REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 8612150363 DOC. DATE: 86/12/11 NOTARIZED: YES DOCKET #
FACIL: 50-220 Nine Mile Point Nuclear Station, Unit 1, Niagara Powe 05000220

AUTH. NAME	AUTHOR AFFILIATION
MANGAN, C. V.	Niagara Mohawk Power Corp.

RECIP. NAME	RECIPIENT AFFILIATION
ZWOLINSKI, J. A.	BWR Project Directorate 1

SUBJECT: Forwards application to utilize alternative to 10CFR50.55a requirements. Alternative acceptance criteria for hydrostatic pressure testing of CRD stub tubes proposed.

DISTRIBUTION CODE: A001D COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 12
TITLE: OR Submittal: General Distribution

NOTES:

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
	BWR EB		1	1	BWR EICSB		2	2
	BWR FOB		1	1	BWR PD1 LA		1	0
	BWR PD1 PD	01	5	5	KELLY, J		1	1
	BWR PSB		1	1	BWR RSB		1	1
INTERNAL:	ADM/LFMB		1	0	ELD/HDS3		1	0
	~~NRR/DHFT~~/TSCB		1	1	NRR/ORAS		1	0
	REG FILE	04	1	1	RGN1		1	1
EXTERNAL:	EG&G BRUSKE, S		1	1	LPDR	03	1	1
	NRC PDR	02	1	1	NSIC	05	1	1

TOTAL NUMBER OF COPIES REQUIRED: LTTR 23 ENCL 19

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/301 PLAINFIELD ROAD, SYRACUSE, N.Y. 13212/TELEPHONE (315) 474-1511

December 11, 1986
NMP1L 0116

Director of Nuclear Reactor Regulation
Attention: Mr. John A. Zwolinski, Project Director
BWR Project Directorate Number 1
Division of BWR Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Dear Mr. Zwolinski:

Niagara Mohawk requests approval to utilize an alternative to the requirements of 10CFR50.55a(g). The attached application proposes alternate acceptance criteria for the hydrostatic pressure testing of Control Rod Drive Stub Tubes.

Very truly yours,

C.V. Mangan

C. V. Mangan
Senior Vice President

KBT:svm
Attachment
7548I

A001
1/1

UNITED STATES

NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
Niagara Mohawk Power Corporation	)	Docket No. 50-220
(Nine Mile Point Nuclear Station Unit 1)		DPR-63

APPLICATION TO UTILIZE AN ALTERNATIVE TO THE REQUIREMENTS OF 10CFR50.55a

Pursuant to Section 50.55a(a)(3) of the Commission's Regulations (10CFR50.55a(a)(3)), Niagara Mohawk Power Corporation, holder of Facility Operating License No. DPR-63, hereby makes application for authorization to utilize an alternative to the requirements set forth in Section 50.55a(g) of the Commission's Regulations.

Section 50.55a(a)(3) states that:

"Proposed alternatives to the requirements of paragraphs (c), (d), (e), (g) and (h) of this section may be used when authorized by the Director of the Office of Nuclear Reactor Regulation. The applicant must demonstrate that (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with specified requirements of this section would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety."

Section 50.55a(g) provides that components which are part of the reactor coolant pressure boundary shall meet the requirements for Class 1 components in ASME Section XI. The ASME Code, Section XI, Paragraph IWA 5250(a) requires that the source of leakages detected during a system pressure test be evaluated by the owner for corrective measures. Niagara Mohawk proposes that the leakage limits presented in Tables 1 and 2 serve as acceptance criteria for any inspection of the Control Rod Drive stub tube penetrations for leakage, in lieu of a repair as required by Paragraph IWA 5250(a)(3).

Attachment A to this application demonstrates that compliances with the requirements of 50.55a(g) would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety.

WHEREFORE, the applicant respectfully requests that the proposed alternative to the requirements of 10CFR50.55a(g), be authorized by the Commission.

NIAGARA MOHAWK POWER CORPORATION

By ______________________

Subscribed and sworn to before me
on this 11th day of December, 1986.

