ATTACHMENT A

Beaver Valley Power Station, Unit No. 2
Proposed Technical Specification Change No. 16, Revision 1
PAGES MARKED TO SHOW CHANGES

Revise the Technical Specification as follows:

Remove Page	Insert Page
3/4 3-74	3/4 3-74

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INSTRUMENTATION

TURBINE OVERSPEED PROTECTION

LIMITING CONDITION FOR OPERATION

3.3.4 At least one Turbine Overspeed Protection System shall be OPERABLE.

APPLICABILITY: MODES 1, 2*, and 3*.

ACTION:

throttle

a. With one ~~stop~~ valve or one governor valve per high pressure turbine steam line inoperable and/or with one reheat stop valve or one reheat intercept valve per low pressure turbine steam line inoperable, restore the inoperable valve(s) to OPERABLE status within 72 hours, or close at least one valve in the affected steam line(s) or isolate the turbine from the steam supply within the next 6 hours.

b. With the above required Turbine Overspeed Protection System otherwise inoperable, within 6 hours isolate the turbine from the steam supply.

c. The provisions of Specification 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.4.1 The provisions of Specification 4.0.4 are not applicable.

4.3.4.2 The above required Turbine Overspeed Protection System shall be demonstrated OPERABLE:

a. ~~At least once per 31 days~~ by cycling each of the following valves through at least one complete cycle from the running position:

throttle

low

1) Four high pressure turbine ~~stop~~ valves, at least once per 31 days
2) Four high pressure turbine governor valves, at least once
3) Four high pressure turbine reheat stop valves, and per 18 months
4) Four low pressure turbine reheat intercept valves.

Copy

b. ~~At least once per 31 days~~ by direct observation of the movement of each of the ~~above~~ valves through one complete cycle from the running position, following

c. At least once per 18 months by performing a CHANNEL CALIBRATION on the Turbine Overspeed Protection Systems, and

d. At least once per 40 months by disassembling at least one of each of the above valves and performing a visual and surface inspection of valve seats, disks, and stems and verifying no unacceptable flaws or excessive corrosion. If unacceptable flaws or excessive corrosion are found, all other valves of that type shall be inspected, unless the nature of the problem can be directly attributed to a service condition specific to that valve. For reheat stop and intercept valves the inspection cycle may be increased to a maximum of 60 months, provided there is no indication of operational distress.

*Specification not applicable with all main steam isolation valves and associated bypass valves in the closed position and all other steam flow paths to the turbine isolated.

 Proposed

ATTACHMENT B

Beaver Valley Power Station, Unit No. 2
Proposed Technical Specification Change No. 16, Revision 1
REVISION OF TURBINE REHEAT STOP AND INTERCEPT VALVE
TEST INTERVAL

A. DESCRIPTION OF AMENDMENT REQUEST

The proposed amendment replaces our previous submittal dated October 1, 1990, and would make the following changes:

- Revise the frequency of reheat stop and intercept valve testing required by Specifications 4.3.4.2.a and 4.3.4.2.b from "at least once per 31 days" to "at least once per 18 months."

- Change the words "stop valve," in Action statement "a" and Surveillance 4.3.4.2.a.1., to read "throttle valve."

- Change the words "high pressure turbine reheat stop valves" in Surveillance Requirement 4.3.4.2.a.3 to read "low pressure turbine reheat stop valves."

- Change the last sentence of Surveillance Requirement 4.3.4.2.d to read as follows (words to be added are shown in brackets):

  If unacceptable flaws or excessive corrosion are found, all other valves of that type shall be inspected [unless the nature of the problem can be attributed to a service condition specific to that valve].

- Add the following sentence to the end of Surveillance Requirement 4.3.4.2.d.

  For reheat stop and intercept valves the inspection cycle may be increased to a maximum of 60 months, provided there is no indication of operational distress.

