ensures that (1) the associated Engineered Safety Features Actuation action and/or reactor trip will be initiated when the parameter monitored by each channel or combination thereof reaches its setpoint, (2) the specified coincidence logic is maintained, (3) sufficient redundancy is maintained to permit a channel to be out of service for testing or maintenance, and (4) sufficient system functional capability is available from diverse parameters.

The OPERABILITY of these systems is required to provide the overall reliability, redundancy, and diversity assumed available in the facility design for the protection and mitigation of accident and transient conditions. The integrated operation of each of these systems is consistent with the assumptions used in the safety analyses.

The quarterly frequency for the channel functional tests for these systems is based on the analyses presented in the NRC approved topical report CEN-327-A, "RPS/ESFAS Extended Test Interval Evaluation," and CEN-327-A, Supplement 1, and calculation 13-JC-SB-200-Rev. 01.

The verification of response time at the specified frequencies provides assurance that the protective and ESF action function associated with each channel is completed within the time limit assumed in the safety analyses. The instrumentation response times are made up of the time to generate the trip signal at the detector (sensor response time) and the time for the signal to interrupt power to the CEA drive mechanism (signal or trip delay time).

Response time may be verified by any series of sequential, overlapping or total channel measurements, including allocated sensor response time, such that the response time is verified. Allocations for sensor response times may be obtained from records of test results, vendor test data, or vendor engineering specifications. Topical Report CE NPSD-1167-A, "Elimination of

(continued)

**TRM SPECIFICATION BASES**

Pressure Sensor Response Time Testing Requirements," provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the Topical Report. Response time verification for other sensor types must be demonstrated by test. The allocation of sensor response times must be verified prior to placing a new component in operation and reverified after maintenance that may adversely affect the sensor response time.

T3.3.101 Radiation Monitoring Instrumentation

The OPERABILITY of the radiation monitoring channels ensures that: (1) the radiation levels are continually measured in the areas served by the individual channels and (2) the alarm or automatic action is initiated when the radiation level trip setpoint is exceeded.

T3.3.102 Incore Detectors

The OPERABILITY of the incore detectors with the specified minimum complement of equipment ensures that the measurements obtained from use of this system accurately represent the spatial neutron flux distribution of the reactor core.

T3.3.103 Seismic Monitoring

The OPERABILITY of the seismic instrumentation ensures that sufficient capability is available to promptly determine the magnitude of a seismic event and evaluate the response of those features important to safety. This capability is required to permit comparison of the measured response to that used in the design basis for the facility to determine if plant shutdown is required pursuant to Appendix A of 10 CFR Part 100. The instrumentation is consistent with the recommendations of Regulatory Guide 1.12, "Nuclear Power Plant Instrumentation for Earthquakes," Revision 2 as identified in the PVNGS FSAR.

T3.3.104 Meteorological Instrumentation

The OPERABILITY of the meteorological instrumentation ensures that sufficient meteorological data are available for estimating potential radiation doses to the public as a result of routine or accidental release of radioactive materials to the atmosphere. This capability is required to evaluate the need for initiating protective measures to protect the health and safety of the public and is consistent with the recommendations of Regulatory Guide 1.23

(continued)

**TRM SPECIFICATION BASES**

"Onsite Meteorological Programs," February 1972. Wind speeds less than 0.6 MPH cannot be measured by the meteorological instrumentation.

Surveillance requirement TSR 3.3.104.2 is modified by a NOTE to indicate that the windspeed sensors are excluded from the CHANNEL CALIBRATION. The device is fixed by design and no adjustments are possible.

T3.3.105 Post Accident Monitoring Instrumentation

The OPERABILITY of the post-accident monitoring instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess these variables following an accident. This capability is consistent with the recommendations of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Plants to Assess Plant Conditions During and Following an Accident," December 1975 and NUREG 0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations."

T3.3.106 Loose-Part Detection Instrumentation

The OPERABILITY of the loose-part detection instrumentation ensures that sufficient capability is available to detect loose metallic parts in the primary system and avoid or mitigate damage to primary system components. The allowable out-of-service times and surveillance requirements are consistent with the recommendations of Regulatory Guide 1.133, "Loose-Part Detection Program for the Primary System of Light-Water-Cooled Reactors," May 1981.

T3.3.107 Explosive Gas Monitoring System

The explosive gas instrumentation is provided for monitoring (and controlling) the concentrations of potentially explosive gas mixtures in the GASEOUS RADWASTE 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.

T3.3.108 Fuel Bldg Essential Ventilation Actuation Signal (FBEVAS)

The FBEVAS is an instrumentation channel that actuates the Fuel Building Essential Ventilation System (FBEVS) to minimize radioactive material released from an irradiated fuel assembly during a Fuel Handling Accident.

TLCO 3.3.108 requires one channel of FBEVAS which includes the Actuation Logic, Manual Trip, and radiation monitor to be OPERABLE.

(continued)

**TRM SPECIFICATION BASES**

The cross-train trip function is provided as a defense-in-depth capability and is not required for FBEVAS channel operability.

