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SUBJECT: Application for amend to License NPF-21,requesting TS Surveillance Requirement 4.6.6.1.b.3 be revised to provide appropriate acceptance criteria for demonstrating operability of primary containment hydrogen recombiner sys.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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December 6, 1993
G02-93-280

Docket No. 50-397

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: **WNP-2, OPERATING LICENSE NPF-21**
REQUEST FOR AMENDMENT TO TECHNICAL SPECIFICATION
4.6.6.1.b.3 CONTAINMENT ATMOSPHERE CONTROL

References:
1) Letter G02-92-061 dated March 13, 1992, JW Baker (SS) to JB Martin (NRC), "Request for Waiver of Compliance Relative to Technical Specification 4.6.6.1.b.3 Containment Atmosphere Control"
2) Letter G02-92-064 dated March 18, 1992, GC Sorensen (SS) to NRC, "Request for Amendment to Technical Specification 4.6.6.1.b.3 Primary Containment Atmosphere Control"
3) Letter G02-92-154 dated June 25, 1992, GC Sorensen (SS) to NRC, "Request for Amendment to Technical Specification 4.6.6.1.b.3 Primary Containment Atmosphere Control (Additional Information)"
4) Letter G02-93-178 dated July 28, 1992, GC Sorensen (SS) to NRC, "Request for Amendment to Technical Specification 4.6.6.1.b.3, Primary Containment Atmosphere Control (Additional Information)"

In accordance with the Code of Federal Regulations, Title 10, Parts 50.90, 2.101, and 50.91(a)(6), the Supply System hereby submits a request for amendment to the WNP-2 Technical Specifications as provided for in the regulations. Specifically, the Supply System is requesting that the Technical Specification Surveillance Requirement 4.6.6.1.b.3 be revised to provide more appropriate acceptance criteria for demonstrating operability of the primary containment hydrogen recombiner systems.

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The proposed change to the Technical Specification surveillance requirements is shown as Attachment 1. Two methods will be used to monitor the effectiveness of the catalyst beds in the CAC system. One test will determine the operability of the catalyst by comparing the hydrogen content in the influent and effluent process streams. The second test examines the temperature profile through the bed, indicating the relative location of the catalytic reaction. A successful test will show that the recombination process is occurring near the top of the bed. In the event that the hydrogen content in the effluent stream is too high or that the peak reaction temperature is occurring lower within the catalyst bed, the operability of the system must be evaluated.

On March 13, 1992, the Supply System requested relief from the Technical Specification Containment Atmosphere Control (CAC) surveillance requirement that upon introduction of a 1% by volume hydrogen in a 140-180 scfm stream containing at least 1% by volume oxygen, that the catalyst bed temperature rises in excess of 120 degrees F within 20 minutes.

References 2, 3 and 4 were submitted in request of a Technical Specification change and to provide additional information in support of the requested change. Because there were still unresolved issues, a meeting between the Supply System and the NRC was held on May 26, 1993. During that meeting, criteria that would establish operability of the catalyst bed were discussed. The main topic discussed in the meeting was the development of an acceptance criterion for the temperature data taken during surveillance testing. The Supply System had originally proposed that the maximum temperature rise must be in the upper 60% of the catalyst bed. However, this would not provide adequate information to assure the relative health or remaining capabilities of the lower portion of the bed. Therefore, it was decided in the meeting that a criterion that would show operability of the lower portions of the bed would be appropriate. The agreement reached was that the Supply System must verify that at least 75% of the maximum temperature rise occurs before the fourth temperature device and that the hydrogen concentration in the effluent stream remain less than or equal to 25 parts per million by volume. Because these criteria are somewhat different from those which were previously submitted, the Supply System is submitting this revised request for a change to the Technical Specifications. This letter will, in effect, replace the earlier requests. As such, it will repeat much of the information provided in the references.

The reason for requesting the waiver (Reference 1) was that as a result of intensive review of the operability of the CAC system it had become evident that the acceptance criterion of the Technical Specification was very dependent on the analytical methods of calculating the input parameters and measurement of performance indicators; hydrogen concentration, process flows and temperatures. Depending on the methods of calculating the input parameters, the required temperature rise can vary significantly. The review led to refinements in input parameter determination. As a result, during this review the temperature rise acceptance criterion method was identified as suspect. In addition to the analytical methods used to determine the input parameters, other factors such as: heat removed by the gas flow; heat capacity of the catalyst

bed and the vessel; heat losses through vessel insulation, supports, and piping; time lag and heat loss caused by temperature sensors and uncertainties in flow determination during testing, all led to a conclusion that the present temperature rise acceptance criterion was not, by itself, an accurate reflection of catalyst operability. Test results showed variations primarily are a result of the ability to set initial conditions, input parameters, and instrument uncertainty.