B. BACKGROUND

A calculation was performed to determine the probability of turbine missile ejection resulting from an extension of the test interval for reheat stop and intercept valves. It was determined, based on the calculation, that the turbine missile generation probability meets the appropriate turbine system reliability criteria (also see Reference 1).

Changing "stop valve" to read "throttle valve" would make the wording consistent with the terminology used in the manufacturer's literature and plant documents.

Changing the words "high pressure turbine reheat stop valves" to read "low pressure turbine reheat stop valves" is an editiorial correction. The change makes the wording reflect the plant configuration and is consistent with the wording in Action a, and standard technical specifications.

The words added to the end of Surveillance Requirement 4.3.4.2.d are intended to eliminate clearly unnecessary inspections, and are not intended to eliminate inspections necessary to achieve the objective of this surveillance requirement. The sentence to be added to Surveillance Requirement 4.3.4.2.d is based on a notification from Westinghouse Electric Corporation that the inspection interval may be increased to a maximum of 60 months provided there is no indication of operational distress. A 60 month inspection interval was also assumed in the calculation of turbine missile ejection probability mentioned above.

C. JUSTIFICATION

Based on the Westinghouse calculation of turbine missile ejection probability, submitted in our letter of May 28, 1992 (Reference 1), it has been determined that with an eighteen (18) month reheat stop and intercept valve test interval, the total turbine missile generation probability for Beaver Valley Power Station Unit 2 meets applicable acceptance criteria.

Operating experience and testing at Unit 1 and Unit 2 have disclosed no significant problems relating to the proper operation of the overspeed protection system. No incidents of valve stem sticking have occurred while the units were carrying load.

Testing over a period of time has been found to cause turbine component damage. In particular, erosion of piping and damage to moisture separator reheater internals at Unit 1.

D. SAFETY ANALYSIS

The following paragraphs discuss:

1. the Updated Final Safety Analysis Report evaluation of postulated turbine missiles,

2. evaluation acceptance criteria,

3. the most recent calculation of turbine missile ejection probability (previously submitted by Reference 1),

4. evaluation results and conclusions, and

5. other changes.

Evaluation of Postulated Turbine Missiles

The turbine overspeed protection specification is provided to ensure that the turbine is protected from destructive overspeed. Protection from excessive overspeed is required since excessive overspeed of the turbine could generate potentially damaging missiles that could impact and damage safety related components, equipment, or structures.

Updated Final Safety Analysis Report (UFSAR) Sections 3.5.1.3 and 3.5.1.4 describe the evaluation of postulated turbine missiles. Both the probability of missile generation and of impact to safety-related items were considered in the UFSAR as described below.

The probability (P4) of damage to plant structures, systems, and components important to safety is:

$$P4 = P1 \times P2 \times P3$$

where:

P1 = the probability of generation and ejection of a high energy missile,

P2 = the probability that a missile strikes a critical plant region, given its generation and ejection, and

P3 = the probability that the missile strike damages its target in a manner leading to unacceptable consequences. Unacceptable consequences are defined here as the loss of the capacity to maintain the integrity of the reactor coolant pressure boundary, to shut down the plant, maintain it in a safe shutdown condition, and/or limit offsite radiation exposures.

Evaluation Acceptance Criteria

The NRC staff considers 1×10^{-7} per year an acceptable risk rate for the loss of an essential system from a single event (Reference Regulatory Guide 1.115). Thus, the probability (P4) of damage to plant structures, systems, and components important to safety is an acceptable risk for values less than or equal to 1×10^{-7} per year.

The combined probability of strike damage (P2 x P3) is considered to be less than or equal to 1×10^{-2} per year. This conservatively considers the unfavorable orientation of the turbine generator.

It follows that the probability of turbine missile generation (P1) is acceptable for values less than or equal to 1×10^{-5} per year.

Description of Most Recent Evaluation

Three overspeed events were considered in evaluating the probability for missile ejection: design overspeed (120 percent of rated speed), intermediate overspeed (132 percent of rated speed), and destructive overspeed (speeds greater than 170 percent of rated speed). The evaluation of turbine missile ejection probability focused on the design and intermediate overspeed events since they would be affected by the test intervals of the reheat stop valves and intercept valves. The destructive overspeed event does not result from failures of reheat stop and intercept valves and therefore was excluded from further consideration.

