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AUTH.NAME AUTHOR AFFILIATION
DISE,D.P. Niagara Mohawk Power Corp.
RECIP.NAME RECIPIENT AFFILIATION
IPPOLITO,T.A. Operating Reactors Branch 2

SUBJECT: Forwards response to NRC 800516 request for info re turbine discs. Info demonstrates that continued operation does not present undue safety hazard to public.

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NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

June 19, 1980

Director of Nuclear Reactor Regulation
Attn: Mr. Thomas A. Ippolito, Chief
Operating Reactors Branch #3
U. S. Nuclear Regulatory Commmission
Washington, D. C. 20555

Gentlemen:

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

Your letter of May 16, 1980 requested information regarding turbine discs at Nine Mile Point Unit 1. The attachment to this letter addresses your request.

The information contained in the attachment to this letter demonstrates that continued operation of Nine Mile Point Unit 1 does not present an undue safety hazard to the public.

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

D. P. Dise
Vice President - Engineering

MGM:jk
Attachment

Add'l
ADD:
W ROSS
W HAZELTON
H WALKER

8006300305 P

State of New York)

County of Onondaga) ss:

DONALD P. DISE, being duly sworn, says:

I am Vice President, Engineering of Niagara Mohawk Power Corporation. I have read the foregoing letter and the facts contained in the letter and attachment are true to the best of my knowledge, information and belief.

Donald P. Dise

Sworn to before me on this
23rd day of June, 1980

Cynthia A. Petta
NOTARY PUBLIC

CYNTHIA A. PETTA
Notary Public in the State of New York
Qualified In Onondaga Co. No. 4682225
My Commission Expires March 30, 1982

NINE MILE POINT UNIT 1

RESPONSE TO

MAY 16, 1980

NRC REQUEST FOR
INFORMATION REGARDING TURBINE DISCS

A. Site Specific

1. Question

Provide the following information for each LP turbine:

a. Turbine type
b. Number of hours of operation for each LP turbine at time of last turbine inspection or if not inspected, postulated to turbine inspection
c. Number of turbine trips and overspeeds
d. For each disc:
    1. type of material including material specifications
    2. tensile properties data
    3. toughness properties data including Fracture Appearance Transition Temperature and Charpy upper steel energy and temperature
    4. keyway temperatures
    5. critical crack size and basis for the calculation
    6. calculated bore and keyway stress at operating design overspeed
    7. calculated K_{1c} data
    8. minimum yield strength specified for each disc

Response

a. The turbine at Nine Mile Point Unit 1 is a General Electric 1800 RPM tandem compound with 3 dual flow low pressure sections and 1 high pressure section.

b. The B&C low pressure sections had 35,178 hours of operation at time of inspection in the fall of 1975. The A section had 58,422 hours of operation at time of inspection during the spring of 1979.

c. There have been 45 turbine trips, including those resulting from scram, and 1 overspeed at Nine Mile Point Unit 1 since 1969. In addition, there have been 7 test overspeed trips since 1969.

d. Answers to these questions involve data which are proprietary to the General Electric Company. Information was provided directly to the NRC during a meeting between General Electric and NRC representatives on April 21, 1980.

2. Question

Provide details of the results of any completed inservice inspection of LP turbine rotors, including areas examined, since issuance of an operating license. For each indication detected, provide details of the location of the indication, its orientation, size, and postulated cause.

Response

The rotors of the B&C low pressure sections were magnetic particle tested during 1975 and showed no indications. Similarly, then A low pressure section was tested in 1979 with no indications.

3. Question

Provide the nominal water chemistry conditions for each LP turbine and describe any condenser inleakages or other significant changes in water chemistry to this point in its operating life.

Response

The nominal water chemistry conditions for the Nine Mile Point Unit 1 low pressure turbine are as follows:

Steam quality	99.9 percent
Conductivity	0.08 umho/cm
Chlorides	5 ppb
Silica	5 ppb
Sodium	0.05 ppb

Even though there have been condenser inleakages from condenser tube leakage, the condensate polishers control the turbine steam purity within the GEK 63430 recommendations.

