May 5, 2004

Mr. Gregg R. Overbeck
Senior Vice President, Nuclear
Arizona Public Service Company
P. O. Box 52034
Phoenix, AZ 85072-2034

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNIT 1 - RELAXATION OF THE REQUIREMENTS OF FIRST REVISED ORDER EA-03-009 REGARDING REACTOR PRESSURE VESSEL HEAD INSPECTIONS (TAC NO. MC2388)

Dear Mr. Overbeck:

On February 11, 2003, the U.S. Nuclear Regulatory Commission (NRC) issued Order Modifying Licenses (Effective Immediately) EA-03-009 (Order) requiring specific inspections of the reactor pressure vessel (RPV) head and associated penetration nozzles at pressurized water reactors. The NRC issued an errata to the Order on March 14, 2003, to correct an administrative part of the Order related to requests for relaxation of the Order requirements. On February 20, 2004, the NRC issued the First Revised Order Modifying Licenses (First Revised Order), which supersedes and revises certain inspection aspects of the original Order.

Section IV.F of the First Revised Order states that requests for relaxation associated with specific penetration nozzles will be evaluated by the staff using its procedure for evaluating proposed alternatives to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code in accordance with Section 50.55a(a)(3) of Title 10 of the *Code of Federal Regulations* (10 CFR 50.55a(a)(3)).

Sections IV.A and IV.B of the First Revised Order provide criteria to categorize each plant's RPV head with respect to its susceptibility to primary water stress corrosion cracking (PWSCC). For plants like Palo Verde Nuclear Generating Station (PVNGS), Unit 1, with an RPV head categorized as highly susceptible to PWSCC, Section IV.C.(1) of the First Revised Order requires that the RPV head penetration nozzles be inspected each refueling outage as prescribed in Sections IV.C.(5)(a) and IV.C.(5)(b).

By letter dated March 19, 2004, as supplemented by letters dated April 16, April 22, April 28, and April 29, 2004, Arizona Public Service Company (APS or the licensee) requested relaxation for the control element drive mechanism (CEDM) nozzles from the requirements of Section IV.C.(1) of the First Revised Order for the PVNGS, Units 1, 2, and 3. The relaxation request was made pursuant to the procedure specified in Section IV.F of the First Revised Order. Specifically, APS stated that compliance with the First Revised Order would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The NRC staff has reviewed and evaluated the information provided in support of this request for relaxation as documented in the enclosed safety evaluation (SE). Because of the plant-specific analysis performed in support of the relaxation request, this evaluation is limited to PVNGS Unit 1 only. In addition, the relaxation is only effective for a period not to exceed 7.7 effective full power months of operation that follows the current refueling outage. The staff's SE concludes that APS has demonstrated good cause for the requested relaxation for this specified operation period because compliance with the First Revised Order for PVNGS Unit 1 CEDM nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The staff is in receipt of the licensee's May 3, 2004, letter providing their additional justification for extending the relaxation to the entire cycle of plant operation. However, the staff cannot determine the acceptability of the information provided in this letter in the short period of time available before the scheduled restart of Unit 1. Therefore, the staff based its review and conclusions on the information supplied by the licensee in its earlier letters, but will continue to review the licensee's May 3 letter to determine if additional relaxation from the requirements of the First Revised Order is warranted.

Therefore, pursuant to Section IV, paragraph F, of the First Revised Order, the staff authorizes the proposed relaxation and alternative inspection for PVNGS Unit 1 for a period not to exceed 7.7 effective full power months of operation, subject to the condition outlined in the conclusion section of the enclosed SE. The licensee agreed to this condition in their letter dated April 16, 2004. The operating period for which this relaxation is granted will start with the Spring 2004 refueling outage for Unit 1.

