FINAL

SYSTEM DESCRIPTION
(Index No. 1)

MAIN AND REHEAT STEAM SYSTEM
(B&R Dwg. No. 2002, Rev. 20)

JERSEY CENTRAL POWER & LIGHT COMPANY

THREE MILE ISLAND NUCLEAR STATION

UNIT NO. 2

Issue Date
March 1976

Prepared by: A. D. Pullin

Burns and Roe, Inc.
700 Kinderkamack Road
Oradell, N.J.
07649

TABLE OF CONTENTS

FOR

MAIN AND REHEAT STEAM SYSTEM

APPENDIX

MAIN AND REHEAT STEAM SYSTEM

1.0 INTRODUCTION

1.1 System Functions

The main steam piping serves primarily to deliver main steam from the steam generators to the high pressure (HP) turbine. It also provides main steam to the steam generator feed pump turbines, emergency steam generator feed pump turbine, second stage reheaters of the moisture separator-reheaters, turbine bypass valves and the turbine gland seal system.

The reheat steam piping serves primarily to deliver reheat steam from the exhaust of the HP turbine to the moisture separator-reheaters and then to the inlet of the two low pressure (LP) turbines. It also provides reheat steam to the steam generator feed pump turbines.

The main and reheat steam system has an interface with the following systems (Dwg. numbers refer to Burns and Roe flow diagrams):

a. Gland Seal Steam System (Dwg. No. 2002)

b. Bleed Steam System (Dwg. No. 2003)

c. Auxiliary Steam System (Dwg. No. 2004)

d. Feedwater and Condensate System (Dwg. No. 2005)

e. Demineralized Service Water System (Dwg. No. 2007)

f. Feedwater Heater Drains System (Dwg. No. 2009)

g. Turbine Lube Oil Purification and Transfer System (Dwg. No. 2011)

h. Instrument and Service Air System (Dwg. No. 2012)

i. Reactor Coolant, Makeup and Purification System (Dwg. No. 2024)

j. Reactor Building Penetration Forced Air Cooling System (Dwg. No. 2497)

k. Steam Generator Secondary Side Vent and Drain System (Dwg. No. 2414)

l. H_2 and CO_2 Supply Systems (Secondary Plant) (Dwg. No. 2532)

1.2 Summary Description of the System (Refer to B&R Dwg. No. 2002, Rev. 20)

High pressure steam is discharged into four main steam lines from two steam generators. Each line carries one-fourth of the total turbine steam to one of the four high pressure turbine stop (throttle) valves. The high pressure turbine exhaust steam enters four identical moisture separator-reheater units where moisture is removed and the steam is reheated before entry into the two low pressure turbines. Low pressure turbine exhaust steam enters the two separate main condenser shells where it is condensed and returned to the condensate and feedwater system. It should be noted that bleed steam is extracted from the high pressure and low pressure turbines to supply the feedwater heaters, the first stage reheaters of the moisture separator-reheaters and the auxiliary steam system. Refer to the Bleed Steam System Description, Index No. 2. Each of the four main steam lines from the steam generators to the high pressure turbine contains a main steam isolation valve. Upstream of the main steam isolation valves are the main steam safety valves and the atmospheric dump valves. From each pair of steam lines, separate take-off lines serve as:

1. Turbine bypass or steam generator dump to the condenser.
2. Steam supply to a steam generator feed pump turbine and the second stage reheater of two moisture separator-reheaters. A branch line from the take-off line of steam generator RC-H-1A supplies steam to the gland seal steam system.

3. Steam supply to the emergency steam generator feed pump turbine (required flow available from either steam generator).

1.3 System Design Requirements

The main steam system consists of the piping and valves necessary to supply 900 psia superheated steam from two once-through steam generators to the HP turbine. Branch piping is required to supply main steam to the two steam generator feed pump turbines. Additional branch piping is necessary for the reheating of high pressure turbine exhaust steam, turbine gland sealing steam, the turbine bypass and emergency steam generator feed pump turbine.

The reheat steam system consists of the piping and valves necessary to carry the HP turbine exhaust steam to the four moisture separator - reheaters and then to the two LP turbines. Reheat steam system piping also carries reheat steam from the outlet side of the moisture separator-reheaters to the steam generator feed pump turbines.