4. Question

If your plant has not been inspected, describe your proposed schedule and approach to ensure that turbine cracking does not exist in your turbine.

Response

As indicated in the Response to Question 2 above, Sections A, B and C of the low pressure turbine have been inspected. During the 1981 refueling outage, the C section of the low pressure turbine will be re-bucketed. At this time, we will perform a UT examination.

5. Question

If your plant has been inspected and plans to return or has returned to power with cracks or other defects, provide your proposed schedule for the next turbine inspection and the basis for this inspection schedule, including postulated defect growth rate.

Response

As indicated in the response to question 2 above, no indications of cracks or defects have been found to date.

6. Question

Indicate whether an analysis and evaluation regarding turbine missiles have been performed for your plant and provided to the staff. If such an analysis and evaluation has been performed and reported, please provide appropriate references to the available documentation. In the event that such studies have not been made, consideration should be given to scheduling such an action.

Response

A turbine missile analysis is presently being scheduled for Nine Mile Point Unit 1. We will inform you of the results when they become available.

B. Generic

1. Question

Describe what quality control and inspection procedures are used for the disk bore and keyway areas.

Response

After the rough machined wheel/disk forging has been tempered, material is removed from surface locations to measure mechanical properties. The forging is then subjected to a 100 percent volumetric ultrasonic inspection. If the test results meet acceptance standards, the forging is released for final machining. During final machining, attention is paid to the finish, contour and dimensions of every surface. For instance, the keyway depth, width, location, radii, and surface finish for every wheel is checked for conformance to drawings. Quality control personnel assure that tolerances are maintained. Any deviation from accepted tolerances are reported to engineering for disposition.

Only approved coolants and lubricants are used in the manufacturing and assembly process. These coolants and lubricants have undergone extensive laboratory corrosion testing to ensure their acceptability prior to their approval for use in manufacturing. Periodic sampling is done on all such fluids to verify that their chemistry is within acceptable limits. If required, corrective actions are taken to maintain the chemistry within limits.

After finish machining, each wheel is thoroughly cleaned and given a magnetic particle inspection of all surfaces. If acceptable, the buckets are assembled and the wheel is static balanced. After assembly on the shaft, each wheel is inspected and measurements are made to assure its proper location. The assembled rotor is then spun to 20 percent overspeed following a high speed balance. Finally, after a magnetic particle inspection of the buckets, the rotor is cleaned to prepare for shipment.

2. Question

Provide details of the General Electric repair/replacement procedures for faulty disks.

Response

Stress corrosion cracks have not been observed to date in nuclear wheels manufactured by General Electric. It is not anticipated that removal or replacement of wheels will be required because of this phenomenon.

3. Question

What immediate and long term actions are being taken by General Electric to minimize future "water cutting" problems with turbine disks? What actions are being recommended to utilities to minimize "water cutting" of disks?

Response

No immediate actions are required to minimize water erosion because of the apparent self-limiting nature of the phenomenen. However, if future inspections shows an unexpected progression of the water erosion, appropriate operating restrictions and/or modifications will be recommended.

4. Question

Describe fabrication and heat treatment sequence for disks, including thermal exposure during shrinking operations.

Response

The wheel/disk forgings are heat treated in the rough machined condition. The heat treatment consists of soaking at a temperature above the upper critical temperature with the time and temperature sufficient to ensure complete austenitization throughout the forging, followed by a quench in cold, vigorously circulated water for a sufficient time to ensure complete transformation throughout the section. The forgings are heated uniformly to a tempering temperature below the lower critical temperature and held for a sufficient time to soften to the desired tensile range. After tempering, the forgings are still-air cooled to room temperature.

After final machining, the wheels (disks) are uniformly heated in an electric furnace to a temperature below the embrittling range, but sufficiently high to increase the wheel diameter enough to assemble on the shaft with the required shrink fit.