You should be aware that, when vessel head inspections are performed using ASME Code requirements, acceptance criteria, or qualified personnel, those activities and all related activities fall within the jurisdiction of the ASME Code. Therefore, Order-related inspection activities may be subject to third party review, including those by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

Herbert N. Berkow, Director
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. STN 50-528

Enclosure: Safety Evaluation

cc w/encl: See next page

The NRC staff has reviewed and evaluated the information provided in support of this request for relaxation as documented in the enclosed safety evaluation (SE). Because of the plant-specific analysis performed in support of the relaxation request, this evaluation is limited to PVNGS Unit 1 only. In addition, the relaxation is only effective for a period not to exceed 7.7 effective full power months of operation that follows the current refueling outage. The staff's SE concludes that APS has demonstrated good cause for the requested relaxation for this specified operation period because compliance with the First Revised Order for PVNGS Unit 1 CEDM nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

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Sincerely,
/RA/
Herbert N. Berkow, Director
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. STN 50-528
Enclosure: Safety Evaluation
cc w/encl: See next page
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO RELAXATION OF THE REQUIREMENTS OF FIRST REVISED ORDER

MODIFYING LICENSES EA-03-009

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

DOCKET NO. STN 50-528

PALO VERDE NUCLEAR GENERATING STATION, UNIT 1

1.0 INTRODUCTION

The First Revised Order Modifying Licenses EA-03-009 (hereinafter referred to as Order), issued on February 20, 2004, requires specific examinations of the reactor pressure vessel (RPV) head and vessel head penetration (VHP) nozzles of all pressurized water reactor (PWR) plants. Section IV, paragraph F, of the Order states that requests for relaxation of the Order associated with specific penetration nozzles will be evaluated by the NRC staff using the procedure for evaluating proposed alternatives to the American Society of Mechanical Engineers (ASME) Code in accordance with 10 CFR 50.55a(a)(3). Section IV, paragraph F, of the Order states that a request for relaxation regarding inspection of specific nozzles shall address the following criteria: (1) the proposed alternative(s) for inspection of specific nozzles will provide an acceptable level of quality and safety, or (2) compliance with this Order for specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

For Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3, and similar plants determined to have a high susceptibility to primary water stress corrosion cracking (PWSCC) in accordance with Section IV, paragraphs A and B of the Order, the following inspections are required to be performed every refueling outage in accordance with Section IV, paragraphs C.(5)(a) and C.(5)(b) of the Order:

(a) Bare metal visual examination of 100 percent of the RPV head surface (including 360° around each RPV head penetration nozzle). For RPV heads with the surface obscured by support structure interferences which are located at RPV head elevations downslope from the outermost RPV head penetration, a bare metal visual inspection of no less than 95 percent of the RPV head surface may be performed provided that the examination shall include those areas of the RPV head upslope and downslope from the support structure interference to identify any evidence of boron or corrosive product. Should any evidence of boron or corrosive product be identified, the licensee shall examine the RPV head surface under the support structure to ensure that the RPV head is not degraded.

(b) For each penetration, perform a nonvisual NDE in accordance with either (i), (ii), or (iii):

(i) Ultrasonic testing of the RPV head penetration nozzle volume (i.e., nozzle base material) from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0 inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater. In addition, an assessment shall be made to determine if leakage has occurred into the annulus between the RPV head penetration nozzle and the RPV head low-alloy steel.

(ii) Eddy current testing or dye penetrant testing of the entire wetted surface of the J-groove weld and the wetted surface of the RPV head penetration nozzle base material from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0 inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater.

(iii) A combination of (i) and (ii) to cover equivalent volumes, surfaces, and leak paths of the RPV head penetration nozzle base material and J-groove weld as described in (i) and (ii). Substitution of a portion of a volumetric exam on a nozzle with a surface examination may be performed with the following requirements:

1. On nozzle material below the J-groove weld, both the outside diameter and inside diameter surfaces of the nozzle must be examined.

2. On nozzle material above the J-groove weld, surface examination of the inside diameter surface of the nozzle is permitted provided a surface examination of the J-groove weld is also performed.

By letter dated March 19, 2004, as supplemented by letters dated April 16, April 22, April 28, and April 29, 2004, Arizona Public Service Company (APS, the licensee) requested relaxation to implement an alternative to the requirements of Section IV, paragraph C.(5)(b)(i), of the Order for RPV head penetration nozzles at PVNGS Units 1, 2, and 3. Because of the plant-specific analysis performed in support of the relaxation request, as discussed later in this evaluation, the NRC staff's evaluation of the licensee's request for relaxation from the Order is limited to PVNGS Unit 1 only. The discussions contained below are therefore limited to Unit 1 only.