Refer to Figure 1 of the Feedwater and Condensate System Description, Index No. 4A for the turbine heat balance which gives heat rates and flows.

Each steam generator has two nozzles which supply steam through independent lines to separate stop valves in the turbine valve chest. The piping from the steam generator nozzles up to the main steam isolation valves outside the reactor building is

flow from each steam generator or a total of 6.4 percent. Turbine bypass control is described in Section 2.2.3. Main steam is automatically admitted to the steam generator feed pump turbines at loads below about 290 MWe and during one pump operation because the normal source of reheat steam is not capable of supplying sufficient steam for feed pump turbine operation under these conditions. The steam generator feed pump turbines exhaust to the condenser cold shell. The inlet and exhaust steam piping of the steam generator feed pump turbines is arranged to allow one pump operation.

The two-stage reheaters require main steam supply to the second stage reheaters. The main steam branch piping to each second stage reheater is equipped with a warming valve and a control valve in parallel. The warming valve is used to purge noncondensibles from the reheater prior to the admission of heating steam. The control valve is required by the turbine control system to control the reheat steam temperature during COLD START or HOT START as described in the Westinghouse Manual (1.00).

In addition to the turbine by-pass connection which is common to both main steam lines of each steam generator, there is a take-off from one main steam line of each steam generator, which supplies steam to the emergency steam generator feed pump drive turbine. These lines contain check valves which prevent flow from one steam generator to the other. Individual isolation valves in each steam supply line open automatically upon loss of both steam generator feed pumps or loss of all four reactor coolant pumps. An alternate steam supply from

the auxiliary steam system is also provided. Refer to the Auxiliary Steam System Description, Index No. 3. A pressure control valve maintains the turbine inlet pressure constant at 214 psig with upstream pressure varying up to 1050 psig. A dc motor operated isolation valve located at the emergency feed pump turbine will open automatically upon loss of both steam generatur feed pumps or loss of all four reactor coolant pumps.

The only connection on one steam generator main steam piping which does not have a corresponding connection on the other steam generator is the gland steam take off from a main steam line of steam generator RC-H-1A. This single source is possible since the system will always function with both steam generators in operation. No provision is made for starting up a steam generator while the other is operating. The use of one gland steam source will prevent the possibility of cross connecting the main steam piping between the two steam generators upstream of the turbine stop valves. During plant start-up, gland sealing steam can be obtained through a connection to the auxiliary steam supply from the boilers of TMI No. 1 plant.

2.0 DETAILED DESCRIPTION OF THE SYSTEM

2.1 Components

2.1.1 Steam Generators RC-H-1A, 1B

The two once-through steam generators RC-H-1A, 1B (see Table 1) are located in the reactor building at El. 281'-6". They are installed vertically and have a height of 73 ft.- 2½" from

the bottom of the support skirt to the top of the primary inlet nozzle and have a diameter of 11½ feet.

The steam generator is a shell and tube heat exchanger. There are 15,331 Inconel tubes with an outside diameter of 0.625 inch in each steam generator tube bundle. Each tube is 56 ft. - 2 3/8 inches long and is rolled and welded into the top and bottom tubesheets. The inner surfaces of the heads and tubes and the outer surfaces of the tubesheets comprise the primary side. The secondary side consists of the inner surfaces of the shell and tubesheets and the outer surfaces of the tubes.

Primary coolant (from the reactor) enters the steam generator through the inlet nozzle in the top head, passes downward through the tubes, collects in the bottom head, and flows out through two outlet nozzles to return to the reactor.

Feedwater enters through the header and 32 nozzles, flows downward in the annulus between the baffle and shell, enters the tube bundle at the lower tubesheet and flows upward through the bundle on the outside of the tubes. The tubes are stabilized in support plates with tri-lobed holes which allow upward flow of the secondary fluid. Heat from the primary coolant is transferred to the secondary fluid. This heat transfer converts feedwater to dry superheated steam which exits through the main steam outlet nozzles.