BETH A. MENIKHEIM
Notary Public in the State of New York
Qualified In Onondaga County No. 4804073
My Commission Expires August 31, 1988

Notary Public

ATTACHMENT A

APPLICATION TO UTILIZE

AN ALTERNATIVE

TO THE REQUIREMENTS OF

10CFR50.55a

ATTACHMENT A

Background

During the Nine Mile Point Unit 1 Spring 1984 Refueling and Maintenance Outage, leakage from several control rod drive (CRD) penetrations was observed. These penetrations were repaired by roll expanding the CRD housing into the reactor vessel wall in order to limit leakage. The examinations and repairs performed on the penetrations were thoroughly reviewed by your staff and documented in a Safety Evaluation, dated June 29, 1984. As discussed in the Safety Evaluation, leakage from the penetrations does not represent a significant safety consideration.

During the Spring 1986 Refueling and Maintenance Outage, an additional CRD penetration was repaired by roll expanding, and two previously repaired penetrations were rolled above and below the previously rolled area to limit leakage resulting from joint relaxation. In August, another CRD penetration was found to be leaking and was repaired by roll expanding.

All the penetrations repaired in 1984 and 1986 successfully passed post repair pressure tests with no leakage. However, further joint relaxation could result in some minor leakage. In addition, it is possible that future roll repairs may not be as successful in limiting leakage.

Alternate Request

In accordance with 10CFR50.55a(a)(3), Niagara Mohawk proposes to provide an acceptable alternative to the requirements of ASME XI, Subsection IWA5250(a)(3). The ASME Code, Section XI, Paragraph IWA 5250(a)(3) requires that the source of leakages detected during a system pressure test be evaluated by the owner and appropriate repairs made. It is Niagara Mohawk's position that the repair of the control rod drive penetrations in accordance with Section IWA of the ASME Code would result in unusual difficulties without a compensating increase in the level of quality and safety. Niagara Mohawk has repaired leaking CRD penetration by roll expanding the control rod drive housing and proposes to define criteria for allowable leakage from CRD penetrations (see Tables 1 and 2 attached).

Example of Applications

The proposed limits would be used as acceptance criteria for inspection of the CRD penetrations for leakage. These inspections would be performed in accordance with our ASME XI Inservice Inspection Program, during refueling and maintenance outages and mid-cycle shutdowns when the drywell is de-inerted. If a penetration exhibited leakage in excess of these limits, it would be repaired as described in Table 1 or 2, and then retested. The leakage limit of 0.1 gpm will apply to penetrations that have been rolled over a 4-1/2 inch length, and then subsequently rerolled with increased wall thinning of 5-1/2% to 6-1/2%. In addition, if more than 5 control rod drive penetrations exhibit leakage, Niagara Mohawk will implement a contingency plan to repair the penetrations at the earliest possible refueling outage.

Technical Difficulties

IWA 5250 requires that the source of leakage detected during the conduct of a system pressure test shall be located and evaluated by the owner for corrective measures as follows:

1. Buried components with leakage loss in excess of limits accepted for continued service shall be repaired or replaced;

2. Repairs or replacement of components shall be performed in accordance with IWA 4000 or IWA 7000, respectively.

Arguably, a Code acceptable repair of the cracked CRD penetration stub tubes would require a weld repair. A weld repair of this type would require the installation of a dry caisson in which to perform the welding and remote machining and welding equipment to fit within the constraints of the caisson. The technology and tools to perform such a repair do not exist or are highly developmental at this time.

Because of the technological limitations of weld repairs, NMPC implemented a program to more immediately address the problems of the CRD penetration leakage associated with stub tube cracking. This program consists of the development of rolling tools and procedures to roll expand the CRD housing into the reactor vessel bore in order to limit leakage. This program also includes the development of mechanical seal concepts and prototypes that could be used in the event of significant relaxation of the rolled joint.

The rolling tool and procedures have been refined since the 1984 outage to improve their effectiveness. The length of the initial roll band has been increased to reduce the end effects that limit the effective roll length. Procedures and tests for increasing the wall thinning are also ongoing. EPRI performed an evaluation of the metallurgical effects of the rolling and concluded that the susceptibility of the CRD to IGSCC is not increased as a result of rolling.

At this time, two types of mechanical seals are under development. One type will leave the existing stub tube in place and seal against both the bottom vessel head and the CAD housing above the stub tube to isolate the crack. The second type of seal repair removes the existing stub tube and replaces it with a mechanical seal which limits leakage. This seal also provides the structural restraint for the CRD housing. A prototype of this seal has been fabricated and successfully hydrostatically tested at ambient temperature. Feasibility testing of the tooling for stub tube removal is currently underway. In addition, we are continuing to pursue the development of the technology, tools and methods to perform a weld repair of the control rod drive stub tube penetrations.