2.0 ORDER RELAXATION REQUEST FOR EXAMINATION COVERAGE FOR RPV HEAD PENETRATION NOZZLES

2.1 Order Requirements for Which Relaxation is Requested

Section IV.C.(5)(b) of the Order requires, in part, that the inspections discussed in Section 1.0 of this safety evaluation be performed every refueling outage for high susceptibility plants similar to PVNGS Unit 1.

The licensee has requested relief from Section IV, paragraph C.(5)(b)(i) of the Order. The specific relaxation requested is identified below.

2.2 Licensee's Proposed Alternative

The licensee seeks relaxation from the Order where inspection coverage is limited due to the design of the funnel attachment to the control element drive mechanism (CEDM) nozzles for nondestructive examination (NDE), including ultrasonic testing (UT), eddy current testing (ET), and dye penetrant testing (PT).

The licensee proposes to examine each CEDM nozzle from 2 inches above the top of the attachment weld to the minimum required inspection distances identified in Table 1 of the March 19, 2004, submittal (identified below). The licensee stated that site procedures will require inspection of each CEDM nozzle as far down as practical, but will in all cases be equal to or greater than the minimum required inspection distances identified in the tables below.

Palo Verde Unit 1 Minimum Required Inspection Coverage

Nozzle Angle (°)	Penetration No. Applicability	Minimum Inspection Coverage Required Below the Weld on the Downhill Side (in)	Effective Full Power Years (EFPY) for Upper Crack Tip to Reach Bottom of Weld
0	1	0.45	1.7
7.5	2-21	0.45	1.7
28.0	22-45	0.45	1.8
35.7	46-85, 90-97	0.40	1.7
51.5	86-89	0.35	1.9

Where the requirement to inspect one inch below the toe of the weld cannot be met, fracture mechanics analysis has been performed by the licensee to demonstrate that postulated cracks in the uninspected area will not propagate to the bottom of the J-groove weld before the next inspection, which will be about 1.35 effective full power years for the next cycle of operation for PVNGS Unit 1.

2.3 Licensee's Basis for Proposed Alternative

The licensee stated that compliance with the Order would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The licensee stated that the design of the funnel attachment to the CEDM nozzles, which consists of a threaded connection with plug weld, and the as-welded condition of nozzle J-groove weld fillet sizes, prevents compliance with the requirement to perform UT to 1.0 inch below the lowest point of the toe of the J-groove weld for all CEDM nozzles. The licensee also stated that experience gained from the previous UT examinations of the CEDM nozzles completed at PVNGS in response to Bulletins 2001-01, 2002-01, 2002-02, and Order EA-03-009 have shown that scanning becomes impractical and ineffective from slightly above the top of the nozzle's chamfer face to the bottom of the nozzle. According to the licensee, UT scans in this area do not yield useful data because of the geometry of the nozzle and funnel and the multiple signals reflected back by the threaded surfaces.

The licensee stated that it had assessed the other testing options provided in the Order. Option IV.C(5)(b)(ii), which allows ET or PT testing of the wetted surface in question, would result in significant radiological exposure to personnel if this testing were conducted for all CEDM nozzles. The high exposures, at least 30 times the dose of the proposed alternative, would be a result of the manual processes needed to performing surface examinations on the outside diameter of the CEDM nozzles, due to the location and proximity of the funnels to each other and limited space. The licensee indicated that it would have to develop new, remote tooling or remove and reinstall a large number of funnels. Option IV.C(5)(b)(iii), which allows a combination of (i) and (ii) to cover equivalent volumes, surfaces, and leak paths of the RPV head penetration nozzle base material and J-groove weld, was not considered an option by the licensee since it had already decided to conduct volumetric examinations of the CEDM nozzles.