A two-section cylindrical baffle, upper and lower, surrounds the tube bundle. It directs flow of feedwater downward and acts as a containment to enclose the tube bundle and feedwater during the heating and conversion process.

The design pressure and temperature of the primary side of the steam generator is 2500 psig and 650°F. The outlet steam design conditions are 1050 psig and 600°F.

For additional information refer to Babcock and Wilcox Once-Through Steam Generator Instruction Manual, No. 01-0016-02 (7.00) and Babcock and Wilcox Pressurized Water Reactor Technology, Volume 2.

2.1.2 Turbine Generator Set

For information refer to Westinghouse Steam Turbine Instruction Manual No. 1250-C734 (1.00) and Westinghouse Hydrogen Cooled Turbine Generator Instruction Manual S.O. 76-P-0704. (1.00). Also refer to Table 2.

2.1.3 Moisture Separator - Reheaters: MO-T-1A, 1B, 2A, 2B

For a description of the moisture separator-reheaters, refer to the Feedwater Heater Drains System Description, Index No. 7 and the applicable Westinghouse manual (1.00).

2.1.4 S.G. Feed Pump Turbine Casing Drain Tanks; FW-T1A, 1B

The S.G. Feed pump turbine casing drain tanks (see Table 3) are located in the Turbine Building at an elevation of 281'-6". They are vertical cylindrical tanks, each having a capacity of 80 gal. These tanks serve as a collection device for the condensed steam from each SGFP turbine casing during normal operation and from the first stage drains and the above seat drains for the S.G.F.P. turbine low pressure stop valve during start-up.

2.1.5 S.G. Feed Pump Turbine Casing Drain Tank Pumps

FW-P-2A, 2B, 2C, 2D

The S.G.F.P. Turbine casing drain tank pumps (see Table 5) are located in the Turbine Building at an elevation of 281'-6". They are single stage, centrifugal pumps each driven by a 3 H.P. electric motor. Each pump delivers 37 GPM at a T.D.H. of 65 ft. The pump casing is split radially and has flanged side suction and top discharge connections. The impeller is a closed type.

The pumps are provided with ball type thrust and journal bearings, and are lubricated by a self-contained oil system. The bearing housing is provided with a constant level oiler and indicator.

Mechanical seals are used to prevent leakage.

Pumps FW-P-2A and 2C receive power from 480V MCC 2-31B. Pumps FW-P-2B and 2D receive power from 480V MCC 2-41B. Pump controls and indicating lights, including an overload trip light are located on Panel 17 in the Control Room.

2.1.6 HP Turbine Crossunder Piping Drain Tank; MS-T-1

The HP turbine crossunder piping drain tank MS-T-1 (See Table 4) is located in the turbine building at El. 306'-3". It is mounted vertically with a 3'-0" diameter, 4'-0" straight side, made of carbon steel and has a capacity of 200 gallons. The tank has four inlet connections to receive drains from the four crossunder pipes, a vent connection to the heater drain tank HD-T-1 a bottom drain connection, two level controller connections, and an internal baffle. The tank discharges to the cold condenser CO-C-1B through a level control valve.

2.1.7 Steam Generator Feed Pump Turbines; FW-U-1A, 1B

Refer to section 2.1.4 and Table 3 of the Feedwater and Condensate System Description, Index No. 4A.

2.1.8 Emergency Steam Generator Feed Pump Turbine; EF-U-1

Refer to section 2.1.5 and Table 4 of the Feedwater and Condensate System Description, Index No. 4A.

2.1.9 Major System Valves

Main Steam to HP Turbine Isolation Valves MS-V4A,4B,7A,7B

A motor operated 24" Y-type globe valve made of CS with 600 lb. ANSI rating and design temperature of 600°F is provided in each of the four main steam lines from the steam generators between the main steam safety valves and the HP turbine main stop valve. The isolation valves are nuclear Class N-2. The valves are normally open and can be remote manually operated from Containment Isolation Panel No. 15 where valve position is also indicated. The motor operators of valves MS-V4A, 7A and MS-V4B, 7B are powered from the engineered safety features 480 volt motor control centers 2-21 EA and 2-11 EA, respectively. The stroke time of each valve is 116 seconds. Local indication and pushbutton control is also available.

