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GO2-14-104
July 21, 2014

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION RELATED TO RELIEF REQUESTS FOR THE COLUMBIA GENERATING STATION FOURTH TEN-YEAR INTERVAL INSERVICE TESTING PROGRAM**

References: 1) Letter, GO2-14-049, dated April 2, 2014, A. L. Javorik (Energy Northwest) to NRC, "Relief Requests for the Columbia Generating Station Fourth Ten-Year Interval Inservice Testing Program"
2) Email, dated July 2, 2014, Andrea George (NRC) to Lisa Williams (Energy Northwest), "Requests for Additional Information - Relief Requests Associated with the Fourth Ten-Year Interval Inservice Testing Program - Columbia Generating Station (TAC NOS. MF3851, MF3854, MF3856, MF3857)"

Dear Sir or Madam:

By Reference 1, Energy Northwest submitted for approval the relief requests for the Fourth Ten-Year Inservice Testing Program.

Via Reference 2, the Nuclear Regulatory Commission (NRC) submitted Requests for Additional Information (RAIs) to Energy Northwest for relief requests RP01, RP02, RP03, and RP06. Enclosure 1 provides the requested information. Enclosures 2 and 3 provide clarification revisions to RP02 and RP03 respectively.

This letter and its enclosures contain no regulatory commitments. If there are any questions or if additional information is needed, please contact Ms. L. L. Williams, Licensing Supervisor, at 509-377-8148.

A047
NRR

I declare under penalty of perjury that the foregoing is true and correct. Executed this 17th day of July, 2014.

Respectfully,

A. L. Javorik
Vice President, Engineering

Enclosures: 1) Response to RAIs
2) RP02 Revision 1
3) RP03 Revision 1

cc: NRC RIV Regional Administrator
NRC NRR Project Manager
NRC Senior Resident Inspector/988C
M Jones - BPA/1399 (email)
JO Luce - ESFEC
RR Cowley – WDOH (email)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)

NRC Request:

EPNB-RAI-RP-01-1: Please provide the discharge pressures for standby service water pumps SW-P-1A and SW-P-1B, and standby service water, HPCS pump HPCS-P-2 from the inservice tests for the past year.

Energy Northwest Response:

The following table contains the one year data requested for SW-P-1A and SW-P-1B from the inservice tests.

Standby Service Water Pumps Discharge Pressure Summary (1 YR)			
	DATE	**PRESSURE**	
SW-P-1A	5/29/13	204.75	PSIG
SW-P-1A	7/30/13	204.63	PSIG
SW-P-1A	10/26/13	205.78	PSIG
SW-P-1A	1/14/14	210.24	PSIG
SW-P-1A	4/12/14	209.83	PSIG
SW-P-1B	6/7/13	211.00	PSIG
SW-P-1B	8/18/13	210.50	PSIG
SW-P-1B	10/6/13	211.50	PSIG
SW-P-1B	10/12/13	213.60	PSIG
SW-P-1B	12/6/13	212.80	PSIG
SW-P-1B	1/31/14	212.00	PSIG
SW-P-1B	4/27/14	212.00	PSIG

The following table contains the one year data requested for HPCS-P-2 from the inservice tests.

Standby Service Water Pumps Discharge Pressure Summary (1 YR)			
	DATE	**PRESSURE**	
HPCS-P-2	4/20/13	60	PSIG
HPCS-P-2	6/9/13	60	PSIG
HPCS-P-2	6/17/13	60	PSIG
HPCS-P-2	7/12/13	60	PSIG
HPCS-P-2	10/5/13	58	PSIG
HPCS-P-2	12/28/13	60	PSIG
HPCS-P-2	3/18/14	59	PSIG

NRC Request:

EPNB-RAI-RP-02-1: It appears that this alternative request is requesting the use of parts of Code Case OMN-16 for the standby service water pumps and the standby service water, HPCS pump. Please confirm if this is correct. If this is correct, please explain how your proposed testing differs from Code Case OMN-16 and provide justification for the differences.

Energy Northwest Response:

The intent of Columbia Generating Station (Columbia) relief request RP02 is to follow all of the requirements of OM Code Case OMN-16. RP02 has been revised to clarify all the requirements specified in OM Code Case OMN-16 will be followed. Enclosure 2 contains Revision 1 to RP02.