The evaluation presents the total probability of turbine missile ejection for the design and intermediate overspeed events given that system separation occurs. The total probability is based on conditional probabilities of missile ejection for Unit 1 given that design or intermediate overspeed occurs. Unit 1 conditional probabilities were used since they are more conservative than the values calculated for Unit 2.

The total probabilities for a missile ejection must be multiplied by the average annual frequency of system separation for the unit so that they can be measured against acceptance criteria. Based on a review of Unit 2 plant trips, the average annual frequency of system separation was calculated to be 0.22 (one occurrence in four and one-half years). To provide additional conservatism, the average annual frequency of system separation was assumed to be one-half (0.5). This value is also conservative for Unit 1.

The evaluation did not consider destructive overspeed probability. Therefore, the "general" acceptance criteria of 1×10^{-5} per year for turbine missile ejection from an unfavorably oriented turbine was reduced. A ten (10) percent fraction of the "general" acceptance criteria was assumed as the acceptance criteria for the design and intermediate overspeed missile probabilities evaluated. This leaves an adequate reserve margin of 90 percent of the acceptance criteria for other significant overspeed events such as destructive overspeed.

Evaluation Results and Conclusion

The product of the average annual frequency of turbine separation for Unit 2 (conservatively assumed to be 0.5) and the total probability of turbine missile ejection (6.79×10^{-7}) is less than the acceptance criteria of 1×10^{-6}.

As stated in the BACKGROUND discussion above, plant operating experience and testing have disclosed no significant problems relating to the proper operation of the turbine overspeed protection system. This taken together with the favorable turbine missile evaluation discussed above indicates that the turbine system reliability is acceptable with an eighteen (18) month test interval for reheat stop and intercept valves. Therefore, the test interval extension is considered to be safe and will not reduce the safety of the plant.

Other Changes

Changing "stop valve" to read "throttle valve" and "high pressure turbine reheat stop valves" to read "low pressure turbine reheat stop valves" is editorial in nature, and does not change or otherwise reduce current requirements. Therefore, the changes are considered to be safe and will not reduce the safety of the plant.

The words added to the end of Surveillance Requirement 4.3.4.2.d are intended to eliminate clearly unnecessary inspections, and are not intended to eliminate inspections necessary to achieve the objective of the surveillance requirement. Therefore, the change is considered to be safe and will not reduce the safety of the plant.

The sentence to be added to Surveillance Requirement 4.3.4.2.d permitting a reheat stop and intercept valve inspection interval extension is based on a notification from Westinghouse Electric Corporation that this inspection interval extension is acceptable. A sixty month inspection interval was assumed in the calculation of turbine missile ejection probability mentioned above. Based on this information, the inspection interval extension to 60 months is considered to be safe and will not reduce the safety of the plant.

E. NO SIGNIFICANT HAZARDS EVALUATION

The no significant hazards considerations involved with the proposed amendment have been evaluated, focusing on the three standards set forth in 10 CFR 50.92(c) as quoted below:

> The commission may determine, pursuant to the procedures in paragraph 50.91, that a proposed amendment to an operating license for a facility licensed under paragraph 50.21(b) or paragraph 50.22 or for a testing facility involves no significant hazards consideration, if operation of the facility according to the proposed amendment would not:
>
> (1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or
>
> (2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or
>
> (3) Involve a significant reduction in a margin of safety.

The following evaluation is provided for the no significant hazards consideration standards.

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

   The previously evaluated accident of interest is a destructive turbine overspeed event. The probability of turbine missile ejection with an extended (18 month) test interval for reheat stop and intercept valves has been determined to be within applicable acceptance criteria.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

   Changing "stop valve" to read "throttle valve" and "high pressure turbine reheat stop valves" to read "low pressure turbine reheat stop valves" is editorial in nature, does not change or otherwise reduce current requirements and has no affect on the probability or consequences of an accident previously evaluated.