Emergency Steam Generator Feed Pump Turbine Steam Shut Off Valves MS-V11A, 11B

A motor operated 4" gate valve made of CS with 600 lb. ANSI rating and design temperature of 600°F is provided in each of the two main steam supply lines to the emergency steam generator feed pump turbine EF-U-1. The valves are nuclear Class N-2. One of the two valves is normally open and an interlock is provided so that when one valve is open the other is closed. The valves are remote manually operated from Panel No. 4

where valve position is indicated. Valve position indication is also displayed on Panel No. 15. Local indication and pushbutton control is provided. The motor operators of valves MS-V11A, 11B are powered from DC distribution panel DCC-1A. The stroke time of each valve is 20 seconds.

Main Steam to Auxiliaries Isolation Valves MS-V15A, 15B

A motor operated 10" gate valve made of carbon steel with 600 lb. ANSI rating and design temperature of 600°F is provided in the main steam take-off line from each steam generator. They are nuclear Class N-2. The valves are normally open and can be remote manually operated from Containment Isolation Panel 15 where valve position is also indicated. The motor operators of valves MS-V15A, 15B are powered from the engineered safety feature 480 volt motor control center 2-21EA, 2-11EA respectively. The stroke time of each valve is 50 seconds. Local indication and pushbutton control is available.

Turbine Bypass Shutoff Valves MS-V23A, 24A and MS-V23B, 24B

Two normally open motor operated 10" gate valves made of carbon steel with 600 lb. ANSI rating and design temperature of 600°F are provided in the turbine bypass lines from steam generators RC-H-1B, 1A. The valves are remote manually operated from Turbine Control Panel 5. The motor operators of valves MS-V23A, 24A and MS-V23B, 24B are powered from the 480 volt motor control centers 2-41B and 2-31B, respectively. The stroke time of each valve is 40 seconds.

Turbine Bypass Control Valves MS-V25A, 26A and MS-25B, 26B

Two air cylinder operated, 8" globe valves made of carbon steel with 600 lb. ANSI rating and design temperature of 600°F are provided in the turbine bypass main steam lines from steam generators RC-H-1B, 1A. The valves are controlled by the turbine bypass controls (ICS) and receive air from the instrument air system.

Atmospheric Dump Valves MS- V3A, 3B

One diaphragm operated 8" globe valve made of carbon steel with 600 lb. ANSI rating and design temperature of 600°F is provided in the bypass to atmosphere take-off line from steam generators RC-H-1B, 1A. The valves are controlled by the turbine bypass controls (ICS) and are utilized when the condenser is lost due to either a loss of cooling water or high condenser pressure. Air is provided from the instrument air system.

Reheat Steam Temperature Control Valves MS-V31A,31B,37A,37B

One diaphragm operated 6" globe valve made of carbon steel with 600 lb. ANSI rating and design temperature of 600°F is provided in the main steam supply line to the second stage reheater of the moisture separator - reheaters MO=T-1B, 1A, 2B, 2A respectively. The valves are controlled by the reheat valve controls on Turbine Supervisory Panel 16 to control the temperature of the reheat steam to the LP turbines. Air is provided from the instrument air system.

Emergency Steam Generator Feed Pump Turbine Steam Pressure Control Valve MS-V14

A diaphragm operated, 2½" globe valve made of carbon steel with 600 lb. ANSI rating and design temperature of 600°F is provided in the main steam line to the emergency steam generator feed pump turbine EF-U-1. The valve is controlled by a pressure controller located downstream of the valve to control the steam pressure to the turbine at 214 psig.

Emergency Steam Generator Feed Pump Turbine Control Valve MS-V207

A DC motor operated 6" gate valve made of carbon steel with 300 lb. ANSI rating and design temperature of 400°F is provided at the emergency steam generator feed pump turbine EF-U-1 steam inlet. A control switch with open, close and automatic positions is provided for valve operation on Plant Control Panel 4, along with valve position indication. The valve is normally closed and the control switch is in the automatic position. The valve will open automatically if both steam generator feed pumps trip or if all four reactor coolant pumps trip. The valve motor actuator is powered from (DCC-1A) DC power panel. Local indication and pushbutton control is also available.