NRC Request:

EPNB-RAI-RP-03-1: Relief request RP-03 lists several elements that are used to develop and implement the provided reference pump curves. Relief request RP-03

states that these elements "follow the guidance of Code Case OMN-16." Please clarify what portions of ASME OM Code Case OMN-16 are being followed. Also, please explain any deviations from ASME OM Code Case OMN-16 that are being requested in relief request RR-03.

Energy Northwest Response:

Intent of Columbia relief request RP03 is to follow all the guidance of Code Case OMN-16 for testing of pumps LPCS-P-1, RHR-P-2A/B/C, HPCS-P-1 and RCIC-P-1. RP03 has been revised to clarify that all requirements of Code Case OMN-16 will be used for testing of these pumps. Enclosure 3 contains Revision 1 to RP03.

NRC Request:

EPNB-RAI-RP-06-1: Alternative request RP-06 provides a table that compares the test flow rate to the design basis accident flow rate. Please provide a table that compares test differential pressure and design basis differential pressure for the pumps for which an alternative is requested.

Energy Northwest Response:

The intent of providing the table comparing test flow rates to the design basis accident flow rates is to satisfy requirements of Note 1 under Division 1, Mandatory Appendix V, Pump Periodic Verification Test Program, of the ASME OM Code 2012 Edition. Per note 1, "The Owner is not required to perform a pump periodic verification test, if the design basis accident flow rate in the Owner's safety analysis is bounded by the comprehensive pump test or Group A test." Since Columbia's Design Basis Accident flow rates are bounded by the test flow rates, Columbia is not required to perform pump periodic verification tests per Note 1 in Appendix V.

RP02
Revision 1
Relief Request
In Accordance with 10 CFR 50.55a(f)(5)(iii)

– Inservice Testing Impracticality –

ASME Code Components Affected

Pump	Code Class	Pump Group	P&ID Dwg. Number	System(s)
SW-P-1A	3	A	M524, SH 1	Standby Service Water
SW-P-1B	3	A	M524, SH 2	Standby Service Water
HPCS-P-2	3	A	M524, SH 1	Standby Service Water, HPCS

Applicable Code Edition and Addenda

The 2004 Edition and the 2005 and 2006 Addenda of the ASME OM Code.

Applicable Code Requirement

Subsection ISTB-5221(b) and ISTB-5223(b). The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to the reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value.

Relief is required for Group A and Comprehensive Pump Tests.

Impracticality of Compliance

The establishment of specific reference values is impractical for these vertical line shaft centrifugal pumps.

Burden Caused by Compliance

1. Service Water systems are designed such that the total pump flow cannot be adjusted to one finite value for the purpose of testing without adversely affecting the system flow balance and Technical Specification operability requirements. Thus, these pumps must be tested in a manner that the Service Water loop remains properly flow balanced during and after the testing and each supplied load remains fully operable to maintain the required level of plant safety.

2. The Service Water system loops are not designed with a full flow test line with a single throttle valve. Thus the flow cannot be throttled to a fixed reference value. Total pump flow rate can only be measured using the total system flow indication installed on the common return header. Although there are valves in the common return line that are used for throttling total system flow during pre-service testing, use of these valves is impractical for regular testing due to the potential effect on the flow balance for the safety related loads. Each main loop of service water supplies 17-18 safety related loads, all piped in parallel with each other. The HPCS-P-2 pump loop supplies four loads, each in parallel. Each pump is independent from the others (i.e., no loads are common between the pumps). Each load is throttled to a calculation and surveillance required flow range which must be satisfied for the loads to be operable. All loads are aligned in parallel, and all receive service water flow when the associated service water pump is running, regardless of whether the served component itself is in service. During power operation, all loops (subsystems) of service water are required to be operable per Technical Specifications. A loop of service water cannot be taken out of service for testing without entering an Action Statement for a Limiting Condition for Operation (LCO) per Technical Specification 3.7.1.