   Surveillance Requirement 4.3.4.2.d has been modified to eliminate clearly unnecessary inspections, and is not intended to eliminate inspections necessary to achieve the objective of this surveillance requirement. This clarification does not change the design, operation, or failure modes of the valves and other components in the turbine overspeed protection system. Therefore, the change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The reheat stop and intercept valve inspection interval extension does not change the design, operation, or failure modes of the valves and other components in the turbine overspeed protection system. Also, a sixty month inspection interval was assumed in the previously described calculation of turbine missile ejection probability. It was determined that the probability of turbine missile ejection is within the applicable acceptance criteria. Therefore, the change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

   The change affects the test interval for the reheat stop and intercept valves and does not change the design, operation, or failure modes of the valves and other components in the turbine overspeed protection system. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

Changing "stop valve" to read "throttle valve" and "high pressure turbine reheat stop valves" to read "low pressure turbine reheat stop valves" is editorial in nature, and does not change the design, operation, or failure modes of the valves and other components in the turbine overspeed protection system. Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

Clarifying Surveillance Requirement 4.3.4.2.d eliminates clearly unnecessary inspections, and is not intended to eliminate inspections necessary to achieve the objective of this surveillance requirement. This clarification does not change the design, operation, or failure modes of the valves and other components in the turbine overspeed protection system. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

The reheat stop and intercept valve inspection interval extension does not change the design, operation, or failure modes of the valves and other components in the turbine overspeed protection system. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the change involve a significant reduction in a margin of safety?

The accident of interest is a destructive turbine overspeed event. The probability of turbine overspeed with an extended (18 month) test interval for reheat stop and intercept valves has been determined to be within applicable acceptance criteria. The change does not affect the design, operation, or failure modes of the valves or other components in the turbine overspeed protection system. Therefore, this proposed change does not involve a significant reduction in a margin of safety.

Changing "stop valve" to read "throttle valve" and "high pressure turbine reheat stop valves" to read "low pressure turbine reheat stop valves" is editorial in nature, and does not change the design, operation, or failure modes of the valves or other components in the turbine overspeed protection system. Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Clarifying Surveillance Requirement 4.3.4.2.d is intended to eliminate clearly unnecessary inspections, and is not intended to eliminate inspections necessary to achieve the objective of this surveillance requirement. This clarification does not change the design, operating parameters, or failure modes of the valves and other components in the turbine overspeed protection system. Therefore, this proposed change does not involve a significant reduction in a margin of safety.

The reheat stop and intercept valve inspection interval extension does not change the design, operating parameters, or failure modes of the valves and other components in the turbine overspeed protection system. This inspection interval extension was also considered in the calculation of turbine missile ejection probability mentioned previously. It was determined that the probability of turbine missile ejection is within applicable acceptance criteria. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

F. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Based on the considerations expressed above, it is concluded that the activities associated with this license amendment request satisfies the no significant hazards consideration standards of 10 CFR 50.92(c). Accordingly, a no significant hazards consideration finding is justified.

G. UPDATED FINAL SAFETY ANALYSIS REPORT CHANGES

Changes to the Unit 2 UFSAR are provided in Attachment D. UFSAR Sections 3.5 and 10.2 will be revised after the technical specification changes discussed in this submittal are approved.

Background Information

Two electronic turbine overspeed trips were originally provided. The first trip circuit includes a speed pickup at the turbine stub shaft and provides a signal to the emergency trip cabinet at 111.5 percent turbine overspeed. This trip circuit does not have provisions for on-line testing without tripping the turbine.

The second trip circuit includes a speed pickup at the turning gear and provides a signal to the overspeed trip chassis within the emergency trip cabinet. This trip circuit would initiate a turbine trip at 111 percent turbine overspeed and provides for on-line testing without tripping the turbine. However, the trip circuit was found to be unreliable due to an undetermined source of "noise" that interferes with the signal going to the overspeed trip chassis, This trip was initially disabled and later removed by DCP 1152 (Reference 2).