2.4 Evaluation

The NRC staff's review of this request was based on criterion (2) of paragraph F of Section IV of the Order, which states:

> Compliance with this Order for specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

In its letter dated March 19, 2004, the licensee indicated that hardship would result from meeting the requirements of the Order, due to the location and proximity of the funnels to each other and limited space. To perform a surface examination on the outside of the CEDM nozzles would be a high dose manual process and that it would need to develop new, remote tooling or remove and reinstall a large number of funnels. With respect to the licensee's rationale for

hardship due to the time constraints to develop new, remote tooling, the NRC staff noted that this same rationale was used by the licensee in its March 21, 2003, and April 2, 2003, letters requesting relaxation from the requirements of the Order Modifying Licenses (Effective Immediately) EA-03-009 dated February 11, 2003, for PVNGS Unit 3. The NRC staff no longer accepts this rationale as the basis for hardship because sufficient time has passed to develop the tooling and the licensee has not provided any evidence of planning progress in its April 22, 2004, response to the NRC staff's request for additional information on this issue. However, considering that the results of the hoop stress analyses provided by the licensee are bounded by the examined areas below the J-groove welds, and the low stress levels in the unexamined areas, no commensurate increase in quality and safety would be obtained by performing the remote surface examination.

In its supplemental letter dated April 16, 2004, the licensee provided a more in-depth analysis of the dose estimate. The total dose to perform the surface examination manually is estimated by the licensee at 48.5 man rem. The licensee also indicated that it would examine each CEDM nozzle from two inches above the top of the J-groove welds to as far down the nozzles as physically possible. Within the context of the licensee's proposed alternative examination of the RPV head penetration nozzles, the NRC staff concludes that the licensee has demonstrated the hardship that would result from implementing examinations to the bottom end of these nozzles.

In its March 19, 2004, letter, the licensee indicated that it had evaluated the other testing options available to them under the Order, specifically under Section IV, paragraphs C.(5)(b)(ii) and (iii). The NRC staff does not agree with the licensee's position that inspection option IV.C.(5)(b)(iii), which allows a combination of (i) and (ii) to cover equivalent volumes, surfaces and leak paths of the RPV head penetration nozzle base material and J-groove weld, does not apply since the licensee is performing a volumetric examination. Paragraph IV.C.(5)(b)(iii) is a viable option because the licensee, by seeking relaxation, is not meeting the requirements of (i) or (ii). In its April 16, 2003, supplemental letter, the licensee responded to this position by the NRC staff to state that it was modifying its request for relaxation to include the testing requirements under Section IV, paragraphs C.(5)(b)(i), (ii), and (iii). The NRC staff concurs that these are the appropriate sections from which to request relaxation since a combination of techniques may be applied to obtain the coverage requirements of the Order. The NRC staff concludes that the hardship rationale discussed previously applies and that the licensee has demonstrated the hardship that would result from implementing examinations to the bottom end of all 97 CEDM nozzles.

The phenomenon of concern is primary water stress corrosion cracking (PWSCC), which typically initiates in the areas of highest stress. The area of CEDM penetrations that has the highest residual stress is the area adjacent to the J-groove attachment weld. Therefore, it is most likely that PWSCC will initiate in an area adjacent to the J-groove attachment weld. The licensee proposed to examine no less than the minimum distance (specified in the table in Section 2.2 of this safety evaluation) of the nozzle base material below the attachment weld to the top of the chamfer above the threads.

The intent of the Order is that all licensees examine as far below the J-groove weld as is physically possible. The table included in Section 2.2 above does not provide sufficient information for the NRC staff to determine the distance from the bottom of the J-groove weld to the CEDM nozzle bottom that was actually examined. Consistent with requests made of other

licensees, the NRC staff asked the licensee to provide actual distances below the J-groove weld that have been examined in order to verify that the hoop stress analyses provided by the licensee are bounded by the areas examined. This provides a more accurate assessment of the calculated time for a postulated crack in the unexamined area to reach the J-groove welds for each plant. By supplemental letter dated April 28, 2004, the licensee committed to determine that the minimum required distances listed above were examined in accordance with the requirements of the Order. On CEDM nozzles where the minimum required distances below the J-groove weld were not examined, the licensee committed to perform a surface examination below the affected nozzle J-groove welds to as low as practical on the affected nozzle inner diameter (ID) and outer diameter (OD) surfaces prior to plant startup.