3. Each loop of Service Water is flow balanced annually to ensure that all loads are adequately supplied. A flow range is specified for each load. Once properly flow balanced, very little flow adjustment can be made for any one particular load without adversely impacting the operability of the remaining loads (increasing flow for one load reduces flow for all the others). Each time the system is flow balanced, proper individual component flows are produced, but this in turn does not necessarily result in one specific value for total flow. Because each load has an acceptable flow range, overall system full flow (the sum of the individual loads) also has a range. Total system flow can conceivably be in the ranges of approximately 9,200 - 10,200 gallons per minute (gpm) for SW-P-1A and SW-P-1B pumps and approximately 1,112 - 1,203

gpm for HPCS-P-2 pump. Consequently, the requirement to quarterly adjust service water loop flow to one specific flow value for the performance of inservice testing conflicts with system design and component operability requirements (i.e., flow balance) as required by Technical Specification.

Proposed Alternative and Basis for Use

As discussed above, it is impractical to return to a specific value of flow rate or discharge pressure for testing of these pumps. As stated in NUREG-1482, Rev 2 Section 5.2, some system designs do not allow for testing at a single reference point or a set of reference points. In such cases, it may be necessary to plot pump curves to use as the basis for variable reference points. Code Case OMN-16, "Use of a Pump Curves for Testing," is included in draft Revision 1 of Regulatory Guide (RG) 1.192, "Operations and Maintenance Code Case Acceptability, ASME OM Code." Flow rate and discharge pressure are measured during inservice testing and compared to an established reference curve. Discharge pressure instead of differential pressure is used to determine pump operational readiness as described in Relief Request RP01. All requirements specified in Code Case OMN-16 will be followed in developing and implementing the reference pump curves. The following information is provided for existing pump curves developed during the third ten year test interval.

1. SW-P-1A and SW-P-1B were replaced with new pumps in 2005 and HPCS-P-2 was replaced in 2008. A preservice test as required by the ASME OM Code was performed and a reference pump curve (flow rate vs. discharge pressure) was established for all three pumps using the preservice test data.

2. Pump curves are based on five or more test points beyond the flat portion of the curve (between 6000 gpm and 10200 gpm for SW-P-1A and 1B pumps and between 650 and 1200 gpm for HPCS-P-2 pump). The pumps are being tested near full design flow rate.

3. Temporary test gauges (± 0.5% full scale accuracy) were installed to take discharge pressure test data in addition to plant installed gauges, and Transient Data Acquisition System (TDAS). TDAS data averages 100 readings with a reading taken each second. All instruments used either met or exceeded the Code required accuracy for Group A and comprehensive pump test.

4. The reference pump curves are based on flow rate vs. discharge pressure. Acceptance criteria curves are based on differential pressure limits given in Table ISTB-5121-1 for applicable test type. Setting the Code Acceptance Criteria on discharge pressure using differential limits is slightly more conservative for these pump installations with suction lift (Relief Request RP01). See the attached sample SW-P-1A pump Acceptance Criteria sheet for Group A test. Area 1-2-5-6 is the acceptable range for pump performance. Area 3-4-5-6 defines the Alert Range, and the area outside 1-2-3-4 defines the required Action Range.

5. Similar reference curves are used for comprehensive pump tests using the applicable acceptance criteria and instrument accuracy and range requirements.

6. Only a small portion of the established reference curve is being used to bind the flow rate variance due to flow balancing of various system loads. See the attached sample SW-P-1A pump Acceptance Criteria sheet for Group A test.

7. A single reference value shall be assigned for each vibration measurement location. The selected reference value shall be at the minimum data over the narrow range of pump curves being used as required by Code Case OMN-16.

8. When the repair, replacement, or routine servicing of a pump may have affected a reference curve, a new reference curve shall be determined, or the existing reference curve reconfirmed, in accordance with para. 16-3310 of Code Case OMN-16.

9. If it is necessary or desirable, for some reason other than that stated in para. 16-3310 of Code Case OMN-16, to extend the current pump curve or establish an additional reference curve, the new curve(s) must be determined in accordance with para. 16-3320 of Code Case OMN-16.

Quality/Safety Impact

The design of the Columbia Generating Station Service Water system and the Technical Specification requirements make it impractical to adjust system flow to a fixed reference value for inservice testing without adversely affecting the system flow balance and Technical Specification operability requirements. The proposed alternate testing using a reference pump curve for each pump provides adequate assurance and accuracy in monitoring pump

condition to assess pump operational readiness and shall adequately detect pump degradation. Alternate testing will have no adverse impact on plant and public safety.