UFSAR Change Description

Page 3.5-9 will be revised by adding a description of the turbine missile ejection probability calculation results.

Page 3.5-23 will be revised by adding references to the calculation of turbine missile ejection probability, and the letter from Duquesne Light Company to the Nuclear Regulatory Commission that forwarded the calculation.

Page 10.2-5 will be revised to delete reference to complete on-line testability since the 111 percent trip has been removed.

Page 10.2-8 will be revised to indicate that high pressure turbine valves are exercised according to technical specifications. The sentence that describes testing of mechanical and backup turbine overspeed trips also will be revised. Reference to the removed backup turbine overspeed trip will be deleted. This sentence also will be revised to indicate that a mechanical overspeed trip test is performed during start-up.

Page 10.2-13 will be revised to indicate that functional testing of the turbine steam inlet valves will be performed according to technical specifications.

I. REFERENCES

1. Letter from J. D. Sieber (Duquesne Light Company) to the NRC dated May 28, 1992. Subject - Turbine Valve Surveillance Testing (TAC M77640).

2. Design Change Package (DCP) 1152, "Turbine Trip System Modification." A <u>summary</u> of the safety evaluation for this DCP was submitted to the NRC in accordance with 10 CFR 50.59 as part of the 1989 Report of Facility Changes, Tests and Experiments, pages 75 and 76, (May 23, 1990).

ATTACHMENT C

Beaver Valley Power Station, Unit No. 2
Proposed Technical Specification Change No. 16, Revision 1
REPLACEMENT PAGES

Typed Pages:

3/4 3-74

3/4 3-75

TURBINE OVERSPEED PROTECTION

LIMITING CONDITION FOR OPERATION

3.3.4 At least one Turbine Overspeed Protection System shall be OPERABLE.

APPLICABILITY: MODES 1, 2*, and 3*.

ACTION:

a. With one throttle valve or one governor valve per high pressure turbine steam line inoperable and/or with one reheat stop valve or one reheat intercept valve per low pressure turbine steam line inoperable, restore the inoperable valve(s) to OPERABLE status within 72 hours, or close at least one valve in the affected steam line(s) or isolate the turbine from the steam supply within the next 6 hours.

b. With the above required Turbine Overspeed Protection System otherwise inoperable, within 6 hours isolate the turbine from the steam supply.

c. The provisions of Specification 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.4.1 The provisions of Specification 4.0.4 are not applicable.

4.3.4.2 The above required Turbine Overspeed Protection System shall be demonstrated OPERABLE:

a. By cycling each of the following valves through at least one complete cycle from the running position:

1) Four high pressure turbine throttle valves at least once per 31 days,

2) Four high pressure turbine governor valves at least once per 31 days,

3) Four low pressure turbine reheat stop valves at least once per 18 months,

4) Four low pressure turbine reheat intercept valves at least once per 18 months,

* Specification not applicable with all main steam isolation valves and associated bypass valves in the closed position and all other steam flow paths to the turbine isolated.

SURVEILLANCE REQUIREMENTS (Continued)

b. By direct observation of the movement of each of the following valves through one complete cycle from the running position:

1) Four high pressure turbine throttle valves at least once per 31 days,

2) Four high pressure turbine governor valves at least once per 31 days,

3) Four low pressure turbine reheat stop valves at least once per 18 months,

4) Four low pressure turbine reheat intercept valves at least once per 18 months,

c. At least once per 18 months by performing a CHANNEL CALIBRATION on the turbine overspeed protection systems, and

d. At least once per 40 months by disassembling at least one of each of the above valves and performing a visual and surface inspection of valve seats, disks, and stems and verifying no unacceptable flaws or excessive corrosion. If unacceptable flaws or excessive corrosion are found, all other valves of that type shall be inspected unless the nature of the problem can be directly attributed to a service condition specific to that valve. For reheat stop and intercept valves the inspection cycle may be increased to a maximum of 60 months, provided there is no indication of operational distress.

