TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
1630 Chestnut Street Tower II

March 25, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

| | | |
|---|---|---|
| In the Matter of the Application of | ) | Docket Nos. 50-390 |
| Tennessee Valley Authority | ) | 50-391 |

By letters dated March 7 and June 19, 1984, TVA requested that technical specification 3/4.3.4, "Turbine Overspeed Protection" (TOP) be deleted from the Watts Bar Nuclear Plant (WBN) unit 1 draft Appendix A Technical Specifications. The basis for this request is that TVA does not consider missile generation as a result of turbine overspeed a nuclear safety concern at the WBN site due to; (1) the turbine orientation (turbines are perpendicular to reactor building), and (2) the probability of missile generation and consequential damage to vital equipment is low.

During a February 28, 1985 meeting held between TVA and NRC representatives to discuss TVA's proposed detection of the TOP technical specification, as well as other power system concerns, TVA committed to: (1) revise the Final Safety Analysis Report (FSAR) to refer to the turbine integrity program with TOP (TIPTOP); (2) obtain vendor approval of the proposed testing intervals; and, (3) evaluate the need to revise the FSAR to more clearly define the TOP system to prevent having to unnecessarily shut down the plant if only a small part of one system (that does not affect operability of the entire system) becomes inoperable.

Enclosure 1 provides TVA's letter to Westinghouse Electric Corporation the turbine vendor) dated March 12, 1985, which submitted for confirmation proposed FSAR and technical specification revisions regarding the TIPTOP. Also provided is Westinghouse's letter of confirmation with corresponding comments dated March 15, 1985. Enclosure 2 provides the approved FSAR changes to be included in the next amendment (Amendment 56). Please note that as a result of Westinghouse's review of the draft FSAR changes submitted to Westinghouse by the previously mentioned letter dated March 12, 1985, FSAR section 10.2.3.6.2 was revised in the final approved version to address



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1/1

Director of Nuclear Reactor Regulation March 25, 1985

Westinghouse's comment concerning the time interval for actual overspeed testing. Also included in enclosure 2 are the TVA-approved proposed technical specification changes.

If you have any questions concerning this matter, please get in touch with D. B. Ellis of my staff at FTS 858-2682 in Chattanooga.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Domer

J. A. Domer,
Nuclear Engineer

Sworn to and subscribed before me
this 25th day of Mar 1985

Bryant M. Lawery
Notary Public
My Commission Expires 4/8/86

Enclosures
cc: U.S. Nuclear Regulatory Commission (Enclosures)
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

ENCLOSURE 1

Turbine Integrity Program With
Turbine Overspeed Protection
TVA/W Letters of Confirmation

Glenn Ashley - 0031
Richard Tucker - 4581

B44 '850318 529

Westinghouse Electric Corporation

Power Generation

Steam Turbine Generator Division

The Quadrangle
University Boulevard at Alafaya Trail
Orlando Florida 32817

March 15, 1985

Mr. C. A. Chandley
Chief, Mech. Engrg. Branch
Tennessee Valley Authority W7C126
400 West Summit Hill Drive
Knoxville, Tennessee 37902

Tennessee Valley Authority
Watts Bar Nuclear Plant
Contract 71C62-54462
Units 1 & 2
(W) G.O. CO-62300-T1
Letter No. 375

Reference: TVA letter #Z641 dated 3/12/85 - Turbine Overspeed Protection - Technical Specifications - FSAR Update M3M1R.

Dear Mr. Chandley:

We have reviewed the information which TVA is proposing to use in your FSAR update regarding valve testing, valve inspection and testing of overspeed protective functions. The version sent by you in your letter Z641 dated March 12, 1985 complies with our recommendations except the time interval for actual overspeed testing.

Based on the monthly testing of the overspeed trip weight using high pressure oil and no prior indication of problems with the trip weight mechanism, the procedures as written are acceptable.

As a matter of clarification, the difference between the monthly testing of the protective trip system devices and the twice a year testing can be done by making a large change in the measured variable and checking to see that the mechanism works. The testing of the setpoints is to assure they have not changed during the course of time. This is really just a calibration check.

