REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8007280410 DOC.DATE: 80/07/21 NOTARIZED: NO DOCKET #
FACIL:50-263 Monticello Nuclear Generating Plant, Northern States 05000263
50-282 Prairie Island Nuclear Station, Unit 1, Northern Stat 05000282
50-306 Prairie Island Nuclear Station, Unit 2, Northern Stat 05000306
AUTH.NAME AUTHOR AFFILIATION
MAYER,L.O. Northern States Power Co.
RECIP.NAME RECIPIENT AFFILIATION
SNAIDER,R. Generic Issues Branch

SUBJECT: Forwards comments on NUREG-0577, "Fracture Toughness and Susceptibility to Stress Corrosion Cracking of Equipment Supports," in response to NRC 800519 request. Addl analysis for stress corrosion cracking is unnecessary.

DISTRIBUTION CODE: A018S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 5
TITLE: Component Support Fracture Toughness (USI A-12)

NOTES:

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
ACTION:	IPPOLITO,T.	05	1	1	CLARK,R.	05	1	1
	KEVERN,T.		1	1	MARTIN,R.		1	1
	MARTIN,R		1	1				
INTERNAL:	A/D MATL & QUAL		1	1	GEN ISSUES BR14		1	1
	I&E	10	2	2	MATL ENG	45	1	1
	NRC PDR	02	1	1	OP EX EVAL BR		1	1
	OR ASSESS	46	1	1	REG FILE	01	1	1
EXTERNAL:	ACRS	30	16	16	LPDR	03	1	1
	NSIC	04	1	1				

TOTAL NUMBER OF COPIES REQUIRED: LTTR 32 ENCL 32

NSP

NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

July 21, 1980

Director of Nuclear Reactor Regulation
Attn: Mr Richard Snaider, Generic Issues Branch
U S Nuclear Regulatory Commission
Washington, DC 20555

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket Nos. 50-282 License Nos. DPR-42
50-306 DPR-60

Comments on NUREG-0577, Fracture Toughness and
Susceptibility to Stress Corrosion Cracking of Equipment Supports

In a letter dated May 19, 1980 from Mr D G Eisenhut, Director, Division of Licensing, USNRC, we were requested to comment on NUREG-0577. NUREG-0577 provides the NRC Staff's position on resolution of the problems of fracture toughness and susceptibility to stress corrosion cracking of equipment supports in the reactor coolant system. Also included in the May 19, 1980 letter was a modification to Section 4 of NUREG-0577 and an expansion to include plants and components not considered in the original study. We were requested to submit comments to Mr Richard Snaider of the Generic Issues Branch by July 7, 1980. We were later notified by the Prairie Island Project Manager in the Division of Licensing that the comment period had been extended to July 21, 1980.

NUREG-0577 and the additional material contained in the May 19, 1980 letter has been reviewed by the Monticello and Prairie Island plant technical staffs and the Prairie Island architect-engineer. There are several comments we believe should be incorporated in the final NRC Staff position on resolution of the equipment support deficiency issue. These comments are attached.

Please contact us if you have any questions related to our comments or wish to discuss them in detail.

L. O. Mayer

L O Mayer, PE
Manager of Nuclear Support Services

A018
S
1/1

LOM/DMM/ak

cc: J G Keppler
G Charnoff

8007280 410

Attachment

P

ATTACHMENT I

Comments On NUREG 0577

1.0 BACKGROUND

Kewaunee Nuclear Power Plant and Prairie Island Nuclear Plant Units 1 & 2 are listed under Group I (Highest Potential Susceptibility to Low Fracture Toughness) by NUREG 0577 because of the concerns stated below:

> "Two items in the steam generator supports which are of concern in this regard are made of Vascomax 250 CVM. They are 0.5 in diameter Heli-coil screws into S.G., which are under pre-tension, and 1 inch diameter upper support ring girder wall bolts which are stressed under normal conditions", Section 4.7.3 of Appendix C, NUREG 0577.

The Vascomax bolts are in fact 1-1/2 inch diameter, and not 0.5 inch, installed in the lower main support pads of the steam generator using Heli-coil inserts. Also, the upper support ring girder wall bolts are not Vascomax bolts but are made from A 307 material. These wall bolts are designated Type III construction (not safety related) and are not active in transferring S. G. support reaction loads to to other support elements.

Apart from lamellar tearing, two other major concerns of NUREG 0577 regarding the materials for S.G. and Pump Supports are:

A) Fracture toughness characteristics required to resist tensile loads and

B) Potential for stress corrosion craking which may result in pre-mature failure under tension loads.

2.0 FRACTURE TOUGHNESS

Based on Sandia Laboratories Report (Appendix C of NUREG 0577) three different test parameters were chosen to assess the fracture toughness characteristics of materials.

i) Charp V-notch (CVN) test: - The report states, "that those plants which maintained a minimum charpy requirement for their materials of construction will be assumed to be constructed of adequate toughness materials, and placed in a higher quality category than those which did not specify any minimum".