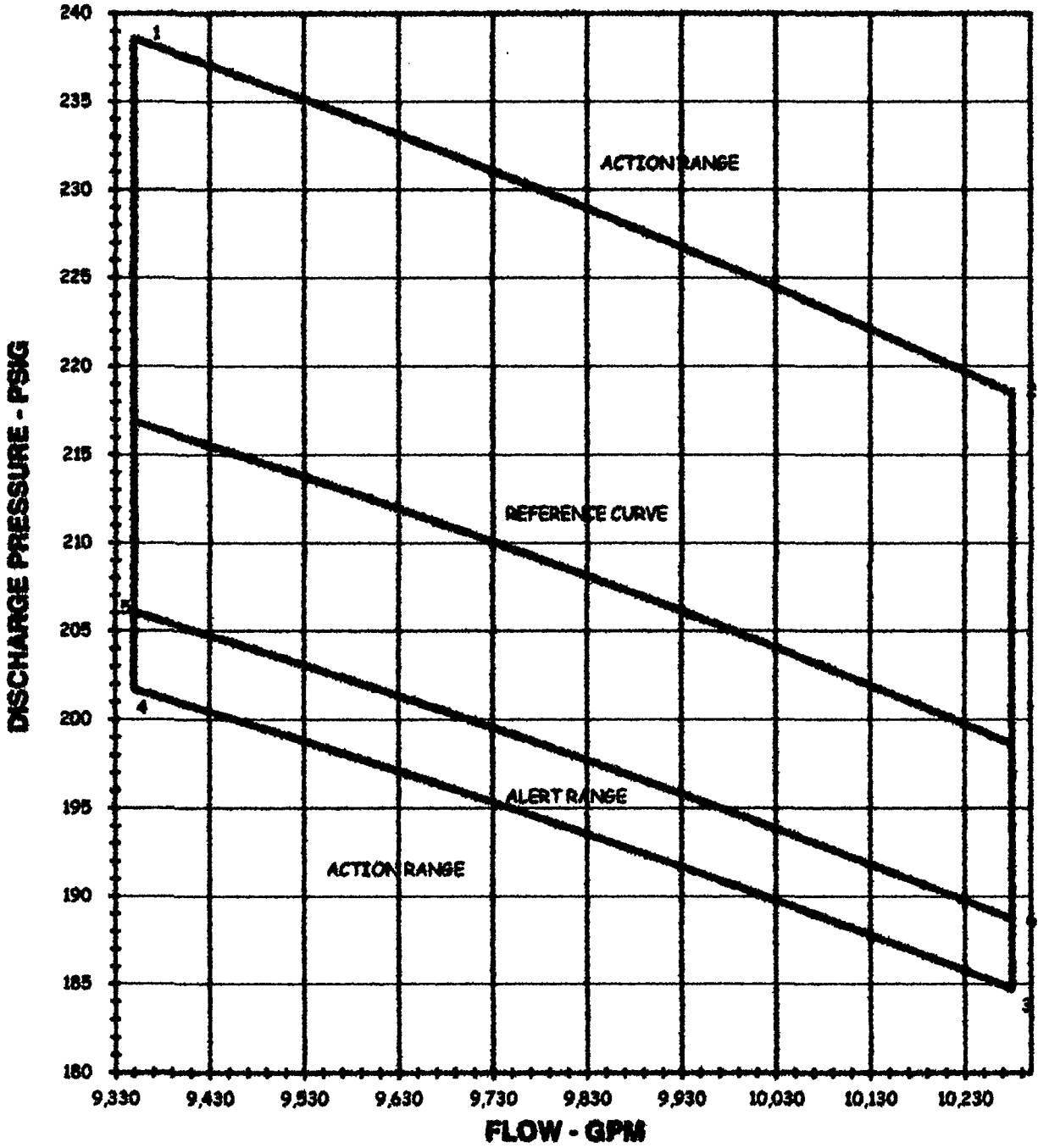
Duration of Proposed Alternative

Fourth 10 year interval.

Precedents

Similar relief was granted for the third 10 year interval. NRC approval was documented in a letter dated May 15, 2007 (ADAMS Accession Number ML 071010344, TAC No. MD3540) for Relief Request No. RP03.

