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RECIP.NAME RECIPIENT AFFILIATION
DENTON,H. Office of Nuclear Reactor Regulation

SUBJECT: Responds to A Schwencer 800429 info request re facility Ge low pressure turbine,Discusses site specific & generic questions re GE low pressure turbine,Serial 170X412.

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Donald C. Cook Nuclear Plant, Unit 1
Docket Nos. 50-315
License No. DPR-58

June 16, 1980
AEP:NRC:00344A

Mr. H. Denton, Director
Division of Operating Reactors
Office of the Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Denton:

This letter responds to Mr. A. Schwencer's letter of April 29, 1980 concerning a request for information on the General Electric low-pressure turbine of the Donald C. Cook Nuclear Plant, Unit 1. Our response to the items contained in Enclosure 3 to Mr. Schwencer's letter, is given in the Attachment to this letter.

Very truly yours,

John E. Dolan

John. E. Dolan
Vice President

cc: R. C. Callen
G. Charnoff
R. S. Hunter
R. W. Jurgensen
D. V. Shaller - Bridgman

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STATE OF NEW YORK

COUNTY OF NEW YORK

John E. Dolan, being duly sworn, deposes and says that he is a Vice President of the licensee Indiana & Michigan Electric Company, that he has read the foregoing response to Mr. A. Schwencer's letter of April 29, 1980 on the subject of the G.E. Low Pressure Turbine of Unit 1 of the Donald C. Cook Nuclear Plant and knows the contents thereof; and that said contents are true to the best of his knowledge and belief.

John E. Dolan

Vice President

Sworn and subscribed to before me this 17th day of June, 1980.

Kathleen Barry

Notary Public

KATHLEEN BARRY
NOTARY PUBLIC, State of New York
No. 41-4606792
Qualified in Queens County
Certificate filed in New York County
Commission expires March 30, 1981

Our response follows the format of Enclosure 3 to Mr. Schwencer's letter of April 29, 1980.

SITE SPECIFIC GENERAL QUESTIONS:

I. L.P. Turbine Information

A. Type - General Electric Co. - Serial No. 170 x 412

1100 MW Tandem Compound - 6 Flow 43
With a single stage of reheat

B. Operating Hours Prior to Last Inspection

Turbine	Date of Insp.	Prior Oper. Hours
L.P - A	6/1/80-7/18/80	35,283
L.P - B	6/1/80-7/18/80	35,283
L.P - C	4/6/78-6/24/78	22,130

C. Total No. of Turbine Trips from power (to 5/30/80): 85

Total No. of Overspeed Tests (to 5/30/80): 29

D. AEP does not normally receive material specifications, metallurgical characteristics, or stress levels for the L.P. turbine rotor discs of the General Electric turbines since it is considered to be proprietary information by the manufacturer. However, AEPSC has been advised by General Electric that all of the information requested in Question I-D was provided directly to the NRC during a meeting between General Electric and the NRC representatives on April 21, 1980.

II. Out of the three turbine elements, the L.P-C turbine element of D. C. Cook Unit #1 was inspected in April-May 1978. This was the first inspection of this turbine section since the initial operation of the unit. All diaphragms and the buckets and discs of the double flow rotor were magnetic particle tested. No indications of cracks were found on the rotors and only minor indications were noted on the stationary diaphragms which were ground out.

III. Normal Water Chemistry Conditions

The effect of condenser leakage was investigated. There have been a number of small leaks in the Unit 1 condensers. The main steam chemistry was evaluated both before and during some periods of leakage. No significant variation from the average chemical values could be noted. It was concluded that condenser leakage had little or no effect on main steam chemistry.

During Unit 1 operation only two occurrences caused a main steam chemistry change. The first involved acid contamination of the steam generator water by leakage of the demineralized water makeup plant regeneration chemicals. The pH depression caused by the acid was reversed by a strong increase in the ammonia feed which increased main steam pH and conductivity. This type of incident has occurred three times. The second occurrence was the adoption of higher feedwater residual hydrazine levels in July, 1979. Previous feedwater chemistry control called for dissolved oxygen $\leq$ 5 ppb and 5 ppb hydrazine residual at the steam generator inlets. Current control calls for feedwater inlet dissolved oxygen at $\leq$ 5 ppb (and preferably $<$ 2.5 ppb) and hydrazine residual at oxygen's concentration in ppb's plus 10 ppb. Under the initial control scheme, main steam raw conductivity had averaged 4 to 6 μmho. Under the improved control, it averages 8 to 10 μmho.

Following are the average main steam chemistry values for Unit 1:

Parameter	Value
Conductivity - μmho/cm^3	9.1
Cation conductivity - μmho/cm^3	0.55
pH	9.3
N_2H_4 - ppb	0.1
NH_3 - ppm	1.5
SiO_2 - ppm	$<$ 0.001
Cl - ppm	$<$ 0.05

IV. As indicated previously, the L.P.-C Turbine element was inspected in 1978. During the current Unit No. 1 Refueling Outage which started on May 30, 1980, the L.P.-A and L.P.-B turbine elements will be disassembled. All blades and rotor discs on both rotors will be magnetic particle tested for surface indications. The General Electric Company will then perform a detailed sonic inspection of the bore and keyway of the discs on at least one rotor.

V. This item is not applicable since the inspection activities are in progress.

VI. Donald C. Cook Nuclear Plant is designed to withstand the effects of potential missiles including the turbine missiles. All Class I structures have been designed for, or protected from, missile impact within the spectrum of the missiles as defined in FSAR Table 5.37-1 and as described in FSAR, Q5.37, Amendment 17 dated September 1971.

GENERIC QUESTIONS:

The following information in response to the Generic Questions was provided to us by the General Electric Company.

I. After the rough machined wheel/disk forging has been tempered, material is removed from surface locations to measure machined properties. The forging is then subjected to a 100% volumetric ultrasonic inspection. If the test results meet stringent acceptance standards, the forging is released for final machining. During final machining, attention is continually 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 coolants and lubricants approved by engineering 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% overspeed following a high speed balance. Finally, after a magnetic particle inspection of the buckets, the rotor is cleaned to prepare for shipment.

II. Stress corrosion cracks have not been observed to date in nuclear wheels manufactured by General Electric, and we do not anticipate that removal or replacement of wheels will be required because of this phenomenon. The water erosion which has been observed in the keyways of wheels on several non-reheat machines* is being studied intensively. It is currently believed that the erosion process is self-limiting and should not require the replacement of any wheels.

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*Donald C. Cook Nuclear Plant, Unit #1 turbine has a moisture separator and reheater

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

IV. 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 through the section. The forgings are heated uniformly to 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.