2.0 FRACTURE TOUGHNESS (CONTINUED)

Kewaunee and P.I. Units 1 & 2 required CVN tests for Vascomax 250 CVM material used in S.G. bolts and a minimum CVN value of 35 ft-lb at 40°F was reported in the Mill Test Reports.

ii) Nil-Ductility Transition (NDT) temperature

The report states that the use of structures at temperatures from 60° to 120°F (depending upon thickness) above the highest NDT measured for the materials would give assurance that locally embrittled regions could not cause catastrophic failure by allowing small cracks to grow to larger sizes.

Ref. 1 indicates that 18Ni-5Mo-9Co maraging steel (Vascomax) exhibits shear fracture at temperatures as low as - 322°F. The normal operating temperature of the S.G. Vascomax bolts is greater than 400°F which is much above the value of NDT + 120°F (i.e., - 322 + 120 = - 202°F).

iii) Fracture Toughness (K_{IC})

The fracture toughness of Vascomax 250 CVM is reported to be greater than 100 $K_{SI}\sqrt{in}$ placing it amongst the low susceptibility materials (Ref.2).

Based on the above discussion, the Kewaunee and P.I plants should be placed in Group III (Lowest Potential Susceptibility class).

3.0 STRESS CORROSION CRACKING

In accordance with Sandia Report, susceptibility of Vascomax 250 CVM to stress corrosion cracking is the only reason for placing this material in Group I. For the same reason, an assurance of no pre-tension on these bolts would have been sufficient to place this material in Group III as in the case of Carpenter Custom 455 steel bolts used in J. M. Farley Plant Units 1 & 2.

Ref. 1 Metal Handbook, Volume 10, "Failure Analysis and Prevention," 8th Edition, American Society For Metals, 1975, pp. 47.

Ref. 2 James K. Stanley, "The CurrentSituation On The Stress Corrosion Cracking And Hydrogen Embrittlement Of High Strength Fasteners," AIAA Paper No. 72-385, Proceedings of 13 Structures, Structured Dynamics, and Materials Conference, San Antonio, Texas, April 10-12, 1972, Volume II.

3.0 STRESS CORROSION CRACKING (CONTINUED)

The S.G. legs having the Vascomax bolts are not subjected to any tensile loads under all loading conditions except LOCA and hence there is no design requirement to pre-tension the bolts.

The design drawings for Kewaunee Nuclear Power Plant indicated a pre-tension on S.G. Bolts. However, it was observed during the visual and UT inspection of S.G. Bolts (May 28-31, 1980), the bolts were not pre-tensioned but were in snug tight condition with a maximum estimated pre-stress of 2 KSI. This low pre-tension value precludes the possibility of stress corrosion cracking in the Vascomax bolts.

Prairie Island Unit 1 specifies a installation torque of 1400 ft-lbs on the Vascomax bolts, whereas no pre-tension is specified on P.I. Unit 2. It is proposed that all the S.G. bolts would be inspected for any indications from stress corrosion cracking. The bolts would be retorqued with an installation torque value of 115 ft-lbs which corresponds to a pre-tension of 1 KSI or less. This torque value will assure against any loosening of the bolts due to vibration, and would preclude the possibility of stress corrosion cracking.

ATTACHMENT II

Comments On NRC Letter Dated May 19, 1980

The comments are directed to portions of the letter that are relevant to Kewaunee/Prairie Island Nuclear Power Plants.

Step 4 (Page 2):

The following comments are made with reference to Attachment 1 of the NRC letter:

1. Part I-B of the attachment states that, "Material having specified minimum yield strength greater than 180 KSI cannot be considered sufficiently resistant to fracture under tensile stress", and requires that the supports containing such material must be analyzed for maximum accident loading conditions after the failure of the most highly-stressed member.

   This requirement goes beyond the NUREG 0577 and is not consistent with the assessment philosophy used in the evaluation of 41 operating plants. This would constitute a review of original design under more stringent design basis and cannot be justified as the method for qualifying a material with respect to fracture toughness characteristics. This requirement should be deleted from the proposed Review Procedure.

2. Part II of the attachment is relevant to the stress corrosion cracking potential of high strength materials subject to steady state tensile stress. With no pre-tension on Vascomax bolts, these bolts are considered safe against possible stress corrosion cracking. As stated earlier, the Kewaunee and Prairie Island Nuclear Plants would examine the steam generator support bolts for indications from possible stress corrosion and assure that no significant pre-tension exist in the bolts.

Therefore, we are of the opinion that additional analysis as required in Part II of the Attachment is not needed when the bolts are not pre-tensioned.