In the event that rerolling with increased wall thinning is not successful in reducing leakage to acceptable levels, we would consider valving out the cooling water to the drive. The increased contact pressure on the vessel wall due to the thermal expansion of the housing should reduce leakage.

If a control rod drive penetration exceeds the maximum leakage of 0.1 gpm after being rolled to 5-1/2% to 6-1/2% wall thinning or if more than five penetrations continue to leak after attempts at rolling, Niagara Mohawk will implement a contingency plan at the earliest possible refueling outage. Niagara Mohawk will submit its contingency plan for repair to the NRC for review and approval prior to implementation of any repairs.

We have proposed a more conservative leakage acceptance criteria for inspections performed during longer scheduled outages (greater than 7 days) than for shorter outages due to the following:

1. During short outages, drywell temperatures and humidity levels are higher. These factors compound worker discomfort, safety and stress as the repair is conducted underneath the vessel in rubber suits and respirators. These conditions resulted in several workers suffering from severe heat exhaustion during the stub tube repair conducted in August 1986.

2. During short outages, radiation levels are higher resulting in increased radiation exposure to personnel. Stub tube repairs conducted during the refueling outage resulted in exposures of approximately 3 man-rem per repair while the stub tube repair conducted during the short outage in August 1986 resulted in 5 man-rem of exposure.

3. During short outages, there is less time for planning, training and coordinating the repair activities, as the team and tools must be mobilized in 24 hours or less. These time restraints could result in further increasing personnel exposure and increasing the potential for procedural error or an industrial accident.

4. During refueling outages when the reactor vessel head is removed, workers on the refueling floor can assist workers under the vessel if problems arise during the repair process. This situation occurred during the 1986 refueling outage when the rolling tool lodged in the penetration and required removal from the refueling floor. During a short outage, this kind of problem would result in significantly extending the outage.

<u>Justification</u>

The safety implications of stub tube cracks have been previously reviewed and found not to be a significant safety concern. This determination was based on:

1. The cracks are located in the stub tube base material, which is not considered part of the vessel reinforcement, and, therefore, do not affect the structural integrity of the reactor vessel pressure boundary.

2. Stub tube cracks will not affect the ability of the CRD to perform its intended safety function (i.e. no adverse effect on the CRD operability or ability to scram).

3. A CRD housing ejection is not possible since the housing to stub tube J-weld is not damaged. The stub tube is loaded in compression and is not affected by cracks, and the shoot-out steel beneath the vessel serves as a back-up.

In addition, the small amount of allowable leakage from stub tube penetrations is well within the capacity of the normal make-up system. If leakage were to increase, it would be detected by using one of the three drywell unidentified leakage measuring systems described in Reference 1:

- Level rate-of-rise in drywell floor drain tank (control room alarm and recorder, 0.25 gpm sensitivity).

- Pump-out timer (control room alarm and timer, sensitivity of 5 gpm in 18 minutes, 0.5 gpm in 180 minutes, etc.).

- Integrated flow to waste disposal is monitored.

Furthermore, Plant Technical Specifications limit reactor coolant unidentified leakage to five gpm maximum and a two gpm increase in unidentified leakage in any twenty-four hour period.

Our June 8, 1984 submittal included an analysis of the maximum leakage from a postulated 360 degree circumferential through wall stub tube crack. This analysis estimated the maximum flow through the as-installed annulus between a stub tube penetration and an unrolled CRD housing to be a maximum of approximately 120 gpm. We would expect the maximum flow from a roll repaired penetration to be significantly lower due to the elimination of this annulus.

<u>Operating Experience</u>

Pertinent information on leakage from CRD penetrations and similar rolled joints is given below:

1. The leak rate prior to rolling at Big Rock Point in 1979 was approximately 1,000 drops per minute. On the basis and results of mockup tests performed in support of the roll repair of a CRD penetration at Big Rock, we conclude that a "good" rolled joint should be leak tight to approximately 5 drops per second at hydrostatic test pressure and, more typically, would be expected to be less than one drop per minute. In addition, the mockup leak test at Chattanooga, performed in April 1984 in support of our stub tube repair, showed leakages less than one drop per hour.

2. Foreign BWR experience is as follows:

   - Prior to rolling of a CRD housing in 1981, the leak rate was approximately 500 drops per second at normal, hot operating conditions.