During movement of irradiated fuel assemblies in the fuel building with the required FBEVAS channel inoperable, an OPERABLE FBEVS train must be immediately placed in the emergency mode of operation (i.e., fan running, valves/dampers aligned to the post-FBEVAS mode, etc.) or movement of irradiated fuel assemblies must be suspended immediately. The first action ensures that no undetected failures preventing FBEVS system operation will occur, and that any active failure will be readily detected. If an OPERABLE FBEVS train is not placed in the emergency mode of operation, this action requires suspension of the movement of irradiated fuel assemblies in order to minimize the risk of release of radioactivity that might require the actuation FBEVS. This does not preclude the movement of fuel to a safe position.

Movement of spent fuel casks containing irradiated fuel assemblies is not within the scope of the Applicability of this technical specification. The movement of dry casks containing irradiated fuel assemblies will be done with a single-failure-proof handling system and with transport equipment that would prevent any credible accident that could result in a release of radioactivity.

T3.3.200 RPS Instrumentation - Operating
(See the ITS 3.3.1 Specification Bases.)

If a valid CPC cabinet high temperature alarm is received, it is possible for an OPERABLE CPC and CEAC to be affected and not be completely reliable. Therefore, a CHANNEL FUNCTIONAL TEST must be performed on OPERABLE CPCs and CEACs within 12 hours. The Completion Time of 12 hours is adequate considering the low probability of undetected failure, the consequences of a single channel failure, and the time required to perform a CHANNEL FUNCTIONAL TEST.

T3.4.100 Auxiliary Spray System

The auxiliary pressurizer spray is required to depressurize the RCS by cooling the pressurizer steam space to permit the plant to enter shutdown cooling. The auxiliary pressurizer spray is required during those periods when normal pressurizer spray is not available, such as during natural circulation and during the later stages of a normal RCS cooldown. The auxiliary pressurizer spray also distributes boron to the pressurizer when normal pressurizer spray is not available.

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## TRM SPECIFICATION BASES

### T3.4.101 RCS Chemistry

The limitations on Reactor Coolant System chemistry ensure that corrosion of the Reactor Coolant System is minimized and reduces the potential for Reactor Coolant System leakage or failure due to stress corrosion. Maintaining the chemistry within the Steady State Limits provides adequate corrosion protection to ensure the structural integrity of the Reactor Coolant System over the life of the plant. The associated effects of exceeding the oxygen, chloride, and fluoride limits are time and temperature dependent. Corrosion studies show that operation may be continued with contaminant concentration levels in excess of the Steady State Limits, up to the Transient Limits, for the specified limited time intervals without having a significant effect on the structural integrity of the Reactor Coolant System. The time interval permitting continued operation within the restrictions of the Transient Limits provides time for taking corrective actions to restore the contaminant concentrations to within the Steady State Limits.

The surveillance requirements provide adequate assurance that concentrations in excess of the limits will be detected in sufficient time to take corrective action.

### T3.4.102 Pressurizer Heatup and Cooldown Limits

The limitations imposed on the pressurizer heatup and cooldown rates and spray water temperature differential are provided to assure that the pressurizer is operated within the design criteria assumed for the fatigue analysis performed in accordance with the ASME Code Requirements.

### T3.4.103 Intentionally Blank

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**TRM SPECIFICATION BASES**

T3.4.104 RCS Vents (Reactor Head Vents)

Reactor Coolant System vents are provided to exhaust noncondensible gases and/or steam from the primary system that could inhibit natural circulation core cooling. The OPERABILITY of at least one Reactor Coolant System vent path from the reactor vessel head ensures the capability exists to perform this function.

A vent path is the flow capability from the reactor vessel head to the reactor drain tank (RDT) or from the reactor vessel head to containment atmosphere. The four vent paths are:

1. From the reactor vessel head through solenoid operated valve (SOV) HV-101, then through SOV HV-105 to the RDT.
2. From the reactor vessel head through SOV HV-101, then through SOV HV-106 directly to containment atmosphere.
3. From the reactor vessel head through SOV HV-102, then through SOV HV-105 to the RDT.
4. From the reactor vessel head through SOV HV-102, then through SOV HV-106 directly to containment atmosphere.

The valve redundancy of the Reactor Coolant System vent paths serves to minimize the probability of inadvertent or irreversible actuation while ensuring that a single failure of a vent valve, power supply, or control system does not prevent isolation of the vent path.

The function, capabilities, and testing requirements of the Reactor Coolant System vent systems are consistent with the requirements of Item II.B.1 of NUREG-0737.

T3.4.200 RCS Pressure and Temperature (P/T) Limits
(See the ITS 3.4.3 Specification Bases.)

T3.4.201 Pressurizer

An OPERABLE pressurizer provides pressure control for the Reactor Coolant System during operations with both forced reactor coolant flow and with natural circulation flow. The minimum water level in the pressurizer assures the pressurizer heaters, which are required to achieve and maintain pressure control, remain covered with water to prevent failure, which could occur if the heaters were energized uncovered. The maximum water level in the pressurizer ensures that this parameter is maintained within the envelope of operation assumed in the safety analysis. The maximum water level also ensures that the RCS is not a hydraulically solid system and that a steam

(continued)

**TRM SPECIFICATION BASES**

bubble will be provided to accommodate pressure surges during operation. The steam bubble also protects the pressurizer code safety valves against water relief. The requirement to verify that on an Engineered Safety Features Actuation test signal concurrent with a loss-of-offsite power the pressurizer heaters are automatically shed from the emergency power sources is to ensure that the non-Class 1E heaters do not reduce the reliability of or overload the emergency power source. The requirement that a minimum number of pressurizer heaters be OPERABLE enhances the capability to control Reactor Coolant System pressure and establish and maintain natural circulation.