SAMPLE DATA SHEET - Group A Test
SW-P-1A ACCEPTANCE CRITERIA



ALERT RANGE = Area Inside 3-4-5-6

ACTION RANGE = Area Outside 1-2-3-4

RP03
Revision 1
Relief Request
In Accordance with 10 CFR 50.55a(f)(5)(iii)

– Inservice Testing Impracticality –

ASME Code Components Affected

Pump	Code Class	Pump Group	P&ID Dwg. Number	System(s)
LPCS-P-1	2	B	M520	Low Pressure Core Spray
RHR-P-2A	2	A	M521, SH 1	Residual Heat Removal
RHR-P-2B	2	A	M521, SH 2	
RHR-P-2C	2	A	M521, SH 3	
HPCS-P-1	2	B	M520	High Pressure Core Spray
RCIC-P-1	2	B	M519	Reactor Core Isolation Cooling

Applicable Code Edition and Addenda

The 2004 Edition and the 2005 and 2006 Addenda of the ASME OM Code.

Applicable Code Requirement

RCIC-P-1 (Centrifugal Pump):

Group B Test: Subsection ISTB-5122(a), ISTB-5122(b) and ISTB-5122(c). The pump shall be operated at a speed adjusted to the reference point (+/- 1%) for variable speed drives. The differential pressure or flow rate shall be determined and compared to its reference value. System resistance may be varied as necessary to achieve the reference point.

Comprehensive Test: Subsection ISTB-5123(a) and ISTB-5123(b). The pump shall be operated at a speed adjusted to the reference point (+/- 1%) for variable speed drives. The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value.

Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value.

Other Pumps (Vertical line Shaft Centrifugal Pumps):

Group B Test for LPCS-P-1 and HPCS-P-1: Subsection ISTB-5222(b) and ISTB-5222(c). The differential pressure or flow rate shall be determined and compared to its reference value. System resistance may be varied as necessary to achieve the reference point.

Group A Test for RHR-P 2A, 2B AND 2C and Comprehensive Test for all pumps except RCIC-P-1: Subsection ISTB-5221(b) and ISTB-5223(b). The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value.

Impracticality of Compliance

The establishment of specific reference values is impractical for these pumps.

Burden Caused by Compliance

Reference values are defined as one or more fixed sets of values of quantities as measured or observed when the equipment is known to be operating acceptably. All subsequent test results are to be compared to these reference values. Based on operating experience, flow rate (independent variable during inservice testing) for these pumps cannot be readily duplicated with the existing flow control systems. Flow control for these systems can only be accomplished through the operation of relatively large motor operated globe valves as throttling valves. Because these valves are not equipped with position indicators which reflect percent open, the operator must repeatedly jog the motor operator to try to make even minor adjustments in flow rate. These efforts, to exactly duplicate the reference value, would require excessive valve manipulation which could ultimately result in damage to valves or motor operators.

Proposed Alternative and Basis for Use

As discussed above, it is impractical to return to a specific value of flow rate, or differential pressure for testing of these pumps. As stated in NUREG-1482, Rev. 2 Section 5.2, some system designs do not allow for testing at a single reference point or a set of reference points. In such cases, it may be necessary to plot pump curves to use as the basis for variable reference points. Code Case OMN-16, "Use of a Pump Curves for Testing," is included in draft Revision 1 of RG 1.192, "Operations and Maintenance Code Case Acceptability, ASME OM Code."

Since the independent reference variable (flow rate) for these pumps is impractical to adjust to a fixed reference value and requires excessive valve manipulation, the maximum variance shall be limited to ± 2% of the reference value. Thus, flow rate shall be adjusted to be within ± 2% of the reference flow rate and the corresponding differential pressure shall be measured and compared to the reference differential pressure value determined from the pump reference curve established for this narrow range of flow rate. Slope of the pump reference curve is not flat even over this narrow range of flow rate. Assuming the flow rate to be fixed over this narrow range can result in additional error in calculating the deviation between the measured and reference differential pressure and at times this deviation can be non-conservative. Since the dependent variable (differential pressure) can be assumed to vary linearly with flow rate in this narrow range, establishing multiple reference points in this narrow range is similar to establishing a reference pump curve representing multiple reference points. This assumption of linearity between differential pressure and flow rate is supported by the manufacturer pump curves in the stable design flow rate region.