Very truly yours,

W. E. Johnson

W. E. Johnson
Project Administrator

cc: Mr. J. Marcel Anderson (TVA)
Mr. V. C. Kolinger (TVA)
Mr. J. A. Coffey, TVA Div. of Nuclear Power
Mr. R. E. Voight, (W)

RAJ-108

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TENNESSEE VALLEY AUTHORITY
KNOXVILLE, TENNESSEE 37902

400 West Summit Hill Drive, W7C126

March 12, 1985

Westinghouse Corporation
The Quadrangle, MC 470
Orlando, Florida 32807

Attention: Mr. W. E. Johnson

Gentlemen:

WATTS BAR NUCLEAR PLANT
TURBOGENERATOR
CONTRACT 71C62-54462
LETTER NO. Z-641

TURBINE OVERSPEED PROTECTION - TECHNICAL SPECIFICATIONS - FSAR UPDATE - N3M-1-R

This letter confirms our recent telecons among J. W. Warren, R. Tucker, and W. Johnson, et. al., regarding the Watts Bar Nuclear Plant Turbine Overspeed Protection Program. Please review the enclosed material (draft FSAR and proposed technical specification revisions) and provide us with confirmation that the intent of your recommendations is being met. Your response is needed by express return mail no later than March 18, 1985 to assist in our meeting the Watts Bar unit 1 schedule for NRC technical specification review.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

C. A. Chandley, Chief
Mechanical Engineering Branch

Enclosures

10.2.3.5 Preservice Inspection

10.2.3.5.1 Low Pressure Turbine Rotor

(Retain existing wording in the FSAR)

10.2.3.5.2 High Pressure Turbine Rotor

(Retain existing wording in the FSAR)

10.2.3.5 Preoperational and Initial Startup Testing

The complete turbine generator control system including the turbine overspeed protection system is given a thorough prestart check and initial startup test verification during the preoperational and hot functional tests and initial heatup of the plant. These tests are documented in section 14.0 of this FSAR.

10.2.3.6 Inservice Inspection

10.2.3.6.1 Turbine Rotors

To help guard against possible failure of low pressure nuclear steam turbine discs, Westinghouse Electric Corporation has developed an ultrasonic in-service inspection method for these discs. The program includes methods and hardware for field inspection of LP turbine discs for incipient cracking located at their bore surface and particularly at their keyways.

The inspection intervals recommended by Westinghouse and based on NRC criterion vary with the construction and makeup of each rotor (and discs). The recommended Westinghouse inspection intervals for the initial WBN rotors vary between 3.34 years and 4.65 years on the various LP rotors and are based on actual operating time. If the initial rotors are replaced or refurbished, the rotor disc inspection intervals will be either approximately every five years based on actual operating time or the Westinghouse inspection interval based on the NRC criterion, whichever provides the lesser inspection interval. In addition, if there is evidence of significant corrosion found during any of the low pressure turbine rotor inspections, Westinghouse will be consulted and the inspection intervals adjusted accordingly. If measurable cracks are detected, the inspection intervals will be adjusted after considering Westinghouse recommendations. The disc inspections will be performed by personnel that are expert and highly skilled in their field.

10.2.3.6.2 Turbine Overspeed Protection

In order to assure that the Turbine Overspeed Protection System (TOPS) continues to carry out its design function in a highly reliable manner, a rigorous program of inspecting, testing, maintaining, and calibrating the various parts of the TOPS will be developed. The development of this program will consider the recommendations of Westinghouse. Various aspects of the TOPS inspection program such as scope and frequency of test, inspections, and other pertinent items are described in the following paragraphs.

The TOPS includes the following major component groups:

a. Turbine valves which control or prevent steam admission into either the high pressure or low pressure turbines.

b. The control valve emergency trip, stop valve emergency trip, and autostop oil trip systems which include the mechanical overspeed trip, electrical overspeed trip, and the overspeed protection controllers. (See section 10.2.2 for additional details.)