T3.4.202 Pressurizer Vents
(See the ITS 3.4.12 specification Bases.)

T3.4.203 RCS Operational LEAKAGE
(See the ITS 3.4.14 Specification Bases.)

T3.4.204 RCS PIV Leakage
(See the ITS 3.4.15 Specification Bases.)

T3.5.200 Safety Injection Tanks
(See the ITS 3.5.1 and 3.5.2 Specification Bases.)

T3.5.201 Shutdown Cooling System

The OPERABILITY of two separate and independent shutdown cooling subsystems ensures that the capability of initiating shutdown cooling exists when required assuming the most limiting single failure occurs. The requirement to verify the functionality of an inoperable shutdown cooling subsystem minimizes the time exposure of the plant to an event requiring shutdown concurrent with the failure of a component on the other shutdown cooling subsystem.

The shutdown cooling subsystem operation is described in UFSAR 5.4.7. Many of the components comprising the shutdown cooling system have specific requirements during Modes 1-3 in the Technical Specifications (e.g., emergency core cooling, containment spray, and containment isolation). However, several components do not have specific operability requirements in Technical Specifications, and some components function differently in their shutdown cooling role than they do when performing the other functions required by Technical Specifications. These factors must be considered when determining the OPERABILITY and/or functionality of the shutdown cooling subsystems.

The safety analysis assumes that shutdown cooling may be placed in operation once cold leg temperature is less than or equal to 350°F and pressurizer pressure is less than approximately 400 psia. Additional information

(continued)

**TRM SPECIFICATION BASES**

regarding the shutdown cooling system is in UFSAR Section 9.3.4. Since the subsystem is manually initiated, temporary changes in the position of shutdown cooling system valves from their normal line up do not necessarily make them inoperable with respect to their shutdown cooling safety function.

The action for one shutdown cooling subsystem inoperable requires verification that the inoperable subsystem is still functional. Functionality requires the subsystem to be capable of performing its safety function given a transient (e.g. Small Break LOCA, SGTR). Functionality will be established utilizing the Operability Determination Program. The allowed outage time is consistent with the durations permitted for those major shutdown cooling components whose operability is controlled by Technical Specifications. The specified outage time allows a reasonable opportunity to effect repairs while providing acceptable limits for the duration of intervals where the system may not be OPERABLE. In combination with the maintenance rule requirements in 10 CFR 50.65, the allowed outage times help ensure that the shutdown cooling subsystems will be functional when required.

If the subsystem cannot be restored or functionality verified within the stated time frame, the associated ACTION places the unit in Mode 4 where the steam generators are still available for heat removal and the stored energy of the NSSS is much less than it is during power operation. While in Modes 3 and 4 continued actions to restore the subsystem to OPERABLE are required.

The action for both shutdown cooling subsystems inoperable require verification of functionality of at least one subsystem within 7 hours. The shorter duration is consistent with the increased safety consequences that exist when the equipment required to establish cold shutdown conditions is inoperable. If at least one subsystem cannot be restored or verified functional within 7 hours, the associated ACTION again places the unit in Mode 4 where the steam generators are available for heat removal and the stored energy in the NSSS is minimized. While in Mode 3 and 4 continued actions to restore the required subsystems to OPERABLE are required.

The surveillance requirement to place each train of shutdown cooling in service every refueling interval demonstrates that the subsystems are functional. In combination with other testing performed to support Technical Specifications, including that conducted as part of the in-service testing and inspection programs, the specified surveillances provide reasonable assurance that the system will be able to perform its intended safety functions.

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The SDC systems are normally in a standby, nonoperating mode. As such, flow path piping has the potential to develop voids and pockets of entrained gases. The method of ensuring that any voids or pockets of gases are removed from the shutdown cooling suction piping is to vent the accessible suction piping high points, which is controlled by PVNGS procedures. Maintaining the shutdown cooling system suction piping full of water ensures the system will perform properly by minimizing the potential for degraded pump performance, preventing pump cavitation, and preventing pumping of noncondensible gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel during SDC. The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC piping and the adequacy of the procedural controls governing system operation.

References:

1. UFSAR Sections 5.4.7 and 9.3.4

2. Combustion Engineering Owners Group Joint Applications Report for Low Pressure Safety Injection System AOT Extension, CE NPSD-995, dated May 1995, as submitted to NRC in APS letter no. 102-03392, dated June 13, 1995, with updates described in letter no. 102-04250 dated February 26, 1999. Also see TS amendment no. 124 dated February 1, 2000.

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**TRM SPECIFICATION BASES**

T3.5.202 ECCS - Operating
(See the ITS 3.5.3 Specification Bases.)

SURVEILLANCE REQUIREMENT

TSR 3.5.202.4

Maintaining the ECCS suction piping full of water from the Refueling Water Tank and the containment sump to the ECCS pumps ensures that the system will perform properly by minimizing the potential for degraded pump performance. The 31 day frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the adequacy of procedural controls governing system operation.

T3.5.203 ECCS - Shutdown
(See the ITS 3.5.4 Specification Bases.)

T3.6.100 Hydrogen Purge Cleanup System

The OPERABILITY of the equipment and systems required for the control of hydrogen gas ensures that this equipment will be available to maintain the hydrogen concentration within containment below its flammable limit during post-LOCA conditions. The purge system is capable of controlling the expected hydrogen generation associated with (1) zirconium-water reactions, (2) radiolytic decomposition of water and (3) corrosion of metals within containment. The hydrogen control system is consistent with the recommendations of Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following a LOCA," March 1971.