   - After the roll repair, the leak rate was approximately 350 drops per second at hot operating conditions with cooling water to the drives.

   - Subsequently, this leak rate reduced to approximately 50 drops per second when cooling water to the drive was secured.

   - After subsequent operation, including several reactor scrams, the leak rate grew to approximately 500 drops per second (0.1 gallons per minute) and remained stable for a period of about 8 months.

Summary

Niagara Mohawk believes the proposed program provides an acceptable alternative to 10CFR50.55a(g) and ASME Section XI.

Specifically:

1. Leakage from the CRD penetrations does not represent a significant safety consideration.

2. The small amount of allowable leakage is well within the capacity of the normal makeup system.

3. Increased drywell leakage would be detected.

4. The proposed leakage criteria are supported by industry experience.

5. Leakage inspections will be performed at a greater frequency.

6. The proposed leakage criteria provides sufficient time to complete the final development of the prototype mechanical seal and associated tooling and investigate other alternatives such as weld repair.

7. The proposed leakage criteria provides Niagara Mohawk with a cost effective program approach in the event leakage is detected in between refueling outages, as well as providing an acceptable level of quality and safety.

8. The proposed leakage criteria also maintains radiation levels ALARA, and enhances personnel safety.

References

1. NMPC Letter (C. V. Mangan) to NRC (D. B. Vassallo), concerning implementation of NUREG 0313, Revision 1, dated December 30, 1982, Docket No. 50-220.

2. NMPC Letter (C. V. Mangan) to NRC (D. B. Vassallo), concerning stub tube repair plans, dated May 11, 1984, Docket No. 50-220.

3. NMPC Letter (C. V. Mangan) to NRC (D. B. Vassallo), concerning stub tube repair plans, dated June 8, 1984, Docket No. 50-220.

4. NRC Letter (D. Vassallo) to NMPC (B. Hooten), concerning control rod drive penetration leakage from stub tube cracking, dated June 29, 1984, Docket No. 50-220.

TABLE 1

CRD Penetrations
Allowable Leakage Rates

OUTAGES < 7 DAYS

CONDITION	ALLOWABLE LEAK RATES (1)		REPAIR ACTIONS (4)
	900-1200 PSIG	DEPRESSURIZED	
Previously Unrolled (2)	5 drops/sec	1 drop/sec	Roll Expand Over 4-1/2" Length
Rolled Once	50 drops/sec	10 drops/sec	Reroll With Increased Wall Thinning
Rerolled	0.1 GPM (3) 500 drops/sec	0.02 GPM (3) 100 drops/sec	Contingency Plan

NOTES:

(1) Leakage rates are based on a vessel internal pressure of approximately 1000 psig. The allowable leak rate when the vessel is depressurized is based on the square root of the pressure ratio between the test pressure and depressurized condition.

(2) Also applies to housings which have been previously roll expanded over a three-inch length.

(3) With 5 being the maximum number of leaking CRD stub tube penetrations.

(4) Repair action will be initiated if leak rates are in excess of the allowables specified above.

TABLE 2

CRD Penetrations
Allowable Leakage Rates

OUTAGES ≥ 7 DAYS

CONDITION	ALLOWABLE LEAK RATES (1) 900-1200 PSIG	ALLOWABLE LEAK RATES (1) DEPRESSURIZED	REPAIR ACTIONS (5)
Previously Unrolled (3)	No evidence (2) of leakage	No evidence (2) of leakage	Roll Expand Over 4-1/2" Length
Rolled Once	5 drops/sec	1 drop/sec	Reroll With Increased Wall Thinning
Rerolled	0.1 GPM (4) 500 drops/sec	0.02 GPM (4) 100 drops/sec	Contingency Plan

NOTES:

(1) Leakage rates are based on a vessel internal pressure of approximately 1000 psig. The allowable leak rate when the vessel is depressurized is based on the square root of the pressure ratio between the test pressure and depressurized condition.

(2) Secondary signs of leakage, such as dried water stains or dried corrosion products around housings and penetrations, do not necessarily require corrective action. Repairs will be considered as part of preventive maintenance as long as the outage schedule permits.

(3) Also applies to housing which have been previously roll expanded over a three-inch length.

(4) With 5 being the maximum number of leaking CRD stub tube penetrations.

(5) Repair action will be initiated if leakage rates are in excess of the allowables specified above.