Steam Generator Feed Pump Turbine Exhaust Valve MS-V44, 45

An electric motor operated 54" butterfly valve made of CS with 75 lb. AWWA rating and design temperature of 250°F is provided in the exhaust piping of the steam generator feed pump turbines FW-U-1A, 1B respectively, to permit maintenance on the steam generator feed pump turbines. Remote manual operation and position indication for the valves is provided at the Turbine Auxiliaries Monitoring Panel No. 17. The motor operators of valves MS-V44, V45, are powered from motor control centers 2-41B, 2-31B, respectively. The stroke time of each valve is one minute.

Steam Generator Feed Pump Turbine Trip Valves MS-48A, 48B 49A, 49B

The trip valves are held in the full open position by turbine control oil pressure. Reheat steam passes through the LP trip valves MS-V48A, 48B to the LP steam throttle valves and main steam passes through the HP trip valves MS-V49A, 49B to the HP steam throttle valves of the steam generator feed pump turbines FW-U-1A, 1B respectively.

HP Turbine Main Stop and Control Valves (4 valves)

For a description of the HP turbine main stop and control valves, refer to the Westinghouse Instruction Manual (1.00).

LP Turbine Reheat Steam Intercept Valves (4 valves)

For a description of the LP turbine reheat steam intercept valves, refer to the Westinghouse Instruction Manual (1.00).

LP Turbine Reheat Steam Stop Valves (4 valves)

For a description of the LP turbine reheat steam stop valves, refer to the Westinghouse Instruction Manual (1.00).

Gland Seal Steam Pressure Regulator Block Valve, MS-V266

For a description of the gland seal steam supply block valve, refer to the Westinghouse Instruction Manual (1.00). Remote manual operation and position indication are provided on the Turbine Auxiliaries Monitoring Panel 17. The valve is powered from motor control center 2-31A.

Gland Seal Steam Pressure Regulator Valve, MS-V267

For a description of the gland seal steam pressure regulator valve MS-V267, refer to the Westinghouse Instruction Manual (1.00).

Gland Seal Steam Pressure Regulator Bypass Valve, MS-V268

For a description of the gland seal steam pressure regulator bypass valve, refer to the Westinghouse Instruction Manual (1.00). Remote manual operation and position indication are provided on the Turbine Auxiliaries Monitoring Panel 17. The valve is powered from motor control center 2-41A.

Main Turbine Automatic Drain Valves (10 valves)

For a description of the main turbine automatic drain valves, refer to the Westinghouse Instruction Manual (1.00).

2.2 Instruments, Controls, Alarms, Computer Inputs and Protective Devices

2.2.1 Instruments

All main and reheat steam system major instrumentation is listed in Tables 7 and 8. A list of malfunctions which will cause a turbine trip is provided in Table 9.

2.2.2 Turbine Control

Steam pressure and temperature are held constant at the turbine inlet by the steam generators, reactor and turbine. The only way the turbine can supply more or less energy is to increase or decrease steam flow to the turbine. The flow to the turbine is therefore a function of the turbine control valve position.

The control of the turbine is accomplished by a simple pressure controller. The turbine header pressure modified by the error between unit load demand and generated MWe, is compared to a set point and this error drives a pulser. The pulses generated are sent to the turbine governor valve motor control where they are integrated into a speed set point. Until the pressure error is reduced within a dead band, the pulser will continue to generate a demand for turbine valve movement. The turbine control station gives the operator the option of letting the ICS control pressure or, by transferring the turbine control station to manual, allowing the operator to establish the amount of generation. For a complete description of the turbine control, refer to the Bailey Integrated Control System, Instruction Book, Volume 2 (7.09).

2.2.3 Turbine Bypass Control

Automatic and remote manual turbine bypass valve control is furnished to allow steam to flow from the steam generators during startup before the turbine is rolled and synchronized and also at low turbine steam flow demand. Two turbine bypass valves at the hot condenser and one atmospheric dump valve are provided for each steam generator. The turbine bypass control serves four automatic functions:

1. Provide pressure control at low plant loads up to 15%, before the turbine is capable of accepting pressure control.

2. Provide a high pressure relief if the turbine header pressure exceeds its set point by 50 psi during plant operation above 15% load when the ICS is controlling the steam pressure.