The throttle valves ~~and~~, governor valves, (reheat stop valves, and reheat intercept valves) will be tested and visually checked after each turbine startup and at intervals of approximately one month ~~(30 to 40 days)~~ to verify complete freedom of valve stem travel. The interval of valve testing may be changed based on plant conditions or overall TVA power system conditions. For example, if equipment necessary to shut the unit down is inoperable, the valve testing would be postponed to avoid the potential for tripping the unit. Also, if the demand for power on the TVA system is large enough that the loss of a unit would create a shortage of power to the system, the testing would wait until more favorable conditions exist. ~~The reheat stop valves, reheat intercept valves, and~~ Extraction and MSR drain non-return valves will be tested during refueling outages. Additionally, one or more of each valve type will be disassembled and inspected during outages ~~with all of these valves being disassembled and inspected at least once every three refueling cycles (approximately once every five years).~~ If during the inspection of one type of valve a problem or defect is noted, all similar valves will be disassembled and inspected. These inspections will consist of detailed dimensional and related checks to assure that critical clearances and fits are maintained within the manufacturer's recommendations.

INSERT A

~~The mechanical overspeed trip is tested at intervals of approximately [illegible] months with the unit on line and [illegible] overspeed test conditions.~~ The overspeed trip oil device which provides an interface between the autostop oil trip system and the mechanical overspeed trip is tested ~~during refueling outages. This testing verifies the correct operation of the mechanical overspeed trip [illegible] and overspeeding the unit [illegible] to but not including actual closure of the affected steam admission and control valves.~~ This testing is also repeated following repair or adjustment to the turbine electrohydraulic control system. ~~The overspeed protection controller is tested during each unit startup prior to synchronizing the unit. Controller checks include verification of closure of the turbine governor and reheat interceptor valves.~~

INSERT B

INSERT C

Calibration and checks of TOPS overspeed protection circuits overspeed controller and components (speed sensors, including OPC and electrical trip sensors, pressure sensors, load sensors, reference signals, comparators, relays, solenoid valves, etc.) is performed during each refueling outage (approximately once every

## INSERT A

with all throttle and governor valves being disassembled and inspected initially at least once every 39 operating months with the interval being reevaluated later if there are no significant valve problems or defects. All of the remaining valves (reheat stop, reheat intercept, and above nonreturn valves) will be disassembled and inspected at least once every 60 operating months (once every three refueling cycles).

## INSERT B

During each unit startup prior to synchronizing the unit if the turbine remote and overspeed trips have not been tested during the previous six months of operation, the remote solenoid, the overspeed protection controller, the mechanical overspeed, and the backup electrical overspeed trips will each be actuated to verify proper turbine and valve action. If the unit operates continuously for periods longer than six months, the above remote and overspeed tests will be deferred until the unit is shutdown and performed during the subsequent startup. The remote solenoid and overspeed trip tests will trip the turbine and close all throttle, governor, reheat intercept, and reheat stop valves. The overspeed protection controller trip test includes verification of closure of the turbine governor and reheat intercept valves. Additionally,

See tele copy for insert

## INSERT C

at approximately monthly internals. This device utilizes high pressure oil to force the overspeed trip weight outward against spring force until it strikes the trigger and actuates an overspeed trip. The above test simulates an actual overspeed trip by comparing the oil pressure at which the mechanism operates with previous test readings. No steam admission or control valves are actuated which allows on-line testing of this feature.

18 months, or following major modifications or adjustments to this system. These calibrations and checks can only be performed safely with the unit off-line.

### 10.2.3.6.3 Other Turbine Protection Features

There are other turbine protection features which serve to trip the turbine during abnormal operation (see section 10.2.4 for a list of mechanical and electrical trubine trips). Inspections, tests, maintenance, and calibrations of these components will be based on Westinghouse recommendations. ~~Some of the more important mechanical protection trips are thrust bearing wear trip, high backpressure (low condenser vacuum) trip, and low bearing oil pressure trip which will be tested during refueling outages.~~

FINAL DRAFT

INSTRUMENTATION

3/4.3.4 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 stop valve or one control 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 7 days by cycling each of the following valves through at least one complete cycle from the running position:

(1) Four high pressure turbine stop valves,
(2) Four high pressure turbine control valves,
(3) Four low pressure turbine reheat stop valves, and
(4) Four low pressure turbine reheat intercept valves.