The following elements are used in developing and implementing the reference pump curves. These elements follow all the requirements of Code Case OMN-16.

1. RHR-P-2B was replaced with a new pump in 2013. A preservice test as required by the ASME OM Code was performed and a reference pump curve (flow rate vs. differential pressure) was established for this pump using the preservice test data. A similar reference pump curve (flow rate vs differential pressure) has been established for RHR-P-2A and RHR-P-2C pumps from data taken on these pumps when they were known to be operating acceptably. These pump curves represent pump performance almost identical to manufacturer's test data.

2. For RCIC-P-1, a variable speed drive pump, flow rate is set within ± 2% of the reference flow rate and the reference curve is based on speed with acceptance criteria based on differential pressure. This is done because of the impracticality of setting speed to a specific reference value to achieve the desired flow rate and pump discharge pressure. See the attached sample RCIC-P-1 pump Acceptance Criteria sheet for Group B test. Additionally, evaluation of the manufacturer pump data, preoperational and special test data used to establish the pump reference curve indicates insignificant change in differential pressure with small variation in flow rate.

3. HPCS-P-1 was replaced with a new pump in 2007. A preservice test as required by the ASME OM Code was performed and a reference pump curve (flow rate vs. differential pressure) was established for this pump using the preservice test data.

4. For LPCS-P-1 pump, the reference pump curve is based on preoperational testing using 5 or more test points beyond the flat portion of the curve.

5. Residual Heat Removal (RHR), High Pressure Core Spray (HPCS) and Reactor Core Isolation Cooling (RCIC) pump curves are based on five or more test points beyond the flat portion of the curve. These ECCS pumps have minimum flow rate requirements specified in Technical Specifications and are being tested near these flow rates.

6. Temporary test gauges (± 0.5% full scale accuracy) were installed to take suction and discharge pressure test data in addition to plant installed gauges and Transient Data Acquisition System (TDAS). TDAS data averages 100 readings with the readings taken at one second intervals. All instruments used either met or exceeded the Code required accuracy for applicable Group A, Group B and comprehensive pump test.

7. Review of the pump hydraulic data trend plots indicates close correlation with the established pump reference curves, thus further validating the accuracy and adequacy of the pump curves to assess pumps operational readiness.

8. Acceptance criteria curves are based on differential pressure limits given in applicable Table ISTB-5121-1 or Table ISTB-5221-1. See the attached sample RHR-P-2A pump Acceptance Criteria sheet for Group A test. Area 1-2-5-6 is the acceptable range for pump performance.

Area 3-4-5-6 defines the Alert Range and the area outside 1-2-3-4 defines the required Action Range. A similar sample RCIC-P-1 pump Acceptance Criteria sheet for Group B test is also attached.

9. Similar reference curves will be used for comprehensive pump tests using the applicable acceptance criteria and instrument accuracy and range requirements.

10. Only a small portion of the established reference curve is being used to accommodate flow rate variance. See the attached sample pump Acceptance Criteria sheets.

11. A single reference value shall be assigned for each vibration measurement location. The selected reference value shall be at the minimum data over the narrow range of pump curves being used as required by Code Case OMN-16.

12. When the repair, replacement, or routine servicing of a pump may have affected a reference curve, a new reference curve shall be determined, or the existing reference curve reconfirmed, in accordance with para. 16-3310 of Code Case OMN-16.

13. If it is necessary or desirable, for some reason other than that stated in para. 16-3310 of Code Case OMN-16, to extend the current pump curve or establish an additional reference curve, the new curve(s) must be determined in accordance with para. 16-3320 of Code Case OMN-16.

Quality/Safety Impact

Due to impracticality of adjusting independent variables (flow rate, and speed for variable drive RCIC pump) to a fixed reference value for inservice testing without system modifications, alternate testing to vary the variables over a very narrow range (up to ± 2% of reference values) and using pump reference curves for this narrow range is proposed. Alternate testing using a reference pump curve for each pump provides adequate assurance and accuracy in monitoring pump condition to assess pump operational readiness and will adequately detect pump degradation. Alternate testing will have no adverse impact on plant and public safety.