ATTACHMENT D

Beaver Valley Power Station, Unit No. 2
Proposed Technical Specification Change No. 16, Revision 1
APPLICABLE UFSAR CHANGES

Section 3.5

Pages 3.5-9, and -23

Section 10.2

Pages 10.2-5, -8, and -13

3.5.1.3.4 Probability Evaluation

The probability of unacceptable damage to safety-related structures, systems and components by turbine disk fragments is less than the plant safety objective of 10^{-7} per year. This is accomplished by a sufficiently frequent turbine testing and inspection schedule which provides that the probability of turbine missile generation (P1) is maintained at 10^{-5} per year or less.

The combined probability of strike and damage (P2 P3) is considered to be 10^{-2} per year or less. This conservatively considers the unfavorable orientation of the turbine generator.

Table 3.5-11 provides a correlation between P1 and years of operation since the last disk inspection.

The P1 values are for the total plant considering all rotors and both design and overspeed conditions. The turbine testing and inspection program is provided in Section 10.2.

INSERT 1 ----->

3.5.1.3.5 Turbine Overspeed Protection

The turbine speed control system has adequate redundancy to ensure that the turbine does not attain destructive overspeed. The standard Westinghouse analog electro-hydraulic control (EHC) system and electromechanical trip system includes three separate speed sensors mounted on the turbine stub shaft located in the turbine front pedestal. These sensors are:

1. Mechanical overspeed trip weight (spring-loaded bolt),

2. Electromagnetic pickup for main speed governing channel, and

3. Electromagnetic pickup for the overspeed protection control channel. This pickup uses the same toothed wheel as item 2.

An overspeed protection controller is provided and is activated in the event turbine speed exceeds 103 percent of rated speed (1,800 rpm), or the measured electrical output of the generator as compared to the low pressure turbine inlet pressure indicates a power mismatch (load impulse pressure feedback). The low pressure turbine inlet pressure represents the energy input to the turbine generator. If a mismatch occurs, one of the following actions is initiated:

1. During a partial load drop the interceptor valves are closed and then reopened after a set time delay, or

2. During a full load drop, both the governor and the interceptor valves close. The governor valves remain closed until the speed is decreased to rated speed (1,800 rpm). The interceptor valves are modulated and reopen when speed decreases to below 103 percent of rated speed to remove

INSERT 1

The following paragraph is to be inserted at the end of Section 3.5.1.3.4 on Page 3.5-9.

A calculation was performed to determine the turbine missile ejection probability resulting from an extension of reheat stop and intercept valve test intervals. A reheat stop and intercept valve inspection interval of 60 months was assumed in the calculation. Based on the calculation, it was determined that the total turbine missile generation probability meets applicable acceptance criteria with an 18 month reheat stop and intercept valve test interval.

National Transportation Safety Board 1972. Railroad Accident Report for East St. Louis, Ill. No. NTSB-RAR-73-1.

National Transportation Safety Board 1974. Railroad Accident Report for Houston, Tex. No. NTSB-RAR-75-7.

National Transportation Safety Board 1979. Railroad Accident Report for Muldraugh, Ky. No. NTSB-RAR-81-1.

National Transportation Safety Board 1980. Railroad Accident Report for Crestview, Fla. No. NTSB-RAR-79-11.

Rhoads, R.E. 1978. An Assessment of the Risk of Transporting Gasoline by Truck. PNL-2133, Pacific Northwest Laboratory, Battelle Memorial Institute, Richland, Wash.

Siewert, R.D. 1972. Evacuation Areas for Transportation Accidents Involving Propellant Tank Pressure Bursts. NASA Technical Memorandum Y68277.

Sihweil, I. 1976. SEB Interim Position on Ductility Ratios of Reinforced Concrete Structural Elements. Memorandum, USNRC, (SEB:808).