As a result of an internal system functional assessment, it was concluded that sampling of the influent and effluent gases would be a more direct indication of catalyst efficiency. This was confirmed with the assistance of industry experts in catalyst bed design and operation. An appropriate acceptance criterion would be the sampling of the effluent gas stream for hydrogen concentration for a defined input volume percent of hydrogen. A sample retaining less than 25 parts per million by volume (ppmV) hydrogen (called reactor leakage in industry terminology) after passing through the catalyst bed would indicate acceptable recombiner operation for a feed of at least 1% hydrogen by volume. The results of tests conducted at WNP-2 led the Supply System to conclude that the catalyst efficiency was acceptable.

The Supply System believes that measuring less than 25 ppmV hydrogen in the effluent stream, after the introduction of at least a 1% hydrogen concentration to the recombiner skid provides acceptable indication of the operability of the catalyst. However, additional information about the degradation of the bed may be obtained by monitoring the temperature profile through the catalyst bed.

Ideally, a catalyst bed should show a sharp increase in temperature within the first few inches of the bed upon the introduction of hydrogen and oxygen. Under ideal equilibrium and adiabatic conditions, downstream temperatures should indicate little or no increase due to recombination because the reaction has been essentially completed in the first few inches. Downstream temperatures would approach that of the first few inches under equilibrium conditions due to conduction and convection. In actual testing where neither equilibrium nor adiabatic conditions exist, the downstream temperatures should be considerably lower than the peak temperature. If the catalyst activity is degraded for any reason, the reaction will take place further into the bed and the location of the peak temperature will move accordingly.

The majority of our tests have shown the peak temperature to be at the second of the four in-bed detectors. The second detector is approximately at the 30% level. A few tests have shown peak temperature at the third detector which is approximately at the 60% level. There has not been a consistent downward trend and we believe these few cases have been due to lower initial temperatures or varying heat loss conditions from year to year.

The capacity of the catalyst bed can be reduced through mechanical, thermal, or chemical (poisoning) deactivation. The Supply System recognizes the possibility of poisoning and the subsequent effects in the catalyst bed. Poison can be introduced through the environment or the process. To protect the catalyst, the CAC skid is maintained isolated with a pressurized nitrogen blanket. During the performance of the required surveillance testing, the catalyst is exposed to air (and the potential for poisoning from the environment). However, the process of testing establishes that the bed is operable and has not been damaged. The process stream, in a design bases event, may include iodine. Iodine can chemically poison the platinum catalyst; however, the CAC skid scrubs the process gas to remove iodine from the process stream and heats it to reduce effects on the catalyst.

It is important to note that a catalyst bed and its ability to recombine hydrogen and oxygen do not deplete simply from use. Any reduction in recombination capability is caused by poisoning or other damage to or loss of catalyst, or by insufficient activation energy (low inlet temperature). Given adequate inlet temperature, the presence of poisons in the process stream will simply move the peak reaction from the top few inches to further down in the bed with very little effect on the percent completion of the reaction. Any such downward movement in the site of the majority of the recombination should be evaluated to determine any actions that may be necessary. Taking temperature readings of the catalyst bed during the surveillance to determine the location of the maximum temperature increase and verification that at least 75% of the temperature increase occurred in the area of the first three in-bed detectors will provide the data to support the analysis of the capability of the catalyst. Measuring the hydrogen concentration in the effluent stream provides the necessary information that in fact the catalyst is able to recombine hydrogen and oxygen. Beyond the Technical Specification requirement to demonstrate operability of the catalyst, the temperature data will be used to trend catalyst performance. Changes in the location of the peak temperature will be evaluated to determine if they are providing early indication of degradation or damage.

The proposed surveillance test and acceptance criteria will provide indication of damage to the catalyst bed. The Technical Specification surveillance frequency has been established at an interval that provides this information at least once each 18 months. However, as with other systems at WNP-2, the operability of a component may be challenged by events at the plant. Because the catalyst is susceptible to environmental damage, it is important that the operability be evaluated in the event of potential damage. The potential for and indications of damage to the catalyst, including the bases for the surveillance acceptance criteria, is discussed in the proposed revision of the Technical Specification Bases. Attachment 2 is the proposed revision to Bases section 3/4.6.6, "Primary Containment Atmosphere Control."