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.

c. At least once per 18 months by performance of 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.



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

PROCEDURES AND PROGRAMS (Continued)

c. Secondary Water Chemistry

A program for monitoring of secondary water chemistry to inhibit steam generator tube degradation. This program shall include:

1) Identification of a sampling schedule for the critical variables and control points for these variables,

2) Identification of the procedures used to measure the values of the critical variables,

3) Identification of process sampling points,

4) Procedures for the recording and management of data,

5) Procedures defining corrective actions for off-control point chemistry conditions,

6) Procedures identifying: (1) the authority responsible for the interpretation of the data; and (2) the sequence and timing of administrative events required to initiate corrective ACTION, and

7) Monitoring of the condensate at the discharge of the condensate pumps for evidence of condenser in-leakage. When condenser in-leakage is confirmed, the leak shall be repaired, plugged, or isolated.

d. Post-accident Sampling

A program which will ensure the capability to obtain and analyze reactor coolant, radioactive iodines and particulates in plant gaseous effluents, and containment atmosphere samples under accident conditions. The program shall include the following:

1) Training of personnel,

2) Procedures for sampling and analysis, and

3) Provisions for maintenance of sampling and analysis equipment.

e. Turbine Integrity Program with Turbine Overspeed Protec (TIPTOP)

{continued on following page}

e. Turbine Integrity Program with Turbine Overspeed Protection (TIPTOP)

1. The TVA TIPTOP program includes a comprehensive program of maintenance, calibration, inspection, and testing of the turbine overspeed protection system (TOPS).

2. The overall objective of this program is to maintain the high reliability of the turbine overspeed protection system.

3. The maintenance program includes inspection and maintenance of the throttle, governor, reheat stop, intercept valves, and extraction steam and MSR drain nonreturn valves during outages.

4. The calibration program includes calibration of the turbine overspeed protection system.

5. The testing program includes testing of the high-pressure turbine governor and throttle valves and the turbine overspeed protection system.

6. The TIPTOP program will be based on the vendors recommendation and any changes to the program will be made with the concurrence of the vendor.

ENCLOSURE 2

Approved FSAR Revisions
and
Proposed Technical Specification Revisions

### 10.2.3.3 High Temperature Properties

The stress-rupture properties of the high-pressure rotor material are considered to be proprietary information of the turbine manufacturer, Westinghouse Electric Corporation.

### 10.2.3.4 Turbine Disc Design

Information on the tangential and radial stresses in the low-pressure discs and high-pressure rotors is considered proprietary information of the turbine manufacturer, Westinghouse Electric Corporation. However, the actual maximum tangential stresses are less than those assumed in Section 10.2.3.2, above.

### 10.2.3.5 Preservice Inspection

#### 10.2.3.5.1 Low Pressure Turbine Rotor

The low pressure turbine rotor and discs are heat treated nickel-chromium-molydenum-vanadium alloy steel procured to specifications that define the manufacturing method, heat treating process, and the test and inspection methods. Specific tests and test documentation, in addition to dimensional requirements, are specified for the forging manufacturer.

The low pressure turbine rotor has the following inspections and tests conducted at the forging manufacturer's plant:

1. A ladle analysis of each heat of steel for chemical composition is to be within the limits defined by the specification.

2. Following preliminary machining and heat treatment for mechanical properties but prior to stress relief, all rotor diameters and faces are subjected to ultrasonic tests defined in detail by a Westinghouse specification which is similar to the requirements of ASTM A-418.

3. After all heat treatment has been completed, the rotor forging is subjected to a thermal stability test defined by a Westinghouse specification which is more restrictive than the requirements of ASTM A-472.

4. The end faces of the main body and the fillet areas joining the body to the shaft ends of the machined forging are subjected to a magnetic particle surface inspection as defined by ASTM A-275.