Stone & Webster Engineering Corporation (SWEC) 1977. Missile - Barrier Interaction, Topical Report SWECO-7703.

U.S. Nuclear Regulatory Commission (USNRC) 1981. Standard Review Plan for the Review of Safety Analysis Report for Nuclear Power Plants. Barrier Design Procedures. Revision 1, NUREG-0800.

U.S. Department of Transportation (USDOT) 1981a (Research and Special Programs Administration). Incidents Involving Deaths, Injuries, Damages Greater than $50,000 or Evacuations. Computer printout, periods covering 12/22/70 to 9/5/80, Washington, D.C.

U.S. Department of Transportation (USDOT) 1981b. Research and Special Programs Administration). Incidents Involving Fire and Explosions by Rail. Computer printout, periods covering 6/6/73 to 11/1/80, Washington, D.C.

Westinghouse Electric Corporation November 1986. Power Generation - Operating Division. Turbine Missile Report, CT-25266, Revision 0, Results of Probability Analysis of Disc Rupture and Missile Generation for the Beaver Valley Partially Integral Rotors.

Westinghouse Electric Corporation April 1992. Calculation of Turbine Missile Ejection Probability Resulting From Extending The Test Intervals Of Interceptor And Reheat Stop Valves At Beaver Valley Units 1 and 2.

Sieber J. D., May 28, 1992. Turbine Valve Surveillance Testing. Letter, Duquesne Light Company to the Nuclear Regulatory Commission (ND2NSM:5568).

The control of the reactor and TG is accomplished from the main control room, which contains all instrumentation and control equipment required. The control system allows BVPS-2 to accept step load increases of 10 percent and ramp load increases of 5 percent/min over a load range of 15 to 100 percent power. Below 70 percent full power, the unit can accept a turbine trip without initiating a reactor trip. Turbine bypass and atmospheric steam dump capacity permits 85 to 100 percent external load rejection without a turbine or reactor trip. The control of the reactor with turbine is covered more fully in Section 7.7. The turbine bypass system's capability is covered more fully in Section 10.4.4.

The Westinghouse analog EHC system and electro-mechanical trip system include three separate speed sensors, mounted on the turbine stub shaft located in the turbine front pedestal as follows:

1. Mechanical overspeed trip weight (spring-loaded),

2. Electro-magnetic pickup for main speed governing channel, and

3. Electro-magnetic pickup for overspeed protection control channel. (This pickup uses the same toothed wheel as item 2.)

10.2.2.1.2 Turbine Trip System

The electro-hydraulic emergency trip system consists of an emergency trip block, two test blocks mounted on the governor pedestal, a cabinet containing all the electrical and electronic hardware, a remote trip test panel, and main control board-mounted trip pushbuttons for manual tripping. The emergency trip system offers a redundant overspeed protection (Section 10.2.2.1.3) via electro-hydraulic and mechanically-actuated systems, an auto stop trip (AST) system which monitors various TG parameters, an overspeed protection controller (OPC) which monitors turbine speed and load, and a mechanical overspeed trip weight. The system also offers ~~partial on-line testability~~, provisions for detection and diagnosis of failed devices, and provisions for inservice maintenance and inspection.

Under normal conditions, the AST solenoid valves and the interface diaphram valve are closed, blocking the path to drain off the auto-stop emergency trip header fluid. The pressure in the trip header line keeps the dump valves associated with each steam valve closed. Upon collapse of this pressure, the dump valve will unseat, causing the throttle valves, governor valves, intercept valves, and reheat stop valves to close in approximately 150 milliseconds.

The AST solenoid valves are separated into two channels, with two valves per channel, which are kept energized from separate relay trains in the emergency trip system cabinet. If a trip contingency

The steam to the high pressure glands is maintained at 5 psig. Steam to the low pressure glands is maintained at 1 psig. Any excess steam is bypassed to the condenser through a spillover valve. The turbine gland sealing system is described more fully in Section 10.4.3.

