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TECHNICAL EVALUATION REPORT
PUMP AND VALVE INSERVICE TESTING PROGRAM
PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3

Docket Numbers 50-528, 50-529, and 50-530

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ABSTRACT

This EG&G Idaho, Inc. report presents the results of our evaluation of the Palo Verde Nuclear Generating Station, Units 1, 2, and 3 Inservice Testing Programs for safety-related pumps and valves.

FOREWORD

This report is supplied as part of the "Review of Pump and Valve Inservice Testing Programs for Operating License Plants" (FIN No. A6811) and "Review of Pump and Valve Inservice Testing Programs for Operating Reactors" (FIN No. A6812) being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Mechanical Engineering Branch, by EG&G Idaho, Inc., Mechanical Systems Evaluations.

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1. INTRODUCTION

Contained herein is a technical evaluation of the pump and valve inservice testing (IST) programs submitted by the Arizona Nuclear Power Project for their Palo Verde Nuclear Generating Station, Units 1, 2, and 3.

The licensee's IST Programs, dated September 10, 1987, and as amended by letter dated August 2, 1988, were reviewed to verify compliance of proposed tests of pumps and valves whose function is safety-related with the requirements of the ASME Boiler and Pressure Vessel Code (the Code), Section XI, 1980 Edition through Winter 1981 Addenda. Any IST program revisions subsequent to those noted above are not addressed in this technical evaluation report (TER). Required program changes, such as revised or additional relief requests or the deletion of any components from the IST Program, should be submitted to the NRC under separate cover in order to receive prompt attention, but should not be implemented prior to review and approval by the NRC.

In their IST Programs, Arizona Nuclear Power Project has requested relief from the ASME Code testing requirements for specific pumps and valves and these requests have been evaluated individually to determine if the criteria in 10 CFR 50.55a for granting relief is met for the specific pumps and valves. This review was performed utilizing the acceptance criteria of the Standard Review Plan, NUREG-0800, Section 3.9.6, and the Draft Regulatory Guide and Value/Impact Statement titled "Identification of Valves for Inclusion in Inservice Testing Program." The IST Program testing requirements apply only to component testing (i.e., pumps and valves) and are not intended to provide the basis to change the licensee's current technical specifications for system test requirements.

Section 2 of this report presents the scope of this review.

Section 3 of this report presents the Palo Verde Nuclear Generating Station, Units 1, 2, and 3 relief requests and EG&G's evaluations and conclusions regarding these requests for the pump testing program. Similar information is presented in Section 4 for the valve testing program.

Category A, A/C, B, and C valves which are exercised during cold shutdowns and refueling outages and meet the requirements of the ASME Code, Section XI are discussed in Appendix A.

A listing of P&ID's used for this review is contained in Appendix B.

Inconsistencies and omissions in the licensee's IST program noted during the course of this review are listed in Appendix C. The licensee should resolve these items in accordance with the evaluations, conclusions, and guidelines presented in this report.

2. SCOPE

The EG&G Idaho review of the Palo Verde Nuclear Generating Station, Units 1, 2, and 3 inservice testing programs for pumps and valves was begun in November of 1986. The program initially examined identified the licensee's proposed testing of safety-related pumps and valves in the plant systems listed in Appendix B.

The licensee's proposed IST program was reviewed by locating and highlighting the components on the appropriate system P&IDs and determining their function in the system. Then the licensee's proposed testing was evaluated to determine if it was in compliance with the ASME Code, Section XI, requirements. During the course of this review, questions and comments were made pertaining to unclear or potential problem areas in the licensee's IST program. These were transmitted to the licensee in the form of a request for additional information (RAI) which served as the agenda for the working meeting between the licensee, the NRC, and the EG&G reviewers.

Each pump and valve relief request was individually evaluated to determine if the criteria in 10 CFR 50.55a for granting relief is met for the specific pumps and valves, that the licensee had clearly demonstrated that the Code requirements are impractical for the identified system components, and to determine if the proposed alternate testing would provide reasonable assurance of component operability. Where the licensee's technical basis or alternate testing was insufficient, the licensee was requested to clarify the relief request. The system P&ID was also examined to determine whether the instrumentation necessary to make the identified measurements is available. If, based on the unavailability of adequate instrumentation or the reviewers experience and system knowledge, it was determined that it may not be possible or practical to make the measurements identified in the licensee's IST program, a question or comment was generated requesting clarification.

For pumps, it was verified that each of the seven inservice test quantities of Table IWP-3100-1 were measured or observed. For those test quantities that were not being measured or observed quarterly in accordance

with the Code, it was verified that a request for relief from the Code requirements had been submitted. If testing was not being performed in accordance with the Code and a relief request had not been submitted, the licensee was requested to explain the inconsistency in the RAI.

The review of the proposed testing of valves verified that all appropriate ASME Code testing for each individual valve is performed as required. The proposed testing was evaluated to determined if all valves that were judged to be active Category A, B, and/or C, (other than safety and relief valves) are exercised quarterly in accordance with IWV-3410 or 3520. If any active safety-related valve is not full-stroke exercised quarterly as required, then the licensee's justification for the deviation, either in the form of a cold shutdown justification or a relief request, was examined to determine its accuracy and adequacy. The proposed alternate testing was also evaluated to determine its compliance with the Code requirements.

Safety-related safety valves and relief valves, excluding those that perform only a thermal relief function, were confirmed to be included in the IST program and tested in accordance with IWV-3510.

For valves with remote position indication, the reviewer confirmed that the valve remote position indication is verified in accordance with IWV-3300. The reviewer verified that the licensee had assigned limiting values of full-stroke times for all power operated valves in the IST program, as required by IWV-3413. For valves having a fail-safe actuator, the reviewer confirmed that the valve's fail-safe actuator is tested in accordance with IWV-3415.

Each check valve was evaluated to determine if the proposed testing would verify its ability to perform its safety function(s). Extensive system knowledge and experience with other similar facilities is employed to determine whether the proposed tests would full-stroke the check valve disks open or verify their reverse flow closure capability. If there was any doubt about the adequacy of the identified testing, questions were included in the RAI.

Further evaluation was performed on all valves in the program to determine that the identified testing could practically and safely be conducted as described. If the licensee's ability to perform the testing was in doubt, a question was formulated to clarify the suspected problem.

Once all the components in the licensee's IST program had been identified on the P&IDs and evaluated as described above, the P&IDs were examined closely by at least two trained and experienced reviewers to identify any additional pumps or valves that may perform a safety function. The licensee was asked to reconcile any components that were identified by this process which were not included in the IST program. Also, the list of systems included in the licensee's program was compared to a system list in the Draft Regulatory Guide and Value/Impact Statement titled, "Identification of Valves for Inclusion in Inservice Testing Programs." Systems that appear in the Draft Regulatory Guide list but not in the licensee's program were evaluated and, if appropriate, questions were added to the RAI.

Additionally, if the reviewers suspected a problem with a specific or a general aspect of the licensee's IST program, questions were included in the RAI to clarify those areas of doubt. Some questions were included for the purpose of allowing the reviewers to make conclusive statements in the TER.