5. After the bore of the rotor is finish machined, the bore is given a visual examination followed by a wet magnetic particle inspection defined in detail by a Westinghouse specification which exceeds the requirements of ASTM A-275.

6. Utilizing specimens removed from the rotor forging at specified locations, tensile, Charpy V Notch impact and FATT properties are determined following the test methods defined by ASTM A-370.

In addition, after the rotor body is finished machined, the rotor surface is given a fluorescent magnetic particle examination as defined by a Westinghouse specification which is similar to ASTM E-138.

The low pressure turbine rotor discs have the following inspections and tests conducted at the forging manufacturer's plant:

1. The ladle analysis of each heat of steel is to be within the composition limits defined by the specification.

2. After all heat treatment, rough machining and stress relief operations, the hub and rim areas of the completed disc forging are subjected to ultrasonic examinations. These ultrasonic tests are defined by a Westinghouse specification which exceeds the requirements of ASTM A-418.

3. The tensile, Charpy V Notch impact and FATT properties are determined from specimens removed from the discs at specific locations. The test methods used for determining these mechanical properties are defined by ASTM A-370.

In addition, after the discs are finish machined, the disc surfaces, except blade grooves, are given a fluorescent magnetic particle examination as defined by a Westinghouse specification which is similar to ASTM E-138.

After the preheated discs are assembled to the rotor body to obtain the specified interference fit, holes are drilled and reamed for axial locking pins at the rotor and disc interface. These holes are given a fluorescent penetrant inspection defined by a Westinghouse specification which is similar to ASTM E-165. Prior to shipping, each fully bladed rotor is balanced and tested to 120% of rated speed in a shop heater box.

10.2.3.5.2 High Pressure Turbine Rotor

The high pressure turbine rotor for low temperature light water reactor applications has the same basic material composition as the low pressure rotors. This nickel-chromium-molybdenumvanadium alloy steel forging is procured, processed, and subjected to test and inspection requirements the same as the low pressure rotor, which include:

1. Ladle analysis
2. Ultrasonic tests
3. Magnetic particle inspection
4. Thermal stability test
5. Bore inspection
6. Tensile and impact mechanical properties
7. Fluorescent magnetic particle inspection
8. Heater box and 120% speed test

10.2.3.5.3 Preoperational and Initial Startup Testing

The complete turbine generator control system including the turbine overspeed protection system is given a thorough prestart check and initial startup test verficiation during the preoperational and hot functional tests and initial heatup of the plant. These tests are documented in section 14.0 of this FSAR.

10.2.3.6 Inservice Inspection

10.2.3.6.1 Turbine Rotors

To help guard against possible failure of low pressure nuclear steam turbine discs, Westinghouse Electric Corporation has developed an ultrasonic in-service inspection method for these discs. The program includes methods and hardware for field inspection of LP turbine discs for incipient cracking located at their bore surface and particularly at their keyways.

The inspection intervals recommended by Westinghouse and based on NRC criterion vary with the construction and makeup of each rotor (and discs). The recommended Westinghouse inspection intervals for the initial WBN rotors vary between 3.34 years and 4.65 years on the various LP rotors and are based on actual operating time. If the initial rotors are replaced or refurbished, the rotor disc inspection intervals will be either approximately every five years based on actual operating time or the Westinghouse inspection interval based on the NRC criterion, whichever provides the lesser inspection interval. In addition, if there is evidence of significant corrosion found during any of the low pressure turbine rotor inspections, Westinghouse will be consulted and the inspection intervals adjusted accordingly. If measurable cracks are detected, the inspection intervals will be adjusted after considering Westinghouse recommendations. The disc inspections will be performed by personnel that are expert and highly skilled in their field.

10.2.3.6.2 Turbine Overspeed Protection

In order to assure that the Turbine Overspeed Protection System (TOPS) continues to carry out its design function in a highly reliable manner, a rigorous program of inspecting, testing, maintaining, and calibrating the various parts of the TOPS will be developed. The development of this program will consider the recommendations of Westinghouse. Various aspects of the TOPS inspection program such as scope and frequency of test, inspections, and other pertinent items are described in the following paragraphs.