The use of ANSI Standard N509 (1980) in lieu of ANSI Standard N509 (1976) to meet the guidance of Regulatory Guide 1.52, Revision 2, Positions C.6.a and C.6.b, has been found acceptable as documented in Revision 2 to Section 6.5.1 of the Standard Review Plan (NUREG-0800).

T3.6.200 Prestressed Concrete Containment Tendon Surveillance

The prestressed concrete containment tendon surveillance program ensures the structural integrity of containment is maintained in accordance with ASME Code Section XI, Subsection IWL of the ASME Boiler and Pressure Vessel Code and applicable addenda as required by 10 CFR 50.55a, except where an exemption or relief has been authorized by the NRC.

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**TRM SPECIFICATION BASES**

T3.6.201 Containment Spray System

The containment system is normally in a standby, nonoperating mode. As such, flow path piping has the potential to develop voids and pockets of entrained gases. The method of ensuring that any voids or pockets of gases are removed from the containment spray suction piping is to vent the accessible suction piping high points, which is controlled by PVNGS procedures. Maintaining the containment spray system suction piping full of water ensures the system will perform properly by minimizing the potential for degraded pump performance, preventing pump cavitation, and preventing delay of spray delivery to the containment atmosphere. The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the containment spray piping and the adequacy of the procedural controls governing system operation.

T3.6.300 Hydrogen Recombiners

BACKGROUND

The function of the hydrogen recombiners is to eliminate the potential breach of containment due to a hydrogen oxygen reaction. Per 10 CFR 50.44, "Standards for Combustible Gas Control Systems in Light-Water-Cooled Reactors" (Ref. 1), and 10 CFR 50, GDC 41, "Containment Atmosphere Cleanup" (Ref. 2), hydrogen recombiners are required to reduce the hydrogen concentration in the containment following a Loss Of Coolant Accident (LOCA) or Main Steam Line Break (MSLB). The recombiners accomplish this by recombining hydrogen and oxygen to form water vapor. The vapor remains in containment, thus eliminating any discharge to the environment. The hydrogen recombiners are manually initiated since flammability limits would not be reached until several days after a Design Basis Accident (DBA).

Two 100% capacity independent hydrogen recombiners are shared among the three units. Each consists of controls, a power supply, and a recombiner located in the Auxiliary Building. Recombination is accomplished by heating a hydrogen air mixture above 1150°F. The resulting water vapor and discharge gases are cooled prior to discharge from the recombiner. Air flows through the unit at 50 cfm with a 5 hp centrifugal blower in the unit providing the motive force. A single recombiner is capable of maintaining the hydrogen concentration in containment below the 4.0 volume percent (v/o) flammability limit. Two recombiners are provided to meet the requirement for redundancy and independence. Each recombiner is powered from a separate Engineered Safety Features bus.

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**TRM SPECIFICATION BASES**

| | |
|---|---|
| APPLICABLE SAFETY ANALYSES (continued) | The hydrogen recombiners provide for controlling the bulk hydrogen concentration in containment to less than the lower flammable concentration of 4.0 v/o following a DBA. This control would prevent a containment wide hydrogen burn, thus ensuring the pressure and temperature assumed in the analysis are not exceeded and minimizing damage to safety related equipment located in containment. The limiting DBA relative to hydrogen generation is a LOCA.<br><br>Hydrogen may accumulate within containment following a LOCA as a result of:<br><br>a. A metal steam reaction between the zirconium fuel rod cladding and the reactor coolant;<br><br>b. Radiolytic decomposition of water in the Reactor Coolant System (RCS) and the containment sump;<br><br>c. Hydrogen in the RCS at the time of the LOCA (i.e., hydrogen dissolved in the reactor coolant and hydrogen gas in the pressurizer vapor space); or<br><br>d. Corrosion of metals exposed to Containment Spray System and Emergency Core Cooling Systems solutions.<br><br>To evaluate the potential for hydrogen accumulation in containment following a LOCA, the hydrogen generation as a function of time following the initiation of the accident is calculated. Conservative assumptions recommended in Reference 3 are used to maximize the amount of hydrogen calculated. |
| TLCO | Two hydrogen recombiners shared among the three units must be OPERABLE. This ensures operation of at least one hydrogen recombiner in the event of a worst case single active failure.<br><br>Operation with at least one hydrogen recombiner ensures that the post LOCA hydrogen concentration can be prevented from exceeding the flammability limit. |

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APPLICABILITY

In MODES 1 and 2, two hydrogen recombiners are required to control the post LOCA hydrogen concentration within containment below its flammability limit of 4.0 v/o, assuming a worst case single failure.

In MODES 3 and 4, both the hydrogen production rate and the total hydrogen produced after a LOCA would be less than that calculated for the DBA LOCA. Also, because of the limited time in these MODES, the probability of an accident requiring the hydrogen recombiners is low. Therefore, the hydrogen recombiners are not required in MODE 3 or 4.

In MODES 5 and 6, the probability and consequences of a LOCA are low, due to the pressure and temperature limitations. Therefore, hydrogen recombiners are not required in these MODES.