At the completion of the review, the RAI was transmitted to the licensee. These questions were later used as the agenda for the working meeting with the licensee on May 27 and 28, 1987. At the meeting, each question and comment was discussed in detail and resolved as follows:

a. The licensee agreed to make the necessary IST program corrections or changes to satisfy the concerns of the NRC and their reviewers.

b. The licensee provided additional information or clarification about their IST program that satisfied the concerns of the NRC and their reviewers, and no program change is required.

c. The item remained open for the licensee to investigate further and propose a solution to the NRC.

d. The item remained open for further investigation by the NRC.

e. The item remained open for further investigation and discussion by both the NRC and the licensee.

A revised partial IST program dated September 10, 1987, and as amended by letter dated August 2, 1988, was received and was compared to the previous submittal to identify any changes. The changes were evaluated to determine whether they were acceptable and if not, they were added to the items that remained open from the meeting.

This TER is based on information contained in the submittals and on information obtained in the meetings which took place during the review process.

3. PUMP TESTING PROGRAM

The Palo Verde Nuclear Generating Station, Units 1, 2, and 3 IST programs submitted by Arizona Nuclear Power Project were examined to verify that all pumps that are included in the program are subjected to the periodic tests required by the ASME Code, Section XI, except for those pumps identified below for which specific relief from testing has been requested and as summarized in Appendix C. Each Arizona Nuclear Power Project basis for requesting relief from the pump testing requirements and the EG&G reviewer's evaluation of that request are summarized below.

3.1 Instrumentation

3.1.1 Relief Request.

The licensee has requested relief from the pump instrumentation full-scale range as required by Section XI, Paragraph IWP-4120 for low pressure safety injection pumps SIA-P01 and SIB-P01 and as an alternative has proposed to utilize the installed process pump discharge pressure instrumentation.

3.1.1.1 Licensee's Basis for Requesting Relief--"The discharge pressure of the LPSI pump ranges from 220 to 240 psig under minimum recirculation flow. Under conditions of shutdown cooling, the discharge pressure under full flow conditions ranges from 300 psig to 480 psig. The discharge Pressure Indicator for the LPSI pump (SIA-PI-306 and SIB-PI-307) range from 0-750 psig. Loop accuracy is nominally 1.14%, compared to Code requirement of 2.0% per IWP-4110-1. It is necessary for the pressure indicator to provide information for both ASME XI and normal plant operation. Indicator range is 3.4 times discharge pressure vice 3.0 times value as per Code. Installation of temporary discharge pressure gauge is impractical due to ALARA considerations ie LPSI discharge piping is 2R/hr. Based on increased accuracy, ALARA considerations and Code intent to use installed instrumentation, PI-306 and 307 should be used. Additionally, IWA-5263 utilizes pressure gauges with a range of 4.0 times the pressure value."

3.1.1.2 Evaluation--Because of the design of these systems, compliance with the Code requirements is impractical. The installed process instrumentation should provide a reasonable means to measure the Code required parameters during Section XI pump testing as this instrumentation exceeds the Code accuracy requirements.

Based on the determination that the Code requirements are impractical, and considering the licensee's proposed alternative of utilizing installed process instrumentation with an accuracy better than the Code requirement, and the burden on the licensee if the Code requirements were imposed, relief may be granted as requested.

3.2 Pressure and Flow Rate Measurements

3.2.1 Relief Request.

The licensee has requested relief from measuring inlet pressure and differential pressure as required by Section XI, Table IWP-3100-1 for charging pumps CHA-P01, CHB-P01, and CHE-P01, and containment spray chemical addition pumps SIA-P05 and SIB-P05. As an alternative the licensee has proposed to set discharge pressure and measure and trend pump flowrate.

3.2.1.1 Licensee's Basis for Requesting Relief--"These pumps are of positive displacement design and as such are designed to deliver constant capacity irrespective of inlet pressure or differential pressure across the pump. The parameters important to monitoring pump degradation are discharge pressure and flow rate. Measuring Inlet pressure and differential pressure provides no meaningful information."

3.2.1.2 Evaluation--The design of these positive displacement pumps precludes the meaningfulness of pump inlet pressure and differential pressure measurements. Since these pumps deliver a constant amount of fluid, setting a discharge pressure and measuring and trending pump flowrate provides a reasonable alternative method for determining pump hydraulic conditions.

Based on the determination that the Code requirements will not provide useful information for monitoring pump degradation and the acceptablility of the licensee's proposed alternative of setting of pump discharge pressure and measuring and trending pump flowrate, relief may be granted as requested.

3.2.2 Relief Request.

The licensee has requested relief from the Section XI, Paragraph IWP-3100 requirement that flow rate be measured for auxiliary feedwater pumps AFN-P01, AFA-P01, and AFB-P01 quarterly and has proposed that flow rate be measured on a refueling outage frequency.

3.2.2.1 Licensee's Basis for Requesting Relief--"Pump degradation may be observed by changes in pump head and/or flowrate. Due to the pump tests being performed at the miniflow recirculation point on the pump curve, changes in pump head are more indicative of degradation. Pump flowrate is not varied for these tests but rather is constant as a result of the fixed resistance of the miniflow line and therefore does not need to be measured."

"As an augmented inspection to provide additional information regarding pump performance, full flow testing of AFA-P01 and AFB-P01 will be performed on refueling basis, and flow rate will be measured."

3.2.2.2 Evaluation--Measuring the auxiliary feedwater pumps' flow rate while operating on the minimum flow recirculation line is not as meaningful a test for pump operability as a full flow test because the low flow rate may cause excess turbulence and cavitation within the pump and may not provide accurate repeatable information for evaluation of pump degradation. In addition, flow induced vibrations may mask or influence mechanical vibration characteristics, thereby providing false information on the mechanical characteristics of the pumps. Testing these pumps by utilizing injection during power operation is not practical because this could result in steam generator thermal shock and subsequent fatigue failure of the steam generator feed nozzles.

However, the licensee has not demonstrated the impracticality of testing these pumps during cold shutdown utilizing an instrumented flowpath into the steam generators. This would permit a larger flow rate, thereby minimizing the low flow induced problems discussed above. Indeed, the licensee is full-stroke exercising during cold shutdown the suction and discharge check valves associated with these pumps (see section 1.1 of Appendix A of this report).

Further, only measuring pump flow rate during a full flow test is not acceptable. The licensee should measure all Code required parameters during the full flow pump test, in addition to measuring all Code required parameters except flow rate quarterly.

Measuring all required pump parameters on a cold shutdown frequency when a larger flow rate path to the steam generators is available is a reasonable alternative to the Code requirements of quarterly measurement of pump flow rate. Because of the design of this system, compliance with the Code requirements is impractical and conformance with the Code would only be possible if the auxiliary feedwater system was substantially redesigned.

Based on the determination that the Code requirements are impractical, and considering the licensee's proposed alternative of measuring flow rate during a full flow test and measuring all required pump parameters except pump flow rate quarterly, and the burden on the licensee if the Code requirements were imposed, relief may be granted, provided that the licensee performs a larger flow rate test during cold shutdown and measures all the Code required pump parameters.

3.2.3 Relief Request.

The licensee has requested relief from the Section XI, Paragraph IWP-3100 requirement that flow rate be measured for low pressure safety injection pumps SIA-P01 and SIB-P01, high pressure safety injection pumps SIA-P02 and SIB-P02, and containment spray pumps SIA-P03 and SIB-P03 quarterly and has proposed that flow rate be measured on a refueling outage frequency.