The licensee's minimum inspection zone is defined as that distance of the nozzle base material below the J-groove weld for which a postulated flaw located below that portion of the nozzle that was not inspected, would not propagate to a level adjacent to the J-groove weld within the next operating period. The licensee's flaw evaluation was performed by postulating a through-wall axial flaw in the area of missed coverage below the weld. The methodology was described in WCAP-15817-P, Revision 1, "Structural Integrity Evaluation of Reactor Vessel Upper Head Penetrations to Support Continued Operation: Palo Verde Units 1 and 2," dated October 2003. This report was provided by the licensee in its March 19, 2004, application. WCAP-15817-P identified the conservatisms embedded in the flaw evaluation for the zero ksi stress case (the most conservative initial assumption for initial crack growth) as:

1. The postulated axial flaw is assumed to be a through wall flaw with its upper crack tip assumed to be located at the end of the inspection zone while its lower crack tip is assumed to be located where the hoop stress drops below 0 ksi on either the inside or outside surface of the CEDM penetration nozzle.

2. For comparison purposes, the minimum inspection coverage for the case with the stress level of the lower crack tip at 20 ksi was provided. The stress level of 20 ksi is a conservative value below which PWSCC initiation is unlikely.

The table in Section 2.2 above and the plant specific hoop stress distribution charts provided by the licensee in WCAP-15817-P indicate that Unit 1 will be able to operate for the next operating cycle (scheduled for 493 days or 1.35 EFPY) without an existing crack(s) in the uninspected region propagating to the bottom of the J-groove weld(s), provided the minimum inspection distances are met. In its supplemental letter dated April 22, 2004, the licensee stated that the upper extremity location for the initial through-wall flaw referenced in its March 19, 2004, relaxation request submittal is postulated at the end of the minimum required inspection coverage zone tabulated in the table in Section 2.2 above. Therefore, the NRC staff concludes that for PVNGS Unit 1 to operate one cycle conservatively, the licensee needs to assure that it has effectively examined the minimum required distance below the J-groove weld(s).

At the NRC staff's request, the licensee provided preliminary results of the nozzle inspections conducted during the current refueling outage for Unit 1. In its letter dated April 28, 2004, the licensee indicated that for CEDM penetrations 84, 87, and 93, the minimum inspection distances were not achieved. To supplement the volumetric examinations conducted on these three penetrations, the licensee performed ultrasonic and eddy current examination of the

available surface on the ID and performed a manual dye penetrant examination from below the J-groove weld (overlapping the volumetric examination) to as low as practical on the OD surface of these four identified penetration nozzles. No indications were identified.

The NRC staff requested the licensee to provide the following information in regard to these three penetrations:

1. The distances inspected below the weld on the ID and OD.

2. The stress levels of the ID for the distance inspected.

3. Yield strength of the nozzles.

4. Additional justification for the acceptance of the distances inspected on the ID of the nozzle.

In its supplemental letter dated April 29, 2004, the licensee provided the information below:

Nozzle	Angle	ID Distanced Covered by UT	PT exam Coverage Downhill Side (OD)	Minimum Inspection Coverage Required Below the Weld on the Downhill Side(Note 1)	Stress at the Minimum Distance	Stress at OD of Nozzle at the Minimum Distance Inspected by UT (Note 2)	PT Exam Coverage Uphill Side (OD)	EFPY for Crack Tip to Reach Bottom of J-groove weld (Note 1)	Material Yield Strength of CEDM Nozzle (Note 2)
84	35.7	0.28"	1.0"	0.40"	25 ksi	45 ksi	1.2"	1.7	37-51 ksi
87	51.5	0.20"	0.8"	0.35"	19 ksi	50 ksi	1.3"	1.9	37-51 ksi
93	35.7	0.36"	0.7"	0.40"	20 ksi	30 ksi	1.1"	1.7	37-51 ksi

Note 1 - Provided in Table 1 of submittal dated March 19, 2004.
Note 2 - Provided in Attachment 3 to submittal dated March 19, 2004.
Note 3 - All distances in the table are below the J-groove weld.

The NRC staff notes that the stated EFPY of permitted operation is predicated on achievement of the minimum inspection distances as determined by the licensee's plant specific analysis. However, since the minimum inspection distances were not met for the subject three nozzles, the licensee has not justified operation of one cycle.