ACTIONS

The required ACTIONS have been modified by a Note stating that all three PVNGS Units (Units 1, 2, and 3) shall simultaneously comply with the REQUIRED ACTION(s) when the shared portion of the hydrogen recombiner(s) is the cause of a CONDITION. This is necessary since the three PVNGS Units share the two hydrogen recombiners that are required by this LCO. It will be necessary for the Control Room of the Palo Verde Unit that discovers an inoperable shared portion of the hydrogen recombiner(s) to notify the other two Palo Verde Unit's Control Rooms of the inoperability.

A.1

With one containment hydrogen recombiner inoperable, the inoperable recombiner must be restored to OPERABLE status within 30 days. In this condition, the remaining OPERABLE hydrogen recombiner is adequate to perform the hydrogen control function. The 30 day Completion Time is based on the availability of the other hydrogen recombiner, the small probability of a LOCA or MSLB occurring (that would generate an amount of hydrogen that exceeds the flammability limit), and the amount of time available after a LOCA or MSLB (should one occur) for operator action to prevent hydrogen accumulation from exceeding the flammability limit.

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## TRM SPECIFICATION BASES

ACTIONS (continued)

B.1 and B.2

With two hydrogen recombiners inoperable, the ability to perform the hydrogen control function via alternate capabilities must be verified by administrative means within 1 hour. The alternate hydrogen control capabilities are provided by the Hydrogen Purge Cleanup System. The 1 hour Completion Time allows a reasonable period of time to verify that a loss of hydrogen control function does not exist. In addition, the alternate hydrogen control system capability must be verified every 12 hours thereafter to ensure its continued availability. Both the initial verification and all subsequent verifications may be performed as an administrative check, by examining logs or other information to determine the availability of the alternate hydrogen control system. It does not mean to perform the Surveillances needed to demonstrate OPERABILITY of the alternate hydrogen control system. If the ability to perform the hydrogen control function is maintained, continued operation is permitted with two hydrogen recombiners inoperable for up to 7 days.

Seven days is a reasonable time to allow two hydrogen recombiners to be inoperable because the hydrogen control function is maintained and because of the low probability of the occurrence of a LOCA that would generate hydrogen in amounts capable of exceeding the flammability limit.

C.1

If the inoperable hydrogen recombiner(s) cannot be restored to OPERABLE status within the required Completion Time. TLCO 3.0.100.3 must be entered immediately

SURVEILLANCE REQUIREMENTS

SR 3.6.7.1

This SR ensures that there are no physical problems that could affect recombiner operation. A visual inspection is sufficient to determine abnormal conditions that could cause failures. The 6 month Frequency for this SR was developed considering that the incidence of hydrogen recombiners failing the SR in the past is low.

SR 3.6.7.2

A functional test of each Hydrogen Recombiner System assures that the recombiners remain operational. The functional test shall include operating the recombiner including the air blast heat exchanger fan motor and enclosed blower motor

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## TRM SPECIFICATION BASES

continuously for at least 30 minutes at a temperature of approximately 800°F reaction chamber temperature. The frequency recommended for this surveillance in the Improved Standard Technical Specifications (NUREG-1432, Rev. 1) is 18 months. The bases for NUREG 1432 was developed for permanently installed hydrogen recombiners. The two portable hydrogen recombiners at PVNGS are shared among the three units; therefore, the 6 month frequency from the initial licensing basis is retained for reliability considerations.

SR 3.6.7.3

Performance of a CHANNEL CALIBRATION to include a system functional test for each hydrogen recombiner ensures that the recombiners are operational and can attain and sustain the temperature necessary for hydrogen recombination. In particular, this SR requires 1) resistance checks of motors, thermocouples, and heater systems, 2) testing/calibration of all flow elements, switches, and temperature elements, and 3) operation of the recombiner to include a functional test at 1200°F (±50°F) for at least 4 hours. Operating experience has shown that these components usually pass the Surveillance when performed at the 12 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. 10 CFR 50.44.
2. 10 CFR 50, Appendix A, GDC 41.
3. Regulatory Guide 1.7, Revision 0.
4. UFSAR, Section 6.2.5

T3.7.100 Steam Generator Pressure and Temperature Limitations

The limitation on steam generator pressure and temperature ensures that the pressure induced stresses in the steam generators do not exceed the maximum allowable fracture toughness stress limits. The limitations to 120°F and 230 psig for Units 1 and 3 are based on a steam generator RTNDT of 40°F and are sufficient to prevent brittle fracture. The limitations to 70°F and 650 psig for Unit 2 are based on a steam generator RTNDT of -20°F and are sufficient to prevent brittle fracture.

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T3.7.101 Snubbers

All snubbers are required to be able to perform their associated safety function(s) to ensure that the structural integrity of the reactor coolant system and all other safety-related systems is maintained during and following a seismic or other event initiating dynamic loads. Snubbers excluded from this inspection program are those installed on nonsafety-related systems and then only if their failure or failure of the system on which they are installed, would have no adverse effect on any safety-related system.

When one or more snubbers are unable to perform their associated safety function(s), either the supported system must be declared inoperable immediately or TS LCO 3.0.8 must be entered. TS LCO 3.0.8 may only be entered if the restrictions described in the LCO 3.0.8 TS Bases are met. TS LCO 3.0.8 is an allowance, not a requirement. When any snubber is unable to perform its associated safety function, the supported system may be declared inoperable instead of utilizing LCO 3.0.8.

Required Action A.2 must be completed whenever Condition A is entered. This Required Action emphasizes the need to perform the evaluation to determine if the components to which the nonfunctional snubbers are attached were adversely affected by the non-functionality of the snubbers in order to ensure that the component remains capable of meeting the designed service. Restoration alone per Required Action A.1.1 or A.1.2 is insufficient because higher than analyzed stresses may have occurred and may have affected the supported system.

A list of individual snubbers with detailed information of snubber location and size and of system affected shall be available at the plant in accordance with Section 50.71(c) of 10 CFR Part 50. The accessibility of each snubber shall be determined and approved by the Plant Review Board. The determination shall be based upon the existing radiation levels and the expected time to perform a visual inspection in each snubber location as well as other factors associated with accessibility during plant operations (e.g., temperature, atmosphere, location, etc.), and the recommendations of Regulatory Guides 8.8 and 8.10. The addition or deletion of any hydraulic or mechanical snubber shall be made in accordance with Section 50.59 of 10 CFR Part 50.

The acceptance criteria specified in the 2001 Edition, 2003 Addenda, of the ASME OM Code, Subsection ISTD are to be used in the visual inspection to determine the functionality of the snubbers.

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**TRM SPECIFICATION BASES**

To provide assurance of snubber functional reliability one of the two functional testing methods specified in the 2001 Edition, 2003 Addenda, of the AMSE OM Code, Subsection ISTD, shall be utilized.

The service life of a snubber is established via manufacturer input and information through consideration of the snubber service conditions and associated installation and maintenance records (newly installed snubber, seal replaced, spring replaced, in high radiation area, in high temperature area, etc.). The requirement to monitor the snubber service life is included in the 2001 Edition, 2003 Addenda, of the ASME OM Code, Subsection ISTD to ensure that the snubbers periodically undergo a performance evaluation in view of their age and operating conditions. These records will provide statistical bases for future consideration of snubber service life.

T3.7.102 Sealed Source Contamination

The limitations on removable contamination for sources requiring leak testing, including alpha emitters, is based on 10 CFR 70.39(c) limits for plutonium. This limitation will ensure that leakage from byproduct, source, and special nuclear material sources will not exceed allowable intake values.

Sealed sources are classified into three groups according to their use, with surveillance requirements commensurate with the probability of damage to a source in that group. Those sources which are frequently handled are required to be tested more often than those which are not. Sealed sources which are continuously enclosed within a shielded mechanism (i.e. sealed sources within radiation monitoring or boron measuring devices) are considered to be stored and need not be tested unless they are removed from the shield mechanism.

T3.7.200 Atmospheric Dump Valves (ADVs)

| | |
|---|---|
| Background | See TS Bases B 3.7.4 |
| Applicable Safety Analyses | TS Bases B 3.7.4. |
| Actions | <u>A.1</u><br><br>If the requirements of TSR 3.7.200 are not met, the condition must be documented in the corrective action program and an operability determination must be initiated as necessary to determine the impact on equipment in the |

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TSs. This action is required to assure compliance with the TSs.

Surveillance Requirements

TSR 3.7.200.1

The nitrogen accumulator tank pressure must be verified to have a pressure of at least 615 psig indicated to ensure that it has sufficient pressurized gas to operate the ADVs for 4 hours at hot standby plus 9.3 hours of operation to reach cold shutdown under natural circulation conditions in the event of failure of the normal control air system, as described in UFSAR 10.3.2.2.4 and based on the RSB 5-1 cooldown evaluation in UFSAR Appendix 5C.

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T3.7.201 AFW System
(See the ITS 3.7.5 Specification Bases.)

T3.7.202 Essential Cooling Water (EW) System
(See the ITS 3.7.7 Specification Bases.)

T3.7.203 Essential Spray Pond System (ESPS)
(See the ITS 3.7.8 Specification Bases.)

T3.7.204 Essential Chilled Water (EC) System
(See the ITS 3.7.10 Specification Bases.)

T3.7.205 Control Room Emergency Air Temperature Control System (CREATCS)
(See the ITS 3.7.12 Specification Bases.)

T3.7.206 Fuel Storage Pool Water Level
(See the ITS 3.7.14 Specification Bases.)

T3.7.207 Secondary Specific Activity
(See the ITS 3.7.16 Specification Bases.)

T3.8.100 Cathodic Protection

If any other metallic structures (e.g., buildings, new or modified piping systems, conduit) are placed in the ground in the vicinity of the fuel oil storage system or if the original system is modified, the adequacy and frequency of inspections of the cathodic protection system shall be re-evaluated and adjusted in accordance with Regulatory Guide 1.137.

T3.8.101 Containment Penetration Conductor Overcurrent Protective Devices

Containment electrical penetrations and penetration conductors are protected by either deenergizing circuits not required during reactor operation or by demonstrating the OPERABILITY of primary and backup overcurrent protection circuit breakers during periodic surveillance. The circuit breakers will be tested in accordance with NEMA Standard Publication No. AB-2-1980. For a frame size of 250 amperes or less, the field tolerances of the high and low setting of the injected current will be within +40%/-25% of the setpoint (pickup) value. For a frame size of 400 amperes or greater, the field tolerances will be ±25% of the setpoint (pickup) value. The circuit breakers should not be affected when tested within these tolerances.

The surveillance requirements applicable to lower voltage circuit breakers provide assurance of breaker reliability by testing at least one

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representative sample of each manufacturer's brand of circuit breaker. Each manufacturer's molded case and metal case circuit breakers are grouped into representative samples which are then tested on a rotating basis to ensure that all breakers are tested. If a wide variety exists within any manufacturer's brand of circuit breakers it is necessary to divide that manufacturer's breakers into groups and treat each group as a separate type of breaker for surveillance purposes. There are no surveillance requirements on fuses. For in-line fuses, the applicable surveillance would require removing the fuses from the circuit which would destroy the fuse. The test data for surveillance on the other fuses would not indicate whether the fuse was degrading which has been stated by the fuse manufacturer and Idaho National Engineering Laboratory.

T3.8.102 MOV Thermal Overload Protection and Bypass Devices

The OPERABILITY of the motor-operated valves thermal overload protection and/or bypass devices ensures that these devices will not prevent safety related valves from performing their function. The surveillance requirements for demonstrating the OPERABILITY of these devices are in accordance with Regulatory Guide 1.106, "Thermal Overload Protection for Electric Motors on Motor Operated Valves," Revision 1, March 1977.

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## TRM SPECIFICATION BASES

T3.8.200 AC Sources - Shutdown

(See the ITS 3.8.2 Specification Bases.)

T3.9.100 Decay Time

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the safety analyses.

T3.9.101 Communications

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity condition during CORE ALTERATIONS.

T3.9.102 Refueling Machine

The OPERABILITY requirements for the refueling machine ensure that: (1) the machine will be used for movement of fuel assemblies, (2) the machine has sufficient load capacity to lift a fuel assembly, and (3) the core internals and pressure vessel are protected from excessive lifting force in the event they are inadvertently engaged during lifting operations.

T3.9.103 Crane Travel

The restriction on movement of loads in excess of the nominal weight of a fuel assembly, CEA and associated handling tool over other fuel assemblies in the storage pool ensures that in the event this load is dropped (1) the activity release will be limited to that contained in a single fuel assembly, and (2) any possible distortion of fuel in the storage racks will not result in a critical array. This assumption is consistent with the activity release assumed in the safety analyses. However, the use of a single failure-proof crane to move spent fuel cask components over irradiated fuel stored in an approved cask is allowed by this LCO.

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T3.9.104 Fuel Building Essential Ventilation System (FBEVS)

The limitations on the fuel building essential ventilation system ensure that all radioactive material released from an irradiated fuel assembly will be filtered through the HEPA filters and charcoal adsorber prior to discharge to the atmosphere. The OPERABILITY of this system and the resulting iodine removal capacity are consistent with the assumptions of the safety analyses.

If one FBEVS train is inoperable, action must be taken to immediately verify that the OPERABLE FBEVS is capable of being powered from an emergency power source and to restore the inoperable train to OPERABLE status within 7 days. During this time period, the remaining OPERABLE train is adequate to perform the FBEVS function. The 7 day Completion Time is reasonable, based on the risk from an event occurring requiring the inoperable FBEVS train, and ability of the remaining FBEVS train to provide the required protection.

During movement of irradiated fuel assemblies in the fuel building, if the Required Actions of Condition A cannot be completed within the required Completion Time, the operation (i.e., fan running, valves/dampers aligned to the post-FBEVAS mode, etc.) or movement of irradiated fuel assemblies must be suspended immediately. The first action ensures that the remaining train is OPERABLE, that no undetected failures preventing system operation will occur, and that any active failure will be readily detected. If the system is not placed in the emergency mode of operation, this action requires suspension of the movement of irradiated fuel assemblies in order to minimize the risk of release of radioactivity that might require the actuation of FBEVS. This does not preclude the movement of fuel to a safe position.

Movement of spent fuel casks containing irradiated fuel assemblies is not within the scope of the Applicability of this technical specification. The movement of dry casks containing irradiated fuel assemblies will be done with a single-failure-proof handling system and with transport equipment that would prevent any credible accident that could result in a release of radioactivity.

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**TRM SPECIFICATION BASES**

When two trains of the FBEVS are inoperable during movement of irradiated fuel assemblies in the fuel building, action must be taken to place the unit in a condition in which the LCO does not apply. This LCO involves immediately suspending movement of irradiated fuel assemblies in the fuel building. This does not preclude the movement of fuel to a safe position.

The use of ANSI Standard N509 (1980) in lieu of ANSI Standard N509 (1976) to meet the guidance of Regulatory Guide 1.52, Revision 2, Positions C.6.a and C.6.b, has been found acceptable as documented in Revision 2 to Section 6.5.1 of the Standard Review Plan (NUREG-0800).

T3.9.200 Boron Concentration
(See the ITS 3.9.1 Specification Bases.)

T3.9.201 Containment Penetrations
(See the ITS 3.9.3 Specification Bases.)

T3.10.200 Liquid Holdup Tanks

The tanks referred to in this specification include all those outdoor radwaste tanks that are not surrounded by liners, dikes, or walls capable of holding the tank contents and that do not have tank overflows and surrounding area drains connected to the liquid radwaste treatment system.

Restricting the quantity of radioactive material contained in the specified tanks provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than 10 times the limits of 10 CFR Part 20.1001-20.2402, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an UNRESTRICTED AREA.

The limit of 60 curies is based on the analyses given in Section 2.4 of the PVNGS FSAR and on the amount of soluble (not gaseous) radioactivity in the Refueling Water Tank in Table 2.4-26.

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T3.10.201 Explosive Gas Mixture

This specification is provided to ensure that the concentration of potentially explosive gas mixtures contained in the waste gas holdup system is maintained below the flammability limits of hydrogen and oxygen. (Automatic control features are included in the system to prevent the hydrogen and oxygen concentrations from reaching these flammability limits. These automatic control features include isolation of the source of hydrogen and/or oxygen, or injection of dilutants to reduce the concentration below the flammability limits.) Maintaining the concentration of hydrogen and oxygen below their flammability limits provides assurance that the releases of radioactive materials will be controlled in conformance with the requirements of General Design Criterion 60 of Appendix A to 10 CFR Part 50.

T3.10.202 Gas Storage Tanks

This specification considers postulated radioactive releases due to a waste gas system leak or failure, and limits the quantity of radioactivity contained in each pressurized gas storage tank in the GASEOUS RADWASTE SYSTEM to assure that a release would be substantially below the guidelines of 10 CFR Part 100 for a postulated event.

Restricting the quantity of radioactivity contained in each gas storage tank provides assurance that in the event of an uncontrolled release of the tank's contents, the resulting total body exposure to a MEMBER OF THE PUBLIC at the nearest exclusion area boundary will not exceed 0.5 rem. This is consistent with Standard Review Plan 11.3, Branch Technical Position ETSB 11-5, "Postulated Radioactive Releases Due to a Waste Gas System Leak or Failure," in NUREG-0800, July 1981.

T3.11.100 FIRE DETECTION INSTRUMENTATION

OPERABILITY of the fire detection instrumentation ensures that adequate warning capability is available for the prompt detection of fires and that fire suppression systems, that are actuated by fire detectors, will discharge extinguishing agent in a timely manner. Prompt detection and suppression of fires will reduce the potential for damage to safety-related equipment and is an integral element in the overall facility fire protection program.

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Fire detectors that are used to actuate fire suppression systems represent a more critically important component of a plant's fire protection program than detectors that are installed solely for early fire warning and notification. Consequently, the minimum number of OPERABLE fire detectors must be greater.

The loss of detection capability for fire suppression systems, actuated by fire detectors, represents a significant degradation of fire protection for any area. As a result, the establishment of a fire watch patrol must be initiated at an earlier stage than would be warranted for the loss of detectors that provide only early fire warning. The establishment of frequent fire patrols in the affected areas is required to provide detection capability until the inoperable instrumentation is restored to OPERABILITY.

When inoperable fire detection instrument(s) are inside containment, REQUIRED ACTIONs B.2 and C.2 require either (1) a fire watch patrol inspect the containment zone(s) with the inoperable instrument(s) at least once per 8 hours, or (2) monitor the containment air temperature at least once per hour at each of the 7 locations listed in the Bases for Technical Specification SR 3.6.5.1. The plant computer with the control room installed multi-point recorder and annunciator is an acceptable means of monitoring temperatures inside containment when required. The continuous monitoring of containment air temperature by the plant computer and multi-point recorder exceeds the requirement of hourly monitoring. The plant computer and multi-point recorder utilizes pre-set alarm points for each monitored location. If setpoints are exceeded, an audio annunciation is received that alerts the operator of an abnormal condition.

The fire zones listed in Table 3.3.11.100-1, Fire Detection Instruments, are discussed in Section 9B of the PVNGS UFSAR.

T3.11.101, 102, 103, 104, 105, and 106 FIRE SUPPRESSION SYSTEMS

The OPERABILITY of the fire suppression systems ensures that adequate fire suppression capability is available to confine and extinguish fires occurring in any portion of the facility where safety-related equipment is located. The fire suppression system consists of the water system, spray and/or sprinklers, CO2, Halon, fire hose stations, and yard fire hydrants and associated emergency response vehicles. The collective capability of the fire suppression systems is adequate to minimize potential damage to safety related equipment and is a major element in the facility fire protection program.

(continued)

**TRM SPECIFICATION BASES**

In the event that portions of the fire suppression systems are inoperable, alternate backup fire fighting equipment is required to be made available in the affected area(s) until the inoperable equipment is restored to service. When the inoperable fire fighting equipment is intended for use as a backup means of fire suppression, a longer period of time is allowed to provide an alternate means of fire fighting than if the inoperable equipment is the primary means of fire suppression.

The surveillance requirements provide assurance that the minimum OPERABILITY requirements of the suppression systems are met. An allowance is made for ensuring a sufficient volume of CO2/Halon in the CO2/Halon storage tank by verifying either the weight or the level of the tank. The interval for some required surveillances for CO2 and Halon systems is based on the statistical reliability methodology provided in Electric Power Research Institute (EPRI) Technical Report 1006756, Fire Protection Equipment Surveillance Optimization and Maintenance Guide. Component failure will be entered into the corrective action program for analysis and trending.

In the event the fire suppression water system becomes inoperable, immediate corrective measures must be taken since this system provides the major fire suppression capability of the plant.

3.11.107 FIRE-RATED ASSEMBLIES

The OPERABILITY of the fire barriers and barrier penetrations ensure that fire damage will be limited. These design features minimize the possibility of a single fire involving more than one fire area prior to detection and extinguishment. The fire barriers, fire barrier penetrations for conduits, cable trays and piping, fire dampers, and fire doors are periodically inspected and functionally tested to verify their OPERABILITY.