3.2.3.1 Licensee's Basis for Requesting Relief--"Pump degradation may be observed by changes in pump head and/or flowrate. Due to the pump tests being performed at the miniflow recirculation point on the pump curve, changes in pump head are more indicative of degradation. Pump flowrate is not varied for these tests but rather is constant as a result of the fixed resistance of the miniflow line and therefore does not need to be measured."

"As an augmented inspection to provide additional information regarding pump performance, full flow testing of these pumps will be performed on refueling basis. Pump flow rate will be measured for the full flow test with an accuracy of plus or minus 5% full scale."

3.2.3.2 Evaluation--Measuring these pumps' flow rate while operating on the minimum flow recirculation line is not as meaningful a test for pump operability as a full flow test because the low flow rate may cause excess turbulence and cavitation within the pump and may not provide accurate repeatable information for evaluation of pump degradation. In addition, flow induced vibrations may mask or influence mechanical vibration characteristics, thereby providing false information on the mechanical characteristics of the pumps. Testing these pumps by utilizing injection during power operation is not practical because the high and low pressure safety injection pumps and containment spray pumps cannot develop sufficient head to inject into the normal operating RCS pressure and could result in thermal shock to the injection nozzles and in premature failure. The high pressure safety injection and containment spray pumps cannot be tested during cold shutdown because the RCS has insufficient volume to contain the necessary injection flow. The containment spray pumps cannot be tested at any time with the spray ring flowpath since this would result in spraying down the inside of containment with its attendant radiological control problems and electrical equipment damage.

Performing a full flow test on a refueling outage frequency for the high pressure safety injection and containment spray pumps is acceptable, however, since the low pressure safety injection pumps are also utilized for shutdown cooling during cold shutdown, it is not acceptable to test the low pressure safety injection pumps only on a refueling outage frequency. When

these pumps are operated with near full flow during cold shutdowns, the licensee should perform a larger flow test, measuring all required Code pump parameters.

Only measuring pump flow rate during a full flow test is not acceptable. The licensee should measure all Code required parameters during the larger flow rate pump test, in addition to measuring all Code required parameters except flow rate quarterly.

Measuring pump flow rate during the full flow test with plus or minus 5% accuracy instrumentation is not acceptable. Further, the licensee has not specifically requested relief for this deviation from the Code instrumentation accuracy requirements or provided any justification for this deviation.

Measuring all required pump parameters on a refueling outage frequency for the high pressure safety injection and containment spray pumps, and on a cold shutdown frequency for the low pressure safety injection pumps when a larger flow rate path to the RCS is available is a reasonable alternative to the Code requirements of quarterly measurement of pump flow rate. Because of the design of these systems, compliance with the Code requirements is impractical and conformance with the Code would only be possible if the safety injection system was substantially redesigned.

Based on the determination that the Code requirements are impractical, and considering the licensee's proposed alternative of measuring flow rate during a full flow test and measuring all required pump parameters except pump flow rate quarterly, and the burden on the licensee if the Code requirements were imposed, relief may be granted, provided that the licensee performs a larger flow rate test on a refueling outage frequency for the high pressure safety injection and containment spray pumps, and on a cold shutdown frequency for the low pressure safety injection pumps and measures all required pump parameters.

3.3 Vibration Measurements

3.3.1 Relief Request.

The licensee has requested relief from measuring pump vibration as required by Section XI, Table IWP-3100-1 for the diesel generator fuel oil transfer pumps DFA-P01 and DFB-P01.

3.3.1.1 Licensee's Basis for Requesting Relief--"These pumps are submersible centrifugal pumps located at the bottom of the Diesel Fuel Oil Storage Tanks under greater than 10 feet of diesel fuel. Access to these pumps is not possible without completely draining the fuel tank. The discharge piping and electrical cable is connected to the pump at the top of the tank. Any vibration readings taken at the flange where the piping is connected would be meaningless due to the dampening effect of the fuel oil and the tank itself."

3.3.1.2 Evaluation--These pumps are submerged and inaccessible. Portable vibration instrumentation cannot be utilized to monitor pump vibration. Because of the design of the diesel fuel oil transfer system, compliance with the Code requirements is impractical. Conformance with the Code requirements would only be possible if the diesel fuel oil transfer system were substantially redesigned.

Based on the determination that the Code requirements are impractical and the burden on the licensee if the Code requirements were imposed, relief may be granted as requested.

4. VALVE TESTING PROGRAM

The Palo Verde Nuclear Generating Station, Units 1, 2, and 3 IST programs submitted by Arizona Nuclear Power Project were examined to verify that all valves that are included in the program are subjected to the periodic tests required by the ASME Code, Section XI and the NRC positions and guidelines. The reviewers found that, except as noted in Appendix C or where specific relief from testing has been requested, these valves are tested to the Code requirements and the NRC positions and guidelines. Each Arizona Nuclear Power Project basis for requesting relief from the valve testing requirements and the reviewer's evaluation of that request are summarized below and grouped according to system and valve category.

4.1 All Systems

4.1.1 Containment Isolation Valves

4.1.1.1 Relief Request. The licensee has requested relief from leak testing containment isolation valves according to Section XI, Paragraphs IWV-3421 through 3425 and has proposed to verify valve operability by leak testing these valves according to 10 CFR 50, Appendix J and Section XI, Paragraphs IWV-3426 and 3427.

4.1.1.1.1 Licensee's Basis for Requesting Relief--"Valves requiring testing per 10 CFR 50, Appendix J are tested on a 24 month frequency. These valves need not be further tested per ASME XI. This basis is in agreement with NRC draft Reg. Guide on Inservice Testing of Valves, issued November, 1981."

4.1.1.1.2 Evaluation--Leak rate testing containment isolation valves in accordance with 10 CFR 50, Appendix J requirements will assure valve operability as required by the Code and is a suitable alternative provided that the licensee also complies with IWV-3426 and 3427. The licensee has committed to comply with IWV-3426 and 3427.

Based on the determination that 10 CFR 50, Appendix J requirements are a suitable alternative to IWV-3421 through 3425 and that the licensee will comply with IWV-3426 and 3427, relief may be granted as requested.

4.1.2 Power Operated Valves

4.1.2.1 Relief Request. The licensee has requested relief from the Section XI, Paragraph IWV-3417(a) requirement that corrective action be taken for power operated valves that exhibit an increase in stroke times from the previous test and has proposed to take corrective action when the stroke times increase as compared to a fixed reference value.

4.1.2.1.1 Licensee's Basis for Requesting Relief--"Using a fixed reference value, provides a more logical and stringent basis for determining increased test frequencies. Adhering to the Code as stated above, a valve's stroke time could increase during each test and still be considered acceptable, while in fact, the valve could be failing or, at least, worthy of being tested at an increased frequency. Using a fixed reference value as a standard would give rise to an increased test frequency much sooner than the standard set forth in the Code."

"If a fixed reference value is exceeded by either:

1) 25% or more for those reference values greater than 10 seconds, or

2) 50% or more for those reference values less than or equal to 10 seconds.

The frequency of testing shall be increased to once a month until the condition is corrected."

4.1.2.1.2 Evaluation--Using a fixed reference value for determining corrective action in accordance with IWV-3417(a) rather than the increase from the previous stroke time test is a more conservative alternative to the Code requirement and thus is acceptable.

