



**Consumers  
Power  
Company**

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-0550

COPY

August 1, 1980

Director, Nuclear Reactor Regulation  
Att Mr Dennis M Crutchfield, Chief  
Operating Projects Branch No 5  
U S Nuclear Regulatory Commission  
Washington, DC 20555

DOCKET 50-155 - LICENSE DPR-6 -  
BIG ROCK POINT PLANT - RESPONSE  
TO ENCLOSURE 3 OF NRC LETTER DATED  
JUNE 11, 1980 - REQUEST FOR INFORMATION  
RELATED TO TURBINE DISCS

By letter dated June 11, 1980, the NRC requested information, enclosure 3 to the letter, on low-pressure turbines manufactured by General Electric. The staff's intent being to learn more about the underlying reasons for turbine disc indications found, the probable rate of growth of these indications and their effects on turbine disc integrity.

Consumers Power Company has reviewed the attachments supplied by the request for information and finds that the concerns stated do not apply to Big Rock Point for the following reasons:

Big Rock Point's Low Pressure (LP) turbine is of a design that does not use discs. Both the High Pressure (HP) and LP turbines are of an integral wheel type construction made from solid forgings without separate discs shrunk onto the turbine shaft. Also, the orientation of the turbine relative to containment, "end-on" configuration, precludes turbine missiles consideration for containment.

Enclosure 3, attached, is being submitted for informational purposes for use by your staff. The original telecopy was not received and in obtaining information from General Electric, a delay was encountered which necessitated a delay in our reply. Mr Walter Paulson of your staff was informed of the delay and accepted it.

David P Hoffman (Signed)

David P Hoffman  
Nuclear Licensing Administrator

CC Director, Region III, USNRC  
NRC Resident Inspector - Big Rock Point

Attachment

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CONSUMERS POWER COMPANY

Big Rock Point Plant

Enclosure 3 of NRC Letter, Dated June 11, 1980

Docket 50-155  
License DPR-6

At the request of the Commission and pursuant to the Atomic Energy Act of 1954, and the Energy Reorganization Act of 1974, as amended, and the Commission's Rules and Regulations thereunder, Consumers Power Company submits our response to Enclosure 3 entitled, "Request for Information Related to Turbine Discs" of NRC letter dated June 11, 1980. Consumers Power Company's response is dated August 1, 1980

CONSUMERS POWER COMPANY

By R C Youngdahl (Signed)  
R C Youngdahl, Executive Vice President

Sworn and subscribed before me this 1st day of August, 1980.

Linda K Carstens (Signed)  
Linda K Carstens, Notary Public  
Jackson County, Michigan  
My commission expires June 10, 1981.

(SEAL)

REQUEST FOR INFORMATION RELATED TO TURBINE DISCS

SITE SPECIFIC GENERAL QUESTIONS

ITEM I

Provide the following information for each low pressure (LP) turbine:

A. Turbine type:

Response

The Consumers Power Company's Big Rock Point Plant consists of one tandem compound, two flow, two casing, condensing 3600 RPM turbine. A cross section of this turbine is shown on the attached turbine assembly drawing, numbered 2127526. This turbine was designed and manufactured by General Electric's Medium Steam Turbine Generator Department in Lynn, MA. This turbine is distinctly different in design from turbines manufactured by General Electric's Large Steam Turbine Generator Department.

B. Number of hours of operation for each LP turbine at the time of the last turbine inspection or if not inspected, postulated to turbine inspection:

Response

The turbine has been operated 102,031 hours through June 30, 1980. No turbine disc inspection is possible due to the lack of turbine discs.

C. Number of trips and overspeeds:

Response

The turbine emergency governor overspeed trip is tested at actual overspeed annually per the vendor's recommendation. Additionally, there has been one overspeed of the unit to the trip set point. Thus, there have been a total of approximately 18 overspeeds to the 110 - 112.2% overspeed range (3960 to 4040 RPM).

D. For each disc:

Response

The Big Rock Point turbine has no discs. Both the High Pressure (HP) and Low Pressure (LP) turbines are of an integral wheel type construction made from solid forgings. There are no separate discs shrunk on the shaft. The LP is constructed from a single forgings due to the small size of this unit (turbine nameplate rating 54,500 kW). Information on the LP rotor material has been provided by General Electric to Consumers Power Company. This information is considered proprietary by General Electric and can be provided upon request as proprietary information.

1. Type of material including material specifications:

Response

The Big Rock Point LP turbine has no discs.

2. Tensile properties data:

Response

The Big Rock Point LP turbine has no discs.

3. Toughness properties data including Fracture Appearance Transition Temperature and Charpy Upper Steel Energy and Temperature:

Response

The Big Rock Point LP turbine has no discs.

4. Keyway temperatures:

Response

The Big Rock Point LP turbine has no discs.

5. Critical crack size and basis for the calculation:

Response

The Big Rock Point LP turbine has no discs so this calculation is not applicable.

6. Calculated bore and keyway stress at operating design overspeed:

Response

The Big Rock Point LP turbine has no bore and no keyways so this calculation is not applicable.

7. Calculated  $K_{IC}$  data:

Response

Calculated  $K_{IC}$  data and calculation methods have been previously supplied to the NRC by General Electric's Large Steam Turbine Department. These data and methods do apply to the turbine at Big Rock Point.

8. Minimum yield strength specified for each disc:

Response

The Big Rock Point LP turbine has no discs so this specification does not apply.

ITEM II

Provide details of the results of any completed in-service 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 Consumers Power Company's Big Rock Point turbine has been inspected three times (April 1964, February 1970 and March 1977). In each case the rotors and buckets were non-destructively tested using magnetic particle methods. No indications have been found on the rotors.

ITEM III

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

Big Rock Point has never sampled the condensed steam from the low pressure turbine. Reactor water analysis most closely approximates the chemistry of the steam flowing over the low pressure turbine. Typically observed values for the last four years of operation have been as follows:

pH	7.0 ± 0.7
conductivity	0.5 mho/cm <sup>3</sup>
chlorides	10pp <sup>b</sup>
boron	0.2 ppm
SiO <sub>2</sub>	0.1 ppm

During the past eighteen years of operation minimal changes in water chemistry have been observed. The use of deep bed polishers and the quality of raw water used for condensate makeup and condensor cooling have assisted greatly in the control of water chemistry at Big Rock Point.

ITEM IV

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

The Big Rock Point turbine has no discs; therefore, disc cracking does not exist.

ITEM V

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

This does not apply to Big Rock Point because of the absence of discs.

ITEM VI

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

There has been no formal analysis or evaluation regarding turbine missiles. The Big Rock Point turbine is oriented in an "end on" configuration relative to the containment. This favorable orientation, combined with integral wheel construction would preclude turbine missiles consideration for containment; therefore, no additional action will be taken with respect to turbine missiles.

GENERIC QUESTIONS

- I. Describe what quality control and inspection procedures are used for the disc bore and keyway areas.
- II. Provide details of the General Electric repair/replacement procedures for faulty discs.
- III. What immediate and long-term actions are being taken by General Electric to minimize future "water cutting" problems with turbine discs? What actions are being recommended to utilities to minimize "water cutting" of discs?
- IV. Describe fabrication and heat treatment sequence for discs, including thermal exposure during shrinking operations.

RESPONSE TO GENERIC QUESTIONS

The Big Rock Point turbine has no discs; therefore, these generic questions do not apply.