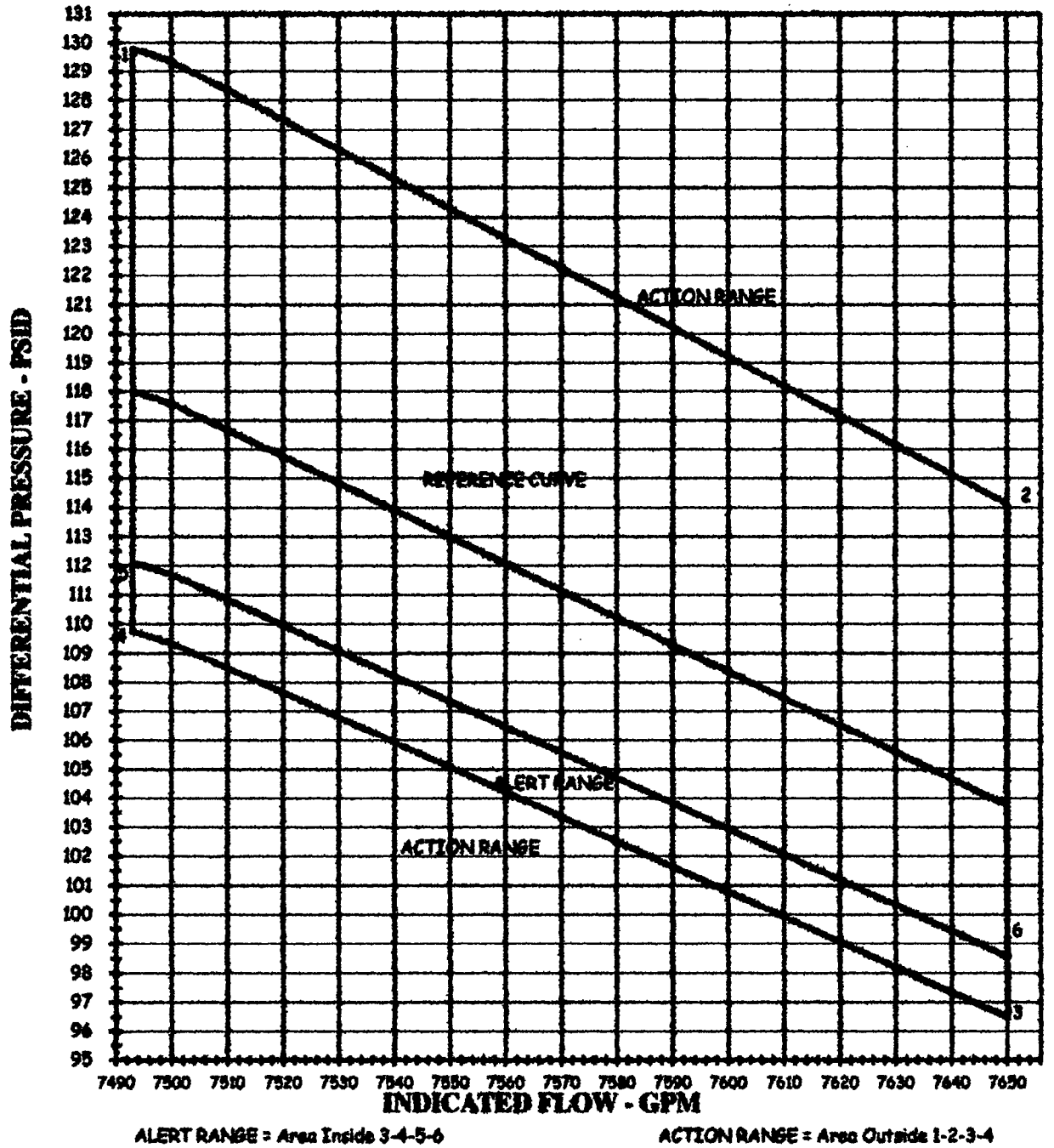
Duration of Proposed Alternative

Fourth 10 year interval.

Precedents

Similar relief was granted for the third 10 year interval. NRC approval was documented in a letter dated March 23, 2007 (ADAMS Accession Number ML 070600111, TAC No. MD3537) for Relief Request No. RP04.