Based on the determination that the Code requirements are less conservative and the licensee's proposed alternative of using a fixed reference stroke time value, relief may be granted as requested.

4.2 Chemical and Volume Control System

4.2.1 Category C Valves

4.2.1.1 Relief Request. The licensee has requested relief from exercising refueling water tank outlet check valves CHB-V305 and CHA-V306 according to Section XI, Paragraph IWV-3521 and has proposed verifying valve operability by partial-stroke exercising these valves quarterly and full-stroke exercising these valves on a refueling outage frequency.

4.2.1.1.1 Licensee's Basis for Requesting Relief--"Valves can be part stroke during operation in support of quarterly testing of LPSI, HPSI and Containment Spray surveillance testing. However, valves require in excess of normal shutdown cooling flow, in order to full stroke valves open. Flow rates of this magnitude are not practical during operations or cold shutdown."

4.2.1.1.2 Evaluation--The licensee has not demonstrated the impracticality of full-stroke exercising valves CHB-V305 and CHA-V306 quarterly in accordance with the Code requirement. Merely stating that it is not practical is not sufficient technical justification for granting relief.

However, the licensee is correct in stating that a full-stroke exercise for these valves is not practical during power operation and cold shutdown. The high and low pressure safety injection and containment spray pumps do not develop sufficient head to overcome RCS pressure during power operation. These valves cannot be exercised during cold shutdown with the high pressure safety injection pumps due to possible RCS low temperature overpressurization. These valves cannot be exercised during cold shutdown with the low pressure safety injection or containment spray pumps as the RCS does not have the volume to contain the necessary exercising flow.

Compliance with the Code required testing frequency would be burdensome since this would require quarterly plant shutdown, cooldown, and reactor head removal.

Based on the impracticality of complying with the Code required testing frequency, and the licensee's proposed alternative testing frequency, relief from the Code requirements may be granted as requested.

4.3 Diesel Generator System

4.3.1 Category B Valves

4.3.1.1 Relief Request. The licensee has requested relief from measuring the stroke time of emergency diesel generators air starting solenoid valves DGA-UV-3, DGB-UV-4, DGA-UV-5, DGB-UV-6, DGA-UV-7, DGB-UV-8, DGA-UV-9, DGB-UV-10, DGA-UV-11, DGB-UV-12, DGA-UV-15, and DGB-UV-16 according to Section XI, Paragraph IWV-3413. As an alternative the licensee has proposed to verify valve operability by measuring the time required for the diesel generators to achieve rated speed.

4.3.1.1.1 Licensee's Basis for Requesting Relief--"The valves are totally enclosed solenoid valves and it is not possible to observe any stem movement. Additionally there are no remote indicator lights. There is no practical way to stroke time the valve since there is no obtainable evidence of valve movement."

"Valves were purchased as part of Diesel Generator skid. Valves UV-3, UV-5, UV-7, and UV-15 are controlled from a single handswitch. Valves UV-4, UV-6, UV-8 and UV-16 are controlled from a single handswitch. Valves UV-9 and UV-11 are controlled from a single handswitch. Valves UV-10, UV-12 are controlled from a single handswitch. Independent operation of individual valves is not possible without rendering other valves inoperable."

"Technical Specifications 3/4.8.1.1.2a(4) requires monthly starting of Diesel Generator. The Diesel must start and attain speed, frequency and voltage within 10 seconds. Valve malfunction or degradation of operation will reduce D/G starting capacity and D/G will be inoperable."

4.3.1.1.2 Evaluation--Valves DGA-UV-3, DGB-UV-4, DGA-UV-5, DGB-UV-6, DGA-UV-7, DGB-UV-8, DGA-UV-9, DGB-UV-10, DGA-UV-11, DGB-UV-12, DGA-UV-15, and DGB-UV-16 cannot be stroke timed due to the lack of position indication. Alternating starting air receivers will test each train of solenoid valves and unsatisfactory stroke time of these valves will be indicated by the diesel generator failing to reach rated speed in equal to or less than 10 seconds. Conformance with the Code required testing method is impractical due to solenoid valve design.

Based on the impracticality of complying with the Code required testing method and the licensee's proposed alternative testing, relief from the Code requirements may be granted as requested, provided the licensee alternates starting air receivers such that all of these valves are tested quarterly.

4.4 Main Steam System

4.4.1 Category C Valves

4.4.1.1 Relief Request. The licensee has requested relief from exercising main feedwater to steam generator inlet check valves SGE-V642, SGE-V652, SGE-V653, and SGE-V693 according to Section XI, Paragraph IWV-3522 and has proposed verifying closure of these valves, the safety position, during cold shutdowns and refueling outages when they will be tested in series.

4.4.1.1.1 Licensee's Basis for Requesting Relief--"These valves are in the feedwater inlet lines to each steam generator and are open during power operations. Full stroke or partial stroke testing of these valves during operations would require securing feedwater flow to the steam generator and cause a reactor trip. Per Technical Specifications, Main Steam System is required to be operable prior to entering Mode 4. These valves require Steam Generator pressure to back pressure test the valves for closing. Adequate pressure in Steam Generator does not exist until in Mode 3."

"Test valves in Mode 3 when sufficient pressure is available for stroking valves to the closed position at cold shutdown. Valves SGE-V642 and SGE-V652 shall be tested in series, as a unit. Valves SGE-V653 and SGE-V693 shall be testing in series, as a unit."

4.4.1.1.2 Evaluation--Valves SGE-V642, SGE-V652, SGE-V653, and SGE-V693 cannot be closure verified, the safety position, during power operation as feedwater stoppage would cause a reactor trip. These valves cannot be individually verified due to the design of the system. Testing these valves in series as a unit is acceptable because upstream in-series air operated isolation valves are included in the IST program as safety-related valves. These isolation valves receive a main steam isolation signal, thus providing closure for mitigation of diversion of auxiliary feedwater flow.

Based on the impracticality of complying with the Code required testing method, the burden to the licensee of complying with the Code required testing frequency, and the licensee's proposed alternative testing method, relief from the Code requirements may be granted as requested.

4.5 Safety Injection and Shutdown Cooling System

4.5.1 Category A/C Valves

4.5.1.1 Relief Request. The licensee has requested relief from exercising long term recirculation lines to reactor coolant system (RCS) hot leg check valves SIA-V522, SIA-V523, SIB-V532, and SIB-V533 according to Section XI, Paragraph IWV-3521 and has proposed verifying valve operability by full-stroke exercising these valves on a refueling outage frequency.

4.5.1.1.1 Licensee's Basis for Requesting Relief--"These valves can only be full stroked exercised by initiation of flow through the valves and into the RCS. Safety Injection pump head is not sufficient to full stroke exercise these valves due to RCS pressure. SI-V522 and SI-V532 cannot be part stroked during operation due to RCS pressure. SI-V523 and SI-V533 cannot be part stroked during operation due to ALARA concerns as

these valves and their test connections are in the containment building. Full stroke exercising during cold shutdown would challenge the Low Temperature Over Pressure (LTOP) relief valves, could damage equipment and would violate RCS Temperature/Pressure limits."