3. Provides an independent high pressure relief that will relieve proportionally to steam generator pressure above 1050 psig.

4. Provides pressure control after a reactor trip [illegible] psi above normal turbine header set point to prevent excessive cooling of the reactor coolant fluid.

When the condenser is lost due to either a loss of cooling water or high condenser pressure, the turbine bypass valves to condenser are shut. Turbine bypass control is automatically switched to the atmospheric dump valves when this occurs and modulates the valves.

2.2.4 Feedwater Latching System

The feedwater latching system is provided to automatically stop feedwater from entering a steam generator if a main steam line ruptures and cuases a low main steam pressure. Two pressure switches are provided for each main steam line from the steam generators. If a low steam pressure occurs for any reason in either main steam line from a steam generator and both pressure switches are activated, each pressure switch will activate a solenoid valve. When both solenoid valves are activated, the integrated control system (ICS) pneumatic signal to the startup and main feedwater control valves of the steam generator will be vented to atmosphere. The feedwater control valves will be automatically closed. The low main steam line pressure will also cause electric motor operated feedwater and emergency feedwater block valves FW-V12A, 12B, 17A, 17B, 19A and 19B to close. A feedwater latching bypass switch is provided on Plant Control Panel 4 for each steam generator to allow startup operation of the steam generators or to override the control signal during plant operation. Refer to Burns and Roe Instrumentation and Control Schematic Dwg. 3090 Sheet 74 for full logic control of the system.

2.2.5 Alarms and Computer Inputs

Alarms and computer inputs are listed in the panel mounted annunciator list in Table 8.

2.2.6 Protective Devices

Each of the two main steam lines from each steam generator has three safety valves. The cross connecting piping between the HP turbine exhaust inlet of moisture separator-reheaters

MO-T-1A, 1B and MO-T-2A, 2B are each provided with three safety valves. The emergency steam generator feed pump turbine EF-U-1 is also fitted with a single steam inlet safety valve. Design and performance data for all the safety valves are listed in Table 6.

Rupture discs are provided on both exhaust ends of each LP double-flow turbine and both steam generator feed pump turbines.

3.0 PRINCIPAL MODES OF OPERATION

3.1 Startup

To start up the main steam and reheat system, the circulating water and the feedwater and condensate systems are first put into operation. The gland sealing steam is supplied from the auxiliary steam system and is regulated by a pressure control valve. The air extraction system is then put into operation and a vacuum is pulled on the condenser.

The water level of each steam generator is set at the required startup level. The main steam lines are opened to the condenser through the turbine bypass valves which are opened by remote manual operation of the turbine bypass control valve station ICS12A MCS and ICS12B-MCS on Turbine Control Panel 5 and a vacuum of 20 - 26" Hg is pulled on the steam generators. The reactor coolant pumps are started to circulate the primary coolant and thereby heat it. The secondary side is heated by heat being transferred from the primary coolant in the steam generators. The turbine bypass control valves are throttled towards a closed position to increase the primary coolant and secondary side temperatures as primary coolant

circulation continues. When the secondary side temperature reaches 220°F, the bypass valves are fully closed and their control stations placed in automatic. Place the turbine header pressure control ICS10-MS on Plant Control Panel 4 in automatic and set it at 900 psia.

The steam generator feed pumps are started using auxiliary steam.

When the primary coolant temperature reaches 532°F, the reactor is brought to criticality and the power and temperature are increased to 8% and 558.7°F. The turbine bypass control valves automatically control the secondary side pressure at the setting of the turbine header pressure control which is 900 psia by dumping steam to the condenser. If the LP turbine inlet metal temperature is less than 300°F, follow the COLD START Westinghouse operating procedures for the moisture separator - reheaters (Spec. 1.00). If the LP turbine inlet metal temperature is above 300°F, follow the HOT START operating procedures. The turbine generator is started by remotely opening the turbine throttle valves. The turbine generator is brought up to speed, synