PVNGS Technical Specification Bases (TS Bases)
Revision 59
Replacement Pages and Insertion Instructions

The following LDCRs are included in this change:

LDCRs 09-B007 and 13-B004 reflect changes to the TS Bases Section 3.4.17, *RCS Specific Activity*, to conform to NRC approved License Amendment 192, dated November 25, 2013. The amendment revised the Technical Specifications (TSs) related to reactor coolant system (RCS) activity limits by replacing the current TS limits on primary coolant gross specific activity with limits on primary coolant noble gas activity. The noble gas activity reflects a new DOSE EQUIVALENT XE-133 definition that replaces the past E-Bar average disintegration energy definition in TS Section 1.1, *Definitions*. The changes are consistent with NRC-approved Industry/Technical Specifications Task Force (TSTF) Standard Technical Specification change traveler, TSTF-490, Revision 0, *Deletion of E-Bar Definition and Revision to RCS Specific Activity Technical Specifications*, with deviations.

LDCR 13-B003 clarified the Limiting Condition for Operation (LCO) descriptions for TS Bases Sections 3.7.7, *Essential Cooling Water (EW) System*, 3.7.8, *Essential Spray Pond System (ESPS)*, and 3.7.10, *Essential Chilled Water (EC) System*. Specifically, the following clarifying language was added:

> "Disassembly, removal of insulation, and other configuration changes to the isolated portions of an OPERABLE system must be explicitly evaluated for operability impact prior to executing any configuration changes of the OPERABLE system."

This clarifying information was added as a result of CRDR 4450413. In addition, a typographical error in the description of ACTION F.1, of TS Bases Section 3.7.2, *Main Steam Isolation Valves (MSIVs)*, identified in PVAR 4474037, is corrected in this LDCR. Specifically, the word "inoperable" was incorrectly typed as "operable" in TS Bases, Revision 40. This correction is consistent with LDCR 06-B023, dated November 7, 2006.

Instructions

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Revision 59
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PVNGS

Palo Verde Nuclear Generating Station
Units 1, 2, and 3

Technical Specification Bases

Revision 59
March 19, 2014

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BASES

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.17 RCS Specific Activity

BASES

BACKGROUND

The maximum dose that an individual at the exclusion area boundary can receive for 2 hours following an accident, or at the low population zone outer boundary for the radiological release duration, is specified in 10 CFR 100.11 (Ref. 1). Doses to control room operators must be limited per GDC 19. The limits on specific activity ensure that the offsite and control room doses are appropriately limited during analyzed transients and accidents.

The RCS specific activity LCO limits the allowable concentration level of radionuclides in the reactor coolant. The LCO limits are established to minimize the dose consequences in the event of a steam generator tube rupture (SGTR) accident.

The LCO contains specific activity limits for both DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133. The allowable levels are intended to ensure that offsite and control room doses meet the 10 CFR 100.11 (Ref. 1) and GDC 19 limits respectively.

APPLICABLE SAFETY ANALYSES

The LCO limits on the specific activity of the reactor coolant ensure that the resulting offsite and control room doses meet the 10 CFR 100.11 (Ref. 1) and GDC 19 limits following a SGTR accident. The safety analysis (Ref. 2) assumes the specific activity of the reactor coolant is at the LCO limits, and an existing reactor coolant steam generator (SG) tube leakage rate of 1.0 gpm exists. The safety analysis assumes the specific activity of the secondary coolant is at its limit of 0.1 μCi/gm DOSE EQUIVALENT I-131 from LCO 3.7.16, "Secondary Specific Activity."

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The analysis for a SGTR accident establishes the acceptance limits for RCS specific activity. Reference to this analysis is used to assess changes to the unit that could affect RCS specific activity, as they relate to the acceptance limits.

The safety analysis considers two cases of reactor coolant iodine specific activity. One case assumes specific activity at 1.0 μCi/gm DOSE EQUIVALENT I-131 with a concurrent large iodine spike that increases the rate of release of iodine from the fuel rods containing cladding defects to the primary coolant immediately after a SGTR (by a factor of 335). The second case assumes the initial reactor coolant iodine activity at 60.0 μCi/gm DOSE EQUIVALENT I-131 due to an iodine spike caused by a reactor or an RCS transient prior to the accident. In both cases, the noble gas specific activity is assumed to be 550 μCi/gm DOSE EQUIVALENT XE-133.

The STGR analysis assumes a rise in pressure in the ruptured SG causes radioactively contaminated steam to discharge to the atmosphere through the atmospheric dump valves or the main steam safety valves. The atmospheric discharge continues through an assumed stuck open atmospheric dump valve. The unaffected SG removes core decay heat by venting steam until the cooldown event ends and the Shutdown Cooling (SDC) system is placed in service.

Operation with iodine specific activity levels greater than the LCO limit is permissible, if the activity levels do not exceed 60.0 μCi/gm for more than 48 hours.

The limits on RCS specific activity are also used for establishing standardization in radiation shielding and plant personnel radiation protection practices.

RCS specific activity satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

(continued)

BASES

LCO

The iodine specific activity in the reactor coolant is limited to 1.0 μCi/gm DOSE EQUIVALENT I-131, and the noble gas specific activity in the reactor coolant is limited to 550 μCi/gm DOSE EQUIVALENT XE-133. The limits on specific activity ensure that offsite and control room doses will meet the 10 CFR 100.11 (Ref. 1) and GDC 19 limits.

The SGTR accident analysis (Ref. 2) shows that the calculated doses are within acceptable limits. Violation of the LCO may result in reactor coolant radioactivity levels that could, in the event of a SGTR, lead to doses that exceed the 10 CFR 100.11 (Ref. 1) and GDC 19 limits.

APPLICABILITY

In MODES 1,2, 3, and 4, operation within the LCO limits for DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 is necessary to limit the potential consequences of a SGTR to within the 10 CFR 100.11 (Ref. 1) and GDC 19 limits.

In MODES 5 and 6, the steam generators are not being used for decay heat removal, the RCS and steam generators are depressurized, and primary to secondary leakage is minimal. Therefore, the monitoring of RCS specific activity is not required.

ACTIONS

A.1 and A.2

With the DOSE EQUIVALENT I-131 greater than the LCO limit, samples at intervals of 4 hours must be taken to demonstrate that the specific activity is ≤ 60.0 μCi/gm. The Completion Time of 4 hours is required to obtain and analyze a sample.

Sampling is continued every 4 hours to provide a trend.

The DOSE EQUIVALENT I-131 must be restored to within limit within 48 hours. The Completion Time of 48 hours is acceptable since it is expected that, if there were an iodine spike, the normal coolant iodine concentration would be restored within this time period. Also, there is a low probability of a SGTR occurring during this time period.

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODE(S), relying on Required Actions A.1 and A.2 while the DOSE EQUIVALENT 1-131 LCO limit is not met. This allowance is acceptable due to the significant conservatism incorporated into the specific activity limit, the low probability of an event which is limiting due to exceeding this limit, and the ability to restore transient-specific activity excursions while the plant remains at, or proceeds to, power operation.

B.1

With the DOSE EQUIVALENT XE-133 greater than the LCO limit, DOSE EQUIVALENT XE-133 must be restored to within limit within 48 hours. The allowed Completion Time of 48 hours is acceptable since it is expected that, if there were a noble gas spike, the normal coolant noble gas concentration would be restored within this time period. Also, there is a low probability of a SGTR occurring during this time period.

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODE(S), relying on Required Action B.1 while the DOSE EQUIVALENT XE-133 LCO limit is not met. This allowance is acceptable due to the significant conservatism incorporated into the specific activity limit, the low probability of an event which is limiting due to exceeding this limit, and the ability to restore transient-specific activity excursions while the plant remains at, or proceeds to, power operation.

C.1 and C.2

If the Required Action and associated Completion Time of Condition A or B is not met, or if the DOSE EQUIVALENT I-131 is > 60.0 μCi/gm, the reactor must be brought to MODE 3 within 6 hours and MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.4.17.1

SR 3.4.17.1 requires performing a gamma isotopic analysis as a measure of the noble gas specific activity of the reactor coolant. This measurement is the sum of the degassed gamma activities and the gaseous gamma activities in the sample taken. This Surveillance provides an indication of any increase in the noble gas specific activity.