4.5.1.1.2 Evaluation--Valves SIA-V522, SIA-V523, SIB-V532, and SIB-V533 cannot be exercised during power operation because the high pressure safety injection pumps do not develop sufficient head to overcome RCS pressure. These valves cannot be exercised during cold shutdown due to possible RCS low temperature overpressurization. Compliance with the Code required testing frequency would be burdensome since this would require quarterly plant shutdown, cooldown, and reactor head removal.

Based on the impracticality of complying with the Code required testing frequency, and the licensee's proposed alternative testing frequency, relief from the Code requirements may be granted as requested.

4.5.1.2 Relief Request. The licensee has requested relief from exercising containment spray header inside containment check valves SIA-V164 and SIB-V165 according to Section XI, Paragraph IWV-3521 and has proposed to verify valve operability by disassembly of both valves once per 5 years when the Technical Specification required air/smoke test is performed.

4.5.1.2.1 Licensee's Basis for Requesting Relief--"Flow cannot be established without discharging water into containment, i.e., spray initiation at greater than 3500 gpm per valve. Partial stroking during operation is prohibited by ALARA concerns as the valves and test connections are in containment. Valves are never in regular service; the internals are immersed in demineralized water."

"1. Perform air/smoke testing 5 years per T. S. 3/4.6.2e.

2. Disassemble both valves during refueling outages in which air/smoke test is performed."

4.5.1.2.2 Evaluation--Valves SIA-V164 and SIB-V165 cannot be exercised with system flow at any time as this would result in spraying down the interior of containment which would result in wet lagging, electrical equipment damage, and radiological contamination problems.

However, these valves may be full-stroke exercised during refueling outages by sample disassembly/inspection. Check valve disassembly/inspection using a manual full-stroke of the disk is an acceptable alternative method to verify the full-stroke capability of check valves. The sampling technique requires that each valve in the group must be of the same design (manufacturer, size, model number and materials of construction) and must have the same service conditions. Additionally, at each disassembly the licensee must verify that the disassembled valve is capable of full-stroking and that its internals are structurally sound (no loose or corroded parts).

A different valve of each group is required to be disassembled, inspected and manually full-stroked at each refueling, until the entire group has been tested. If it is found that the disassembled valve's full-stroke capability is in question, the remainder of the valves in that group must also be disassembled, inspected, and manually full-stroked at the same outage.

Based on the determination that there is a burden for the licensee of complying with the Code required testing frequency and that a suitable method is available for check valve testing, relief from the Code requirements may be granted provided the licensee tests these check valves in accordance with the provisions described above.

4.5.1.3 Relief Request. The licensee has requested relief from exercising safety injection tank outlet check valves SIE-V215, SIE-V225, SIE-V235, and SIE-V245 according to Section XI, Paragraph IWV-3521 and has proposed to verify valve operability by partial-stroke exercising these valves on a refueling outage frequency and by sample/disassembly on a every second refueling outage frequency.

4.5.1.3.1 Licensee's Basis for Requesting Relief--"Full stroke testing is not practical during any plant mode other than when the reactor vessel head is removed, fuel is off-loaded, and the core barrel is removed. Part stroke testing is feasible during hot shutdown. Plant design conditions allows part stroke testing with a maximum of 35 gpm through the valve. Full stroke testing would require a full blowdown of SIT. This is not feasible and would create a significant crud burst, and airborne contamination."

"Part stroke exercise in Mode 3 after each refueling outage when the Safety Injection Tank pressure is above 600 psig. Additionally, disassemble valves and verify freedom of movement of disc motion on a refueling basis, such that one valve is inspected every second refueling outage."

4.5.1.3.2 Evaluation--Valves SIE-V215, SIE-V225, SIE-V235, and SIE-V245 cannot be exercised during power operation since system pressure cannot overcome RCS pressure. These valves cannot be exercised during cold shutdown due to insufficient RCS expansion volume to contain the required exercising flow.

However, these valves may be full-stroke exercised during refueling outages by sample disassembly/inspection. Check valve disassembly/inspection using a manual full-stroke of the disk is an acceptable alternative method to verify the full-stroke capability of check valves.

Based on the impracticality of complying with the Code required testing frequency and the licensee's proposed alternative testing, relief may be granted as requested, provided the licensee tests these check valves in accordance with the provisions described in section 4.5.1.2.2 of this report.

4.5.1.4 Relief Request. The licensee has requested relief from exercising safety injection and shutdown cooling to RCS check valves SIE-V217, SIE-V227, SIE-V237, and SIE-V247 according to Section XI, Paragraph IWV-3521 and has proposed to verify valve operability by either

sample/disassembly on a refueling outage frequency, or by using ultrasonic methods to verify valve full-stroke capability on a refueling outage frequency.

4.5.1.4.1 Licensee's Basis for Requesting Relief--"These valves can only be stroked open by initiation of flow through the valves and into the RCS. Low Pressure Safety Injection pump head is not sufficient to exercise these valves due to pressure of the RCS. Discharge of Safety Injection Tank through the valves would create significant crud burst, airborne contamination and could uplift core if vessel head and UGS is not in place or Fuel is not loaded."

"Disassemble (1) valve each refueling outage to verify freedom of disc movement, or use ultrasonic methods to verify valve full stroke on a refueling basis. Currently under ANPP review is the movats checkmate system to be used for check valve full stroke determination as an option in lieu of valve disassembly."

4.5.1.4.2 Evaluation--Valves SIE-V217, SIE-V227, SIE-V237, and SIE-V247 cannot be exercised during power operation or cold shutdown since the low pressure safety injection pump capacity is not sufficient to full-stroke exercise the valves. These valves cannot be exercised with safety injection tank flow due to insufficient expansion volume to contain the required exercising flow. These valves cannot be exercised with safety injection tank flow when the reactor vessel head is removed at refueling due to possible vessel damage and radiological control problems. These valves may be full-stroke exercised during refueling outages by sample disassembly/inspection.

The NRC has not approved any ultrasonic methods to verify check valve full-stroke capability for Section XI, Paragraph IWV-3522 requirements at this time.

Based on the impracticality of complying with the Code required testing frequency and the licensee's proposed alternative testing, relief may be granted as requested, provided the licensee tests these check valves in

accordance with the provisions described in section 4.5.1.2.2 of this report. The licensee should not be granted relief to use ultrasonic methods to verify these valves' full-stroke capability until this test method has been witnessed by NRC reviewers and proven accurate and reliable.

4.5.2 Category C Valves

4.5.2.1 Relief Request. The licensee has requested relief from exercising high pressure safety injection to RCS check valves SIE-V113, SIE-V123, SIE-V133, SIE-V143, SIA-V404, and SIB-V405 according to Section XI, Paragraph IWV-3521 and has proposed verifying valve operability by full-stroke exercising these valves on a refueling outage frequency.

4.5.2.1.1 Licensee's Basis for Requesting Relief--"These valves can only be full stroke exercised by initiation of flow through the valves and into the Reactor Coolant system. Safety Injection pump head is insufficient to establish flow through the valves against Reactor Coolant System pressure. Additionally, when the Reactor Coolant System pressure is low, over pressurization of the RCS is possible if the Vessel head is installed. Testing would challenge the Low Temperature Over-Pressure protection (LTOP) system, and could damage equipment due to over-pressure and would violate Tech. Spec. pressure/temperature limits. Partial stroke exercising of these valves would require the establishment of a flow path through valves addressed by Technical Specification Surveillance Requirement 4.4.5.2.2d and subsequent containment Radiological Controlled Area entry would be necessary by personnel, in order to meet this Tech. Spec. requirement. Containment entry by personnel during normal operations is an ALARA and radiation protection concern."