The changes to Bases 3/4.6.6 are provided to support this change request and to reflect the oxygen control function of the CAC system resulting from the change to an inerted containment. WNP-2 design basis for combustible gas control was changed from hydrogen control with a non-inerted containment to oxygen control with a nitrogen inerted containment during plant licensing.

The Supply System has concluded that changing the acceptance criteria for determining the operability of the catalyst recombiner bed from a prescribed temperature increase and within a range of process stream flow rate to a measurement of effluent hydrogen concentration in combination with peak temperature rise does not involve a significant hazards consideration for the following reasons.

1. It would not involve a significant increase in the probability or consequences of an accident. The recombiners are provided as an accident mitigating feature and, as such, do not have potential to cause an accident. In addition, the consequences of accidents are not increased. The 25 ppmV acceptance criterion more adequately demonstrates operability of the CAC system as it is a more direct indication of recombiner operational efficiency and is not dependent on analytical methods of determining input parameters or temperature losses and temperature measurement inaccuracies. Hence, there is no increase in consequences of an accident introduced by this request as the proposed testing method is superior to that currently in the Technical Specification as it better quantifies the conversion capability of the catalyst. The existing testing method only confirms an efficiency of approximately 80% while the proposed method confirms a minimum efficiency of 99.75% for the minimum 1% hydrogen feed.

   Combining the effluent hydrogen measurement with the measurement confirming that at least 75% of the temperature rise occurs above the fourth RTD, provides additional information concerning the operability and the capability of the recombiner skid. This establishes that even if, for some reason, the location of the majority of the recombination process was occurring deeper in the bed, the catalyst is still able to provide adequate capacity of the necessary recombining function.

2. It would not create the possibility of a new or different kind of accident. No new methods of system operation are introduced by this request. Accordingly, no new or different kind of accident is credible as a result of this request.

3. It would not create a significant decrease in a margin of safety. The proposed testing provides more direct and rigorous acceptance criteria. Sampling of the feed and product gases will be a more reliable indicator of catalyst performance thus assuring that the margin to unacceptable oxygen level is maintained. Limiting the catalyst bed preheat temperature to less than that expected for a LOCA condition provides additional insurance that the margin of safety will be maintained.

   Measuring that at least 75% of the temperature increase occurs above the fourth RTD establishes that even if the recombination location has shifted, the lower portions of the bed are capable of providing the necessary catalytic function.

   The proposed data recording provides information concerning the health of the catalyst. This provides additional assurance that the catalyst bed will be able to perform the required functions in the event of the design bases accidents. Hence, this request does not represent a decrease in the margin of safety.

As discussed above, the Supply System considers that this change does not involve a significant hazards consideration, nor is there a potential for significant change in the types or significant increase in the amount of any effluents that may be released offsite, nor does it involve a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criteria for categorical exclusion set forth in 10CFR 51.22(c)(9) and therefore, per 10CFR 51.22(b), an environmental assessment of the change is not required.

This Technical Specification change has been reviewed and approved by the WNP-2 Plant Operations Committee (POC) and the Supply System Corporate Nuclear Safety Review Board (CNSRB). In accordance with 10CFR 50.91, the State of Washington has been provided a copy of this letter.

Sincerely,

J. V. Parrish (Mail Drop 1023)
Assistant Managing Director, Operations

Attachments

cc: BH Faulkenberry - NRC RV
NS Reynolds - Winston & Strawn
JW Clifford - NRC
DL Williams - BPA/399
NRC Site Inspector - 901A
W Bishop - EFSEC

STATE OF WASHINGTON)
)
COUNTY OF BENTON)

Subject: Request for Amend to TS 3/4.3.3
4.6.6.1.b.3 CAC

I. J. V. PARRISH, being duly sworn, subscribe to and say that I am the Assistant Managing Director, Operations for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that I have the full authority to execute this oath; that I have reviewed the foregoing; and that to the best of my knowledge, information, and belief the statements made in it are true.

DATE 6 December, 1993

J. V. Parrish, Assistant Managing Director
Operations

On this date personally appeared before me J. V. PARRISH, to me known to be the individual who executed the foregoing instrument, and acknowledged that he signed the same as his free act and deed for the uses and purposes herein mentioned.

GIVEN under my hand and seal this 6th day of December 1993.

Grace M. Hardy
Notary Public in and for the
STATE OF WASHINGTON

Residing at Kennewick, WA

My Commission Expires 8/9/95

County of Benton


TRACI M. HARDY
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
5-9-98