Trending the results of this Surveillance allows proper remedial action to be taken before reaching the LCO limit under normal operating conditions.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

If a specific noble gas nuclide listed in the definition of DOSE EQUIVALENT XE-133 is not detected, it should be assumed to be present at the minimum detectable activity.

SR 3.4.17.2

This Surveillance is performed to ensure iodine specific activity remains within limit during normal operation and following fast power changes when iodine spiking is more apt to occur. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Frequency, between 2 hours and 6 hours after a power change of ≥ 15% RTP within a 1 hour period, is established because the iodine levels peak during this time following iodine spike initiation; samples at other times would provide inaccurate results.

If a specific iodine isotope listed in the definition of DOSE EQUIVALENT I-131 is not detected, it should be assumed to be present at the minimum detectable activity.

(continued)

BASES

REFERENCES	1.	10 CFR 100.11
	2.	UFSAR, Section 15.6.3

BASES (continued)

ACTIONS (continued)

E.1 (continued)

or more MSIVs inoperable while in MODE 1 requires entry into LCO 3.0.3.

F.1

With one MSIV inoperable in MODE 1, time is allowed to restore the component to OPERABLE status. Some repairs can be made to the MSIV with the unit hot. The 4 hour Completion Time is reasonable, considering the probability of an accident occurring during the time period that would require closure of the MSIVs.

Condition F is entered when one MSIV is inoperable in MODE 1, including when both actuator trains for one MSIV are inoperable. When only one actuator train is inoperable on one MSIV, Condition A applies.

The 4 hour Completion Time is consistent with that normally allowed for containment isolation valves that isolate a closed system penetrating containment. These valves differ from other containment isolation valves in that the closed system provides an additional means for containment isolation.

G.1

If the MSIV cannot be restored to OPERABLE within 4 hours, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in MODE 2 within 6 hours and Condition H would be entered. The Completion Time is reasonable, based on operating experience, to reach MODE 2, and close the MSIVs in an orderly manner and without challenging unit systems.

H.1 and H.2

Condition H is modified by a Note indicating that separate Condition entry is allowed for each MSIV.

Since the MSIVs are required to be OPERABLE in MODES 2 and 3, the inoperable MSIVs may either be restored to OPERABLE status or closed. When closed, the MSIVs are already in the position required by the assumptions in the safety analysis.

(continued)

BASES (continued)

ACTIONS (continued)

H.1 and H.2 (continued)

The 4 hour Completion Time is consistent with that allowed in Condition F.

Inoperable MSIVs that cannot be restored to OPERABLE status within the specified Completion Time, but are closed, must be verified on a periodic basis to be closed. This is necessary to ensure that the assumptions in the safety analysis remain valid. The 7 day Completion Time is reasonable, based on engineering judgment, MSIV status indications available in the control room, and other administrative controls, to ensure these valves are in the closed position.

I.1 and I.2

If the MSIVs cannot be restored to OPERABLE status, or closed, within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from MODE 2 conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.2.1

This SR verifies that the closure time of each MSIV is within the limit given in Reference 5 with each actuator train on an actual or simulated actuation signal and is within that assumed in the accident and containment analyses. This SR also verifies the valve closure time is in accordance with the Inservice Testing Program. This SR is normally performed upon returning the unit to operation following a refueling outage. The MSIVs should not be full stroke tested at power.

The Frequency for this SR is in accordance with the Inservice Testing Program. This Frequency demonstrates the valve closure time at least once per refueling cycle.

(continued)

B 3.7 PLANT SYSTEMS

B 3.7.7 Essential Cooling Water (EW) System

BASES

BACKGROUND

The EW System provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. The EW System acts as a backup to the non-safety related Nuclear Cooling Water System for several non-safety related loads. The EW System serves as a barrier to the release of radioactive byproducts between potentially radioactive systems and the Essential Spray Pond System (ESPS), and thus to the environment.

The EW System is arranged as two independent full capacity cooling loops, which are normally isolated from the Nuclear Cooling Water System. Each safety related train includes a full capacity pump, surge tank, heat exchanger, piping, valves, chemical addition tank, and instrumentation. Each safety related train is powered from a separate bus. The surge tank in the system provides pump trip protective functions to ensure sufficient net positive suction head is available. The pump in each train is automatically started on receipt of an ESFAS signal.