4.5.2.1.2 Evaluation--Valves SIE-V113, SIE-V123, SIE-V133, SIE-V143, SIA-V404, and SIB-V405 cannot be exercised during power operation as the high pressure safety injection pumps do not develop sufficient head to overcome RCS pressure. These valves cannot be exercised during cold shutdown due to possible RCS low temperature overpressurization. Compliance with the Code required testing frequency would be burdensome since this would require quarterly plant shutdown, cooldown, and reactor head removal.

Based on the impracticality of complying with the Code required testing frequency, and the licensee's proposed alternative testing frequency, relief from the Code requirements may be granted as requested.

4.5.2.2 Relief Request. The licensee has requested relief from exercising containment spray pumps suction check valves SIA-V157 and SIB-V158 and low pressure safety injection pumps suction check valves SIA-V201 and SIB-V200 according to Section XI, Paragraph IWV-3521 and has proposed verifying valve operability by partial-stroke exercising these valves quarterly and full-stroke exercising these valves on a refueling outage frequency.

4.5.2.2.1 Licensee's Basis for Requesting Relief--"These valves can be partial stroked during operation. The valves cannot be full stroked during operation or during cold shutdown. During operation, the only recirculation line (2" with an orifice) and a maxi-recirculation line (6"). Neither line has the capacity to handle full stroke exercise flows. During cold shutdown, these valves are closed and are not part of the shutdown cooling lineup, i.e., the shutdown cooling lines taps into the LPSI and containment spray suction lines down stream from these valves. These valves can be full stroked at refueling as part of filling of the reactor refueling pool from the RWT."

4.5.2.2.2 Evaluation--Valves SIA-V157, SIB-V158, SIA-V201, and SIB-V200 cannot be exercised during power operation or cold shutdown as no full-stroke exercising flowpath is available. Compliance with the Code required testing frequency would be burdensome since this would require quarterly plant shutdown, cooldown, and reactor head removal.

Based on the impracticality of complying with the Code required testing frequency, and the licensee's proposed alternative testing frequency, relief from the Code requirements may be granted as requested.

4.5.2.3 Relief Request. The licensee has requested relief from exercising containment recirculation sump outlet check valves SIA-V205 and SIB-V206 according to Section XI, Paragraph IWV-3521 and has proposed

verifying valve operability by sample/disassembly on a every fourth refueling outage frequency.

4.5.2.3.1 Licensee's Basis for Requesting Relief--"The recirculation sump is normally dry, therefore full stroking during operation is impractical. Partial stroking during operation is also impractical."

4.5.2.3.2 Evaluation--Valves SIA-V205 and SIB-V206 cannot be exercised at any time with flow as the recirculation sump is normally dry. Flooding the sump in order to provide exercising fluid is not practical as this would introduce unclean fluid into the suction piping of the high pressure and low pressure safety injection and containment spray pumps which could result in pump blockage.

Disassembly of one valve every fourth refueling outage is not an acceptable frequency of inspection because of the large difference between the proposed interval and the basic Code requirement to test valves quarterly.

However, these valves may be full-stroke exercised during refueling outages by sample disassembly/inspection. Check valve disassembly/inspection using a manual full-stroke of the disk is an acceptable alternative method to verify the full-stroke capability of check valves.

Based on the impracticality of complying with the Code required testing frequency and the licensee's proposed alternative testing, relief may be granted as requested, provided the licensee tests these check valves in accordance with the provisions described in section 4.5.1.2.2 of this report.

APPENDIX A

VALVES TESTED DURING COLD SHUTDOWNS

APPENDIX A

VALVES TESTED DURING COLD SHUTDOWNS

The following are Category A, B, C, and A/C valves that meet the exercising requirements of the ASME Code, Section XI, and are not full-stroke exercised every three months during plant operation. These valves are specifically identified by the owner in accordance with Paragraph IWV-3412 and 3522 and are full-stroke exercised during cold shutdowns and refueling outages. All valves in this Appendix have been evaluated and the reviewer agrees with the licensee that testing these valves during power operation is not possible due to the valve type and location or system design. These valves should not be full-stroke exercised during power operation. These valves are listed below and grouped according to the system in which they are located.

1. AUXILIARY FEEDWATER SYSTEM

1.1 Category C Valves

Auxiliary feedwater pumps suction and discharge check valves AFA-V007, AFB-V022, AFA-V137, and AFB-V138, auxiliary feedwater discharge headers check valves AFA-V015 and AFB-V024, and auxiliary feedwater to main feedwater headers check valves AFA-V079 and AFB-V080 cannot be exercised during power operation as this could result in thermal shock and subsequent fatigue failure of feedwater piping or of the steam generator(s). These valves will be full-stroke exercised during cold shutdowns and refueling outages.

2. CHEMICAL AND VOLUME CONTROL SYSTEM

2.1 Category A Valves

Reactor coolant pump (RCP) seal water bleed off isolation valves CHB-UV-505 and CHA-UV-506 and RCP seal water injection isolation valve CHE-HV-255 cannot be exercised during power operation due to possible RCP

seal damage. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Letdown to regenerative heat exchanger isolation valve CHA-UV-516 and regenerative heat exchanger outlet isolation valve CHB-UV-523 cannot be exercised during power operation as stroking these valves will cause loss of pressurizer level control and possible subsequent plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

2.2 Category A/C Valves

RCP seal water injection check valve CHN-V835 cannot be exercised during power operation due to possible RCP seal damage. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

Makeup water supply to reactor drain tank inside containment check valve CHN-V494 cannot be verified to close, the safety position, during power operation as testing requires access to containment. This valve will be closure verified during cold shutdowns and refueling outages.

2.3 Category B Valves

Letdown to regenerative heat exchanger isolation valve CHB-UV-515 cannot be exercised during power operation as stroking this valve will cause loss of pressurizer level control and possible subsequent plant shutdown. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

Refueling water tank to safety injection pump suction isolation valves CHB-HV-530 and CHA-HV-531 cannot be exercised during power operation as failure in the closed position would render one train of high pressure safety injection, low pressure safety injection and containment spray inoperable. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Volume control tank outlet isolation valve CHN-UV-501 cannot be exercised during power operation as this will cause a loss of net positive suction head for the operating charging pump which could result in charging pump damage. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

Boric acid makeup pumps to charging pumps suction isolation valve CHN-UV-514 and boric acid gravity feed isolation valve CHE-HV-536 cannot be exercised during power operation since this would cause excessive boration of the RCS and could result in plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Auxiliary pressurizer spray isolation valves CHB-HV-203 and CHA-HV-205 cannot be exercised during power operation due to resulting aberrant RCS pressure changes and subsequent reactor trip. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

2.4 Category C Valves

Boric acid makeup pumps to charging pumps suction check valve CHA-V177 and boric acid gravity feed check valve CHA-V190 cannot be exercised during power operation since this would cause excessive boration of the RCS and could result in plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Auxiliary pressurizer spray check valve CHE-V431 cannot be exercised during power operation due to resulting aberrant RCS pressure changes and subsequent reactor trip. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

3. CONTAINMENT PURGE SYSTEM

3.1 Category A Valves

Containment purge supply isolation valves CPA-UV-2A and CPB-UV-3A and containment purge exhaust isolation valves CPA-UV-2B and CPB-UV-3B cannot be

exercised during power operation as failure in the open position would violate containment integrity. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

4. ESSENTIAL COOLING WATER SYSTEM

4.1 Category B Valves

Essential cooling water to nuclear cooling water crossconnect isolation valves EWA-UV-65 and EWA-UV-145 cannot be exercised during power operation as this would require placing the nuclear cooling water system out of service. The resultant loss of RCP cooling water would require stoppage of the RCPs which would result in a reactor trip. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

5. INSTRUMENT AIR AND SERVICE GAS SYSTEMS

5.1 Category A Valves

Instrument air containment isolation valve IAE-UV-2 cannot be exercised during power operation as stroking this valve will cause loss of pressurizer level control and possible subsequent plant shutdown. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

5.2 Category A/C Valves

Instrument air inside containment check valve IAE-V021 and service gas inside containment check valves GAE-V011 and GAE-V015 cannot be verified to close, the safety position, during power operation as testing requires access to containment. These valves will be closure verified during cold shutdowns and refueling outages.

6. CHILL WATER SYSTEM

6.1 Category A/C Valves

Chill water inside containment check valve WCE-V039 cannot be verified to close, the safety position, during power operation as testing requires access to containment. This valve will be closure verified during cold shutdowns and refueling outages.

7. NUCLEAR COOLING WATER SYSTEM

7.1 Category A Valves

Nuclear cooling water supply and return for RCPs and control element drive mechanisms isolation valves NCB-UV-401, NCA-UV-402, and NCB-UV-403 cannot be exercised during power operation due to possible RCP seal damage. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

7.2 Category A/C Valves

Nuclear cooling water supply for RCPs and control element drive mechanisms check valve NCE-V118 cannot be exercised during power operation due to possible RCP seal damage. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

8. REACTOR COOLANT SYSTEM

8.1 Category B Valves

Reactor vessel and pressurizer vent isolation valves RCA-HV-101, RCB-HV-102, RCA-HV-103, RCB-HV-105, RCA-HV-106, RCB-HV-108, and RCB-HV-109 cannot be exercised during power operation as they are required to remain closed as per Technical Specifications and failure in the open position would require reactor shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

9. MAIN STEAM SYSTEM

9.1 Category B Valves

Feedwater isolation valves SGB-UV-130, SGB-UV-132, SGB-UV-135, SGB-UV-137, SGA-UV-172, SGA-UV-174, SGA-UV-175, and SGA-UV-177 cannot be exercised during power operation as feedwater isolation would cause a reactor trip due to low steam generator water level. Valves SGB-UV-132, SGB-UV-137, SGA-UV-174, and SGA-UV-177 will be partial-stroke exercised quarterly and all of these valves will be full-stroke exercised during cold shutdowns and refueling outages.

Main steam atmospheric dump isolation valves SGB-HV-178, SGA-HV-179, SGA-HV-184, and SGB-HV-185 cannot be exercised during power operation as exercising would cause an excessive steam flow rate with a resultant plant shutdown due to excessive reactor power. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Main steam isolation valves SGE-UV-170, SGE-UV-171, SGE-UV-180, and SGE-UV-181 cannot be exercised during power operation as closure would result in a turbine trip and a subsequent reactor trip. These valves will be partial-stroke exercised quarterly and full-stroke exercised during cold shutdowns and refueling outages.

9.2 Category C Valves

Main steam supply to steam driven auxiliary feedwater pump check valves SGA-V043, SGA-V044, SGE-V887, and SGE-V888 cannot be exercised during power operation as the excessive feedwater flow could upset steam generator water level and cause a reactor trip. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Main feedwater to steam generator inlet check valves SGE-V003, SGE-V005, SGE-V006 and SGE-V007 cannot be closure verified, the safety position, during power operation as feedwater stoppage would cause a reactor trip. These valves will be closure verified during cold shutdowns and refueling outages. (These valves were improperly identified in valve relief request no. 23 as a request for relief and should be identified as a cold shutdown justification. See item 7 in Appendix C.)

10. SAFETY INJECTION AND SHUTDOWN COOLING SYSTEM

10.1 Category A Valves

Shutdown cooling warmup bypass valves SIA-HV-691 and SIB-HV-690 cannot be exercised during power operation as failure in the open position would render a required operable shutdown cooling train inoperable. This would result in a Technical Specification required plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Long term recirculation lines to RCS hot leg isolation valves SIC-HV-321 and SID-HV-331 cannot be exercised during power operation as these valves are required to be de-energized closed by Technical Specifications. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Shutdown cooling isolation valves SIA-UV-651, SIB-UV-652, SIA-UV-653, and SIB-UV-654 cannot be exercised during power operation as these valves are interlocked to remain closed with pressurizer pressure greater than 400 psig. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

10.2 Category A/C Valves

Safety injection and shutdown cooling to RCS check valves SIE-V540, SIE-V541, SIE-V542, and SIE-V543 cannot be exercised during power operation as the combined low pressure and high pressure safety injection pumps flow is not enough to full-stroke exercise the valves. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

10.3 Category B Valves

Long term recirculation lines to RCS hot leg isolation valves SIA-HV-604 and SIB-HV-609 and safety injection tank vent isolation valves SIA-HV-605, SIA-HV-606, SIA-HV-607, SIA-HV-608, SIB-HV-613, SIB-HV-623, SIB-HV-633, and SIB-HV-643 cannot be exercised during power operation as these valves are required to be de-energized closed by Technical Specifications. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Shutdown cooling isolation valves SIA-UV-655 and SIB-UV-656 cannot be exercised during power operation as these valves are interlocked to remain closed with pressurizer pressure greater than 400 psig. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Safety injection tank outlet isolation valves SIB-UV-614, SIB-UV-624, SIA-UV-634, and SIA-UV-644 cannot be exercised during power operation as these valves are required to be de-energized open by Technical Specifications. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Safety injection pumps combined recirculation isolation valves SIA-UV-660 and SIB-UV-659 cannot be exercised during power operation as failure in the closed position would render one complete train (i.e. low pressure safety injection, high pressure safety injection, and containment spray pumps) of safety injection inoperable and would require plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

10.4 Category C Valves

Low pressure safety injection to RCS check valves SIE-V114, SIE-V124, SIE-V134, and SIE-V144 and low pressure safety injection pump discharge check valves SIA-V434 and SIB-V446 cannot be exercised during power operation as the low pressure safety injection pump does not develop enough flow to full-stroke exercise the valves. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Containment spray pump discharge check valves SIB-V484 and SIA-V485 cannot be exercised during power operation without spraying down the inside of containment which would water damage equipment. These valves cannot be exercised with flow to the RCS as the containment spray pumps do not develop enough flow to overcome RCS pressure. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

APPENDIX B

P&ID LIST

APPENDIX B

P&ID LIST

The P&IDs listed below were used during the course of this review.