10.2.2.3 Inspection and Testing Requirements

The main turbine stop and control valves and the combined intercept and intermediate stop valves are exercised ~~monthly~~ in accordance with ~~Westinghouse recommendations~~ to detect possible valve stem sticking. The valves are closed and then reopened during this procedure. Mechanical ~~and backup~~ overspeed trip tests are performed ~~periodically while carrying load, without tripping the unit, by using special test provisions~~.

Technical Specifications

10.2.2.4 Generator

during startup

The generator is sized to accept the output of the turbine. The generator is equipped with an excitation system, hydrogen control system (HCS), and a seal oil system. The generator terminals are connected to the main step up transformer and unit station service transformers through the isolated phase generator leads.

The air-cooled generator excitation system controls the voltage of the generator. The HCS includes pressure regulators, condition monitor for detection of thermally produced particulate, purity monitor for recording changes in gas density, temperature pressure transmitters, liquid detector, and water-cooled gas coolers. A circuit to supply and control the CO_2 is used during filling and purging operations to avoid explosive gas mixtures. A hydrogen seal oil system (Figure 10.2-9) prevents hydrogen leakage or air inleakage through the generator shaft seals. This system includes pumps, controls, and a storage tank, and degasifies the oil before it is returned to the shaft seals.

10.2.2.5 Generator Hydrogen

The HCS is used to cool both the rotor and stator. The rating of the generator is a function of the hydrogen pressure which is normally 75 psig. The system includes pressure regulators for control of the hydrogen gas, and a circuit for supplying and controlling the carbon dioxide used in purging the generator during filling and degassing operations. To prevent hydrogen leakage through the generator shaft seals, a hydrogen seal oil system is provided. This system, which includes pumps, controls, and a storage tank, deaerates the oil before it is sent to the shaft seals. The hydrogen control system appears on Figure 10.2-10.

Hydrogen is manually fed to the generator to maintain design pressure. A normally closed automatic shutoff valve, provided at the bulk storage facility, is operable from the local hydrogen control panel. The bulk storage facility also supplies hydrogen to the

The ISI program for throttle, governor, reheat stop and interceptor valves is in accordance with vendor recommendation of 15, 27, and 39 months after initial start-up of a turbine. In this program, some valves are inspected 12 to 15 months after start-up, others 24 to 27 months, and the remainder 36 to 39 months so that all valves are inspected at least once in the 39 months of operation following initial start-up. Throttle and reheat stop valves are inspected twice in this period. After this initial inspection program is completed, valves will be inspected periodically in accordance with Westinghouse recommendations.

~~The~~ F~~f~~unctional ~~test~~ testing of the turbine steam inlet valves will be performed ~~monthly.~~ in accordance with Technical Specifications. ~~This test can be made~~ These tests can be performed while the unit is carrying load. The purpose of the tests is to ensure proper operation of the throttle, governor, reheat stop, and interceptor valves. The operation of these valves will be observed during the tests by an operator stationed at the valves. Movements of the valves should be smooth and free. Jerky or intermittent motion may indicate a buildup of deposits on shafts.

10.2.3.6 High Temperature Properties

The operating temperatures of the high pressure rotors in turbines operating with light-water-reactors are below the creep rupture range. Creep rupture is, therefore, not considered to be a factor in assuring rotor integrity over the lifetime of the turbines.

10.2.4 Safety Evaluation

Beaver Valley Power Station - Unit 2 is a pressurized water reactor. As such, during normal operation the concentration of radioactive contaminants is minimal and no shielding is required for the TG, thus permitting unlimited access. There is no QA Category I equipment in the turbine building, thus, rupturing of the connection joints between the low pressure casing and the condenser will not adversely affect any QA Category I equipment.

The turbine stop and control valves and reheat stop and intercept valves are arranged such that failure of any one valve will not cause an overspeed event.

10.2.5 References for Section 10.2

Westinghouse Electric Corporation 1971. Scientific Paper. 71-1E7-MSLRF-P1. MSTG-1P.