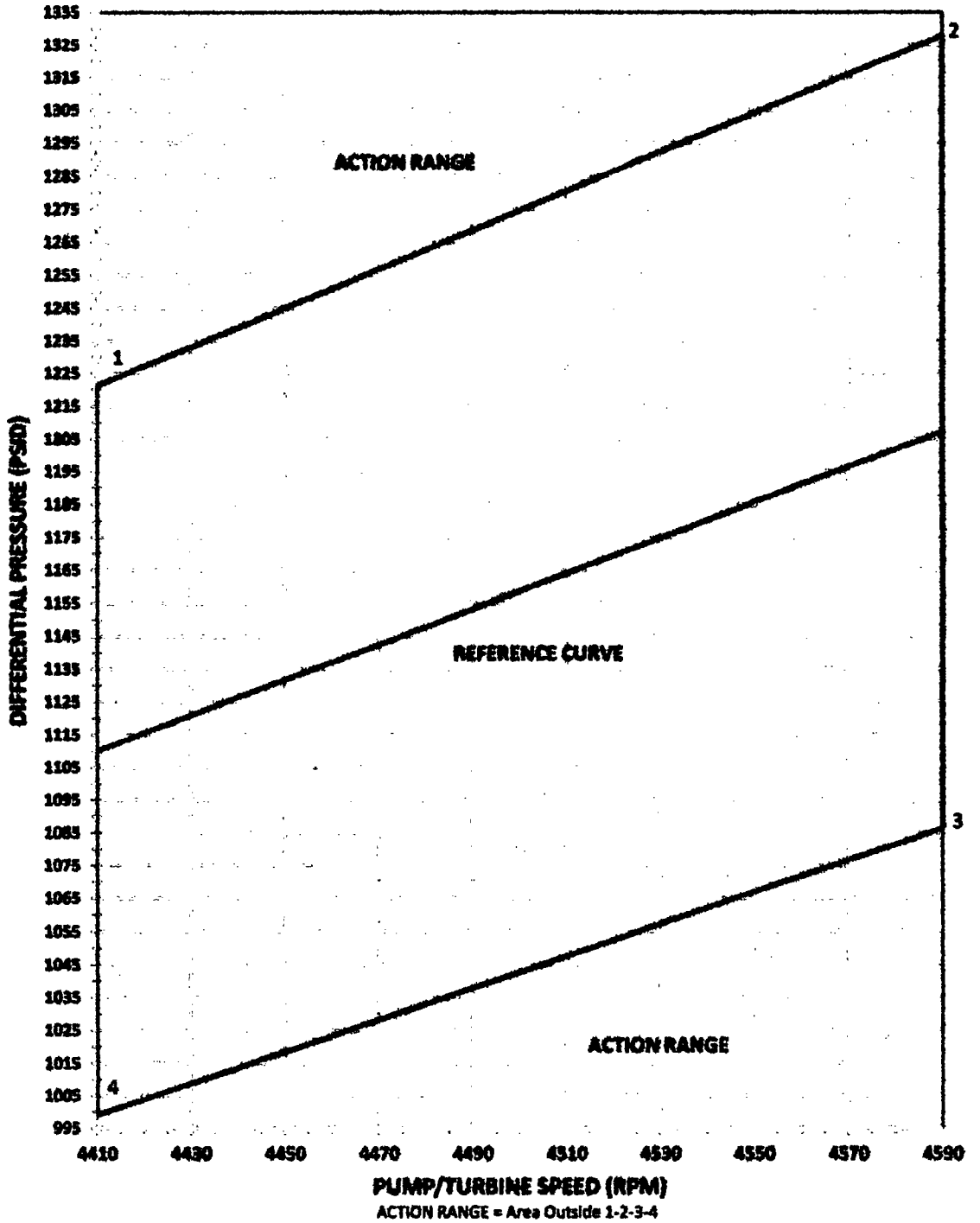
SAMPLE DATA SHEET - Group A Test
RHR-P-2A ACCEPTANCE CRITERIA



ALERT RANGE = Area Inside 3-4-5-6

ACTION RANGE = Area Outside 1-2-3-4

SAMPLE DATA SHEET - Group B Test
RCIC-P-1 ACCEPTANCE CRITERIA



ACTION RANGE = Area Outside 1-2-3-4