System	P&ID	Revision
Auxiliary Feedwater System	AFP-001	9
Chemical and Volume Control System	CHP-001 CHP-002 CHP-003	5 7 5
Containment Purge System	CPP-001 175010-2	7 8
Condensate Storage and Transfer System	CTP-001	14
Diesel Fuel Oil and Transfer System	DFP-001	8
Diesel Generator System	DGP-001 DGS-006	7 2
Essential Chilled Water System	ECP-001	22
Essential Cooling Water System	EWP-001	6
Fire Protection System	FPP-006	6
Service Gas System	GAP-001	5
Gaseous Radwaste System	GRP-001	7
Containment Building Heat, Ventilation, and Air Conditioning System	HCP-001	7
Containment Hydrogen Control System	HPP-001	4
Instrument and Service Air System	IAP-002 IAS-003	4 0
Nuclear Cooling Water System	NCS-002 NCP-003	0 7

System	P&ID	Revision
Fuel Pool Cooling and Cleanup System	PCP-001	7
Reactor Coolant System	RCP-001	17
Radioactive Waste Drain System	RDP-001	5
Main Steam System	SGP-001 SGP-002	24 6
Safety Injection and Shutdown Cooling System	SIP-001 SIP-002	18 5
Essential Spray Pond System	SPP-001 SPP-002	6 3
Nuclear Sampling System	SSP-001	7
Normal Chilled Water System	WCP-001	9

APPENDIX C

IST PROGRAM ANOMALIES IDENTIFIED DURING THE REVIEW

APPENDIX C

IST PROGRAM ANOMALIES IDENTIFIED DURING THE REVIEW

Inconsistencies and omissions in the licensee's program noted during the course of this review are summarized below. The licensee should resolve these items in accordance with the evaluations, conclusions, and guidelines presented in this report.

1. Pump Relief Request No. 1 requests relief from the IWP-3100 quarterly flow rate measurement requirement for the auxiliary feedwater pumps (see section 3.2.2 of this report). The licensee has proposed to measure only pump flow rate on a refueling outage frequency. This is not acceptable and to be granted relief for this request the licensee should perform a larger flow rate test at cold shutdown and measure all Code required parameters. The licensee should also perform a miniflow test quarterly and may be granted relief to not measure pump flow rate quarterly. Relief for this request may be granted, provided that the licensee performs testing as described in section 3.2.2.2 of this report. Further, the licensee did not provide sufficient technical justification for not being able to perform a larger flow rate test during power operation. The licensee should modify Pump Relief Request No. 1 to include this information (see section 3.2.2.2 of this report).

2. Pump Relief Request No. 6 requests relief from the IWP-3100 quarterly flow rate measurement requirement for the low pressure safety injection, high pressure safety injection, and containment spray pumps (see section 3.2.3 of this report). Performing a larger flow rate test on a refueling outage frequency for the high pressure safety injection and containment spray pumps is acceptable, however, because the low pressure safety injection pumps are also utilized for shutdown cooling during cold shutdown, it is not acceptable to test the low pressure safety injection pumps on a refueling outage frequency. When these pumps are operated with a larger flow rate flowpath during cold shutdown,

the licensee should perform a larger flow rate test, measuring all required Code pump parameters. Further, only measuring pump flow rate during this flow test is not acceptable. The licensee should measure all Code required parameters during the larger flow rate pump test, in addition to measuring all Code required parameters except flow rate quarterly. Also, measuring pump flow rate during the larger flow rate test with plus or minus 5% accuracy instrumentation is not acceptable. The licensee has not specifically requested relief for this deviation from the Code instrumentation accuracy requirements. Relief for this request may be granted, provided that the licensee performs testing as described in section 3.2.3.2 of this report. In addition, the licensee did not provide sufficient technical justification for not being able to perform a larger flow rate test for these pumps during power operation and cold shutdown. The licensee should modify Pump Relief Request No. 6 to include this information (see section 3.2.3.2 of this report).

3. Valve Relief Request No. 31 requests relief from full-stroke exercising of the containment spray header inside containment check valves and proposes to verify valve operability by disassembly of both valves once per 5 years (see section 4.5.1.2 of this report). The NRC staff position is that check valve sample disassembly/inspection is a suitable alternative means to full-stroke exercise these valves and, therefore, relief should only be granted in accordance with the provisions of section 4.5.1.2.2 of this report.

4. Valve Relief Request No. 33 requests relief from full-stroke exercising of the safety injection tank outlet check valves and proposes to verify valve operability by sample/disassembly of these valves every second refueling outage (see section 4.5.1.3 of this report). The NRC staff position is that check valve sample disassembly/inspection as discussed in section 4.5.1.2.2 of this report is a suitable alternative means to full-stroke exercise

these valves and, therefore, relief should only be granted in accordance with the provisions of section 4.5.1.2.2 of this report.

5. Valve Relief Request No. 34 proposes to utilize ultrasonic methods to verify the full-stroke capability of the safety injection and shutdown cooling to RCS check valves (see section 4.5.1.4 of this report). The NRC has not approved any ultrasonic methods to verify check valve full-stroke capability for Section XI, Paragraph IWV-3544 requirements at this time and, therefore, relief for this alternative method should be denied. However, the licensee may be granted relief for these valves provided that the proposed sample disassembly/inspection is performed in accordance with the provisions of section 4.5.1.2.2 of this report.

6. Valve Relief Request No. 32 requests relief from full-stroke exercising of the containment recirculation sump outlet check valves and proposes to verify valve operability by sample/disassembly of these valves every fourth refueling outage (see section 4.5.2.3 of this report). The NRC staff position is that check valve sample disassembly/inspection as discussed in section 4.5.1.2.2 of this report is a suitable alternative means to full-stroke exercise these valves and, therefore, relief should only be granted in accordance with the provisions of section 4.5.1.2.2 of this report.

7. Valve Relief Request No. 23 requests relief for deferring the closure verification of main feedwater to steam generator check valves (see second paragraph of section 9.2 of Appendix A of this report) to cold shutdown. These valves should be deleted from Valve Relief Request No. 23 and a specific cold shutdown justification provided as cold shutdown closure verification is not a deviation from the Code requirements.

8. Valve Relief Request No. 25 and Valve Relief Request No. 27 requests relief for the IWV-3300 requirement of two year position indication verification for auxiliary feedwater turbine warmup line and steam header steam trap isolation valves. Since position indication verification may be performed for these valves as the plant is returned to power from refueling outages, relief is not necessary and has not been addressed. These relief requests should be deleted.

9. Valve Relief Request No. 16 requests relief from measuring the stroke time of emergency diesel generators air starting solenoid valves (see section 4.3.1.1 of this report). Relief may be granted, provided the licensee alternates starting air receivers such that all of these valves are tested quarterly.

10. Valve Relief Request No. 6 requests relief from full-stroke exercising of the refueling water tank outlet check valves and proposes to full-stroke exercise these valves during refueling outages (see section 4.2.1.1 of this report). Sufficient technical justification for not exercising these valves in accordance with the Code has not been provided. However, there are valid reasons for not full-stroke exercising these valves quarterly and during cold shutdown, and relief may be granted (see section 4.2.1.1.2 of this report). The licensee should modify Valve Relief Request No. 6 to provide proper and sufficient technical justification for the granting of relief.

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U.S. NUCLEAR REGULATORY COMMISSION

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This EG&G Idaho, Inc. report presents the results of our evaluation of the Palo Verde Nuclear Generating Station, Units 1, 2, and 3, Inservice Testing Program for pumps and valves that perform a safety-related function.

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