The TOPS include the following major component groups:

a. Turbine valves which control or prevent steam admission into either the high pressure or low pressure turbines.

b. The control valve emergency trip, stop valve emergency trip, and autostop oil trip systems which include the mechanical overspeed trip, electrical overspeed trip, and the overspeed protection controllers. (See section 10.2.2 for additional details).

The throttle valves, governor valves, reheat stop valves and reheat intercept valves will be tested and visually checked after each turbine startup and at intervals of approximately one month to verify complete freedom of valve stem travel. The interval of valve testing may be changed based on plant conditions or overall TVA power system conditions. For example, if equipment necessary to shut the unit down is inoperable, the valve testing would be postponed to avoid the potential for tripping the unit. Also, if the demand for power on the TVA system is large enough that the loss of a unit would create a shortage of power to the system, the testing would wait until more favorble conditions exist. Extraction and MSR drain non-return valves will be tested during refueling outages. Additionally, one or more of each valve type will be disassembled and inspected during outages with all throttle and governor valves being disassembled and inspected initially at least once every 39 operating months with the interval being reevaluated later if there are no significant valve problems or defects. All of the remaining valves (reheat stop, reheat intercept, and above non-return valves) will be disassembled and inspected at least once every 60 operating months (once every three refueling cycles). If during the inspection of one type of valve a problem or defect is noted, all similar valves will be disassembled and inspected. These inspections will consist of detailed dimensional and related checks to assure that critical clearances and fits are maintained within the manufacturer's recommendations.

During each unit startup prior to synchronizing the unit if the turbine remote and overspeed trips have not been tested during the previous six months of operation, the remote solenoid, the overspeed protection controller, the mechanical overspeed, and the backup electrical overspeed trips will each be actuated to verify proper turbine and valve action. If the unit operates continuously for periods longer than six months and there have been no significant problems with the overspeed trip weight mechanism, the above remote and overspeed tests will be deferred until the unit is shutdown and performed during the subsequent startup. The remote solenoid and overspeed trip tests will trip the turbine and close all throttle, governor, reheat intercept, and reheat stop valves. The overspeed protection controller trip test includes verification of closure of the turbine governor and reheat intercept valves. Additionally, the overspeed trip oil device which provides an interface between the autostop oil trip system and the mechanical overspeed trip is tested at approximately monthly intervals. This device utilizes high pressure oil to force the overspeed trip weight outward against spring force until it strikes the trigger and actuates an overspeed trip. The above test simulates an actual overspeed trip by comparing the oil pressure at which the mechanism operates with previous test readings. No steam admission or control valves are actuated which allows on-line testing of this feature. This testing is also repeated following repair or adjustment to the turbine electrohydraulic control system.

Calibration and checks of TOPS overspeed protection circuits overspeed controller and components (speed sensors, including OPC and electrical trip sensors, pressure sensors, load sensors, reference signals, comparators, relays, solenoid valves, etc.) is performed during each refueling outage (approximately once every 18 months) or following major modifications or adjustments to this system. These calibrations and checks can only be performed safely with the unit off-line.

#### 10.2.3.6.3 Other Turbine Protection Features

There are other turbine protection features which serve to trip the turbine during abnormal operation (see section 10.2.4 for a list of mechanical and electrical turbine trips). Inspections, tests, maintenance, and calibrations of these components will be based on Westinghouse recommendations.

### 10.2.4 Evaluation

The following operational transients which are caused by operation of turbine, generator, or distribution system protection equipment, can occur:

1. Turbine trip due to turbine abnormalities.

2. Turbine trip due to generator abnormalities.

3. Transients due to rapid load changes or system abnormalities.

All turbogenerator protective trips that will automatically trip the turbine due to turbine (mechanical) and generator (electrical) abnormalities are tabulated below. Reactor trip and safety injection signals also will automatically trip the turbine. All turbine trips except for the first three trips tabulated in the turbine (mechanical) abnormalities list below are also shown in Figure 10.2-1.