Based on the configuration, the most limiting distance is the ID distance covered by UT from below the J-groove weld to the top of the chamfer above the threads. In its supplemental letter dated April 22, 2004, the licensee stated that the upper extremity location for the postulated initial through-wall flaw referenced in its March 19, 2004, relaxation request submittal is at the end of the minimum required inspection coverage zone tabulated in Tables 1 and 2 of the subject submittal. Therefore, it would have been appropriate for the licensee to assume the upper extremity of the postulated through-wall flaw to be located at the end of the inspection coverage obtained on the ID, which is to the top of the chamfer. Using the inspection distances achieved as documented in the April 29, 2004, submittal and the flaw analysis charts provided in WCAP-15817-P, the NRC staff has determined that the most limiting time for a postulated through-wall flaw in the uninspected area to reach the bottom of the J-groove weld on either the ID or OD, is 7.7 effective full power months.

The licensee's analysis in WCAP-15817-P used the crack growth formula in Electric Power Research Institute (EPRI) Report Material Reliability Program (MRP) report MRP-55, "Material Reliability Program (MRP) Crack Growth Rates for Evaluating Primary Water Stress Corrosion Cracking (PWSCC) of Thick Wall Alloy 600 Material (MRP-55), Revision 1." The NRC staff has made preliminary assessment of the crack growth formula, but has not yet made a final determination on the acceptability of the subject industry report. Should the NRC staff determine the crack growth formula used by the licensee to be unacceptable, the licensee will be required to revise its analysis to incorporate an acceptable crack growth formula as described below.

> If the NRC staff finds that the crack-growth formula in industry report MRP-55 is unacceptable, the licensee shall revise its analysis that justifies relaxation of the Order within 30 days after the NRC informs the licensee of an NRC-approved crack growth formula. If the licensee's revised analysis shows that the crack growth acceptance criteria are exceeded prior to the end of the current operating cycle, this relaxation is rescinded and the licensee shall, within 72 hours, submit to the NRC written justification for continued operation. If the revised analysis shows that the crack growth acceptance criteria are exceeded during the subsequent operating cycle, the licensee shall, within 30 days, submit the revised analysis for NRC review. If the revised analysis shows that the crack growth acceptance criteria are not exceeded during either the current operating cycle or the subsequent operating cycle, the licensee shall, within 30 days, submit a letter to the NRC confirming that its analysis has been revised. Any future crack-growth analyses performed for this and future cycles for RPV head penetrations must be based on an acceptable crack growth rate formula.

The licensee agreed to this condition in its letter dated April 16, 2004.

Based upon the evaluation above, the NRC staff finds that the licensee's proposed alternative examination for Unit 1 is acceptable for no greater than 7.7 effective full power months of operation, as it provides reasonable assurance of the structural integrity of the RPV head, VHP

nozzles and welds. Further inspections to comply with the Order requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

5.0 CONCLUSION

The NRC staff concludes that the licensee's proposed alternative examination of the CEDM nozzles for PVNGS Unit 1, provides reasonable assurance of the structural integrity of the RPV head, VHP nozzles and welds for a limited operating time of 7.7 effective full power months of operation. Further inspections of these VHP nozzles in accordance with Section IV, paragraph C.(5)(b), of the Order would result in hardship without a compensating increase in the level of quality and safety. Therefore, pursuant to Section IV, paragraph F, of the Order, the NRC staff authorizes the proposed alternative inspection for the CEDMs at PVNGS Unit 1, for 7.7 effective full power months of operation, for good cause shown, subject to the following condition:

> If the NRC staff finds that the crack-growth formula in industry report MRP-55 is unacceptable, the licensee shall revise its analysis that justifies relaxation of the Order within 30 days after the NRC informs the licensee of an NRC-approved crack growth formula. If the licensee's revised analysis shows that the crack growth acceptance criteria are exceeded prior to the end of the current operating cycle, this relaxation is rescinded and the licensee shall, within 72 hours, submit to the NRC written justification for continued operation. If the revised analysis shows that the crack growth acceptance criteria are exceeded during the subsequent operating cycle, the licensee shall, within 30 days, submit the revised analysis for NRC review. If the revised analysis shows that the crack growth acceptance criteria are not exceeded during either the current operating cycle or the subsequent operating cycle, the licensee shall, within 30 days submit a letter to the NRC confirming that its analyses has been revised. Any future crack-growth analyses performed for this and future cycles for RPV head penetrations must be based on an acceptable crack growth rate formula.

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