Additional information on the design and operation of the system, along with a list of the components served, is presented in the UFSAR, Section 9.2.2, Reference 1, and Section 9.2.1, Reference 2. The principal safety related function of the EW System is the removal of decay heat from the reactor via the Shutdown Cooling (SDC) System heat exchanger.

APPLICABLE SAFETY ANALYSES

The design basis of the EW System is for one EW train in conjunction with the ultimate heat sink and a 100% capacity Containment Spray System to remove sufficient heat to ensure a safe reactor shutdown coincident with a loss of offsite power. The EW System provides a gradual reduction in the temperature of the containment sump fluid as it is supplied to the Reactor Coolant System (RCS) by the safety injection pumps.

(continued)

BASES

APPLICABLE SAFETY ANALYSIS (continued)

The EW System is designed to perform its function with a single failure of any active component, assuming a loss of offsite power.

The EW System also functions to cool the unit from SDC entry conditions (T_{cold} < 350°F) to MODE 5 (T_{cold} < 210°F) during normal and post accident operations. The time required to cool from 350°F to 210°F is a function of the number of EW and SDC trains operating. One EW train is sufficient to remove decay heat during subsequent operations with T_{cold} < 210°F. This assumes that the worst case meteorological conditions occur simultaneously with the maximum heat loads on the system.

The EW System satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

The EW trains are independent of each other to the degree that each has separate controls and power supplies and the operation of one does not depend on the other. In the event of a DBA, one EW train is required to provide the minimum heat removal capability assumed in the safety analysis for the systems to which it supplies cooling water. To ensure this requirement is met, two EW trains must be OPERABLE. At least one EW train will operate assuming the worst single active failure occurs coincident with the loss of offsite power.

A EW train is considered OPERABLE when the following:

a. The associated pump and surge tank are OPERABLE; and

b. The associated piping, valves, heat exchanger and instrumentation and controls required to perform the safety related function are OPERABLE.

The isolation of EW from other components or systems renders those components or systems inoperable, but does not necessarily affect the OPERABILITY of the EW System. Isolation of the EW System to the Essential Chiller, while rendering the Essential Chiller inoperable, is acceptable and does not impact the OPERABILITY of the EW System. Disassembly, removal of insulation, and other configuration changes to the isolated portions of an OPERABLE system must be explicitly evaluated for operability impact prior to executing any configuration changes of the OPERABLE system. Isolation of the EW System to SDC system heat exchanger is

(continued)

B 3.7 PLANT SYSTEMS

B 3.7.8 Essential Spray Pond System (ESPS)

BASES

BACKGROUND

The ESPS provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During a normal shutdown, the ESPS also provides this function for various safety related components.

The ESPS consists of two separate, 100% capacity safety related cooling water trains. Each train consists of one 100% capacity pump, one Essential Cooling Water (EW) heat exchanger, piping, valves, instrumentation, and a cleanup and Chemistry Control System. The valves are manually aligned, and secured in position. The pumps are automatically started upon receipt of an ESFAS signal.

Additional information about the design and operation of the ESPS, along with a list of the components served, is presented in the FSAR, Section 9.2.1 (Ref. 1). The principal safety related function of the ESPS is the removal of decay heat from the reactor via the EW System.

APPLICABLE SAFETY ANALYSES

The design basis of the ESPS is for one ESPS train, in conjunction with the EW System and a 100% capacity containment spray system to remove sufficient heat to ensure a safe reactor shutdown coincident with a loss of offsite power. The ESPS is designed to perform its function with a single failure of any active component, assuming the loss of offsite power.

The ESPS, in conjunction with the EW System, also cools the unit from shutdown cooling (SDC), as discussed in the UFSAR, Section 5.4.7 (Ref. 2) entry conditions to MODE 5 during normal and post accident operations. The time required for this evolution is a function of the number of EW and SDC System trains that are operating. One ESPS train is sufficient to remove decay heat during subsequent operations in MODES 5 and 6. This assumes that worst case meteorological conditions occur simultaneously with maximum heat loads on the system.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)	The ESPS satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

Two ESPS trains are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming the worst single active failure occurs coincident with the loss of offsite power.

An ESPS train is considered OPERABLE when:

a. The associated pump is OPERABLE; and

b. The associated piping, valves, instrumentation, heat exchanger, and instrumentation and controls required to perform the safety related function are OPERABLE.

The isolation of the ESPS from other components or systems renders those components or systems inoperable, but does not necessarily affect the OPERABILITY of the ESPS. Isolation of the ESPS to the Diesel Generator (DG) cooler(s), while rendering the DG inoperable, is acceptable and does not impact the OPERABILITY of the ESPS. Disassembly, removal of insulation, and other configuration changes to the isolated portions of an OPERABLE system must be explicitly evaluated for operability impact prior to executing any configuration changes of the OPERABLE system. Isolation of the ESPS to the essential cooling water heat exchanger is not acceptable and would render both the Essential Cooling Water System and the ESPS inoperable (Ref. 3). The ESPS is inoperable in this situation because it is operating outside of the acceptable limits of the system.

APPLICABILITY

In MODES 1, 2, 3, and 4, the ESPS System is required to support the OPERABILITY of the equipment serviced by the ESPS and required to be OPERABLE in these MODES.

When the plant is in other than MODES 1, 2, 3 or 4, the requirements of the ESPS shall be consistent with the definition of OPERABILITY which requires (support) equipment to be capable of performing its related support function(s).

(continued)

B 3.7 PLANT SYSTEMS

B 3.7.10 Essential Chilled Water (EC) System

BASES

BACKGROUND

The EC System provides a heat transfer system to the ultimate heat sink for the removal of process and operating heat from selected safety related air handling systems during a Design Basis Accident (DBA) or transient.

The EC System is a closed loop system consisting of two independent trains. Each 100% capacity train includes a heat exchanger, surge tank, pump, chemical addition tank, piping, valves, controls, and instrumentation. An independent 100% capacity chilled water refrigeration unit cools each train. The EC System is actuated on receipt of an ESFAS signal and supplies chilled water to the Heating, Ventilation, and Air Conditioning (HVAC) units in Engineered Safety Feature (ESF) equipment areas (e.g., the main control room, DC equipment room, AFW pump rooms, EW pump rooms and safety injection pump rooms).

The flow path for the EC System includes the closed loop of piping to all serviced equipment.

During normal operation, the normal Chilled Water System (WC) and the normal HVAC System cools the areas served by the EC System. The WC System and the normal HVAC System are nonsafety grade systems. Following ESFAS actuations, the EC System with essential HVAC units provide this cooling function to the control room and safety grade equipment. Additional information about the design and operation of the system, along with a list of components served, can be found in the UFSAR, Section 9.2.9 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The design basis of the EC System is to remove the post accident heat load from ESF spaces following a DBA coincident with a loss of offsite power. Each train provides chilled water to the HVAC units. The EC system design flowrates and temperatures are referenced in the Design Bases Manual.

(continued)

BASES

APPLICABLE SAFETY ANALYSIS (continued)

The maximum heat load in the ESF pump room area occurs during the recirculation phase following a loss of coolant accident. During recirculation, hot fluid from the containment sump is supplied to the high pressure safety injection and containment spray pumps. This heat load to the area atmosphere must be removed by the EC System to ensure that these pumps remain OPERABLE.

The EC satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

Two EC trains are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming the worst single failure.

An EC train is considered OPERABLE when:

a. The associated pump and surge tank are OPERABLE; and

b. The associated piping, valves, heat exchanger, refrigeration unit, and instrumentation and controls required to perform the safety related function are OPERABLE.

The isolation of the EC System from other components or systems renders those components or systems inoperable, but does not necessarily affect the OPERABILITY of the EC System. Isolation of the EC System to any single EC supplied cooling coil, while rendering the cooling coil inoperable, is acceptable and does not impact the OPERABILITY of the EC System. Disassembly, removal of insulation, and other configuration changes to the isolated portions of an OPERABLE system must be explicitly evaluated for operability impact prior to executing any configuration changes of the OPERABLE system. Isolation of the EC System to any additional cooling coil is not acceptable without an engineering evaluation and an operability determination for that configuration (Ref. 2). The EC System is inoperable in this situation, unless it has been specifically evaluated, because it is operating outside of the acceptable limits of the system.

APPLICABILITY

In MODES 1, 2, 3, and 4, the EC System is required to be OPERABLE when a LOCA or other accident would require ESF operation.

(continued)