I. Automatic Turbine Trips Due To Turbine (Mechanical) Abnormalities

1. Low Bearing Oil Pressure Trip
2. Low Vacuum Trip
3. High Thrust Bearing Trip
4. High Turbogenerator Viberation Trip
5. Low Differential Water Pressure Across Generator Stator Coils Trip (Alarm only below 15 percent power)
6. High Stator Coil Outlet Water Temperature Trip (Alarm only below 15 percent power)
7. Low EHC Fluid Tank Level
8. Low Lube Oil Tank Pressure
9. Low EHC Fluid Pressure Trip
10. Low Auto Stop Oil Pressure Trip
11. 111 Percent Rated Speed Electrical Overspeed Trip
12. 111 Percent Rated Speed Mechanical Overspeed Trip
13. EHC DC Power Failure Trip
14. Loss of Both Main Feedwater Turbines Trip
15. Steam Generator High-High Level Trip

II. Automatic Turbine Trips Due To Generator (Electrical) Abnormalities

1. Generator Differential Current Trip
2. Generator Neutral Overvoltage Trip
3. Generator Time Overcurrent (Voltage Supervised) Trip
4. Generator Negative Sequence Trip
5. Generator Backup and Main Transformer Feeder Differential Trip
6. Generator Reverse Power Trip
7. Unit Station Service Transformer A Overcurrent Trip
8. Unit Station Service Transformer B Overcurrent Trip
9. Main Transformer Sudden Pressure Trip
10. Main and Unit Station Service Transformers Differential Trip
11. 500 kV Bus 2, Section 3 Breaker Failure Trip
12. 500 kV Bus 2, Section 3 Differential Set 1 Trip

FINAL DRAFT

## 3/4.3.4 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 stop valve or one control 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 7 days by cycling each of the following valves through at least one complete cycle from the running position:

(1) Four high pressure turbine stop valves,
(2) Four high pressure turbine control valves,
(3) Four low pressure turbine reheat stop valves, and
(4) Four low pressure turbine reheat intercept valves.

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,

c. At least once per 18 months by performance of 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.



OCT 26 1984

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

PROCEDURES AND PROGRAMS (Continued)

c. Secondary Water Chemistry

A program for monitoring of secondary water chemistry to inhibit steam generator tube degradation. This program shall include:

1) Identification of a sampling schedule for the critical variables and control points for these variables,

2) Identification of the procedures used to measure the values of the critical variables,

3) Identification of process sampling points,

4) Procedures for the recording and management of data,

5) Procedures defining corrective actions for off-control point chemistry conditions,

6) Procedures identifying: (1) the authority responsible for the interpretation of the data; and (2) the sequence and timing of administrative events required to initiate corrective ACTION, and

7) Monitoring of the condensate at the discharge of the condensate pumps for evidence of condenser in-leakage. When condenser in-leakage is confirmed, the leak shall be repaired, plugged, or isolated.

d. Post-accident Sampling

A program which will ensure the capability to obtain and analyze reactor coolant, radioactive iodines and particulates in plant gaseous effluents, and containment atmosphere samples under accident conditions. The program shall include the following:

1) Training of personnel,

2) Procedures for sampling and analysis, and

3) Provisions for maintenance of sampling and analysis equipment.

e. Turbine Integrity Program with Turbine Overspeed Prote[illegible] (TIPTOP)

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e. Turbine Integrity Program with Turbine Overspeed Protection (TIPTOP)

1. The TVA TIPTOP program includes a comprehensive program of maintenance, calibration, inspection, and testing of the turbine overspeed protection system (TOPS).

2. The overall objective of this program is to maintain the high reliability of the turbine overspeed protection system.

3. The maintenance program includes inspection and maintenance of the throttle, governor, reheat stop, intercept valves, and extraction steam and MSR drain nonreturn valves during outages.

4. The calibration program includes calibration of the turbine overspeed protection system.

5. The testing program includes testing of the high-pressure turbine governor and throttle valves and the turbine overspeed protection system.

6. The TIPTOP program will be based on the vendors recommendation and any changes to the program will be made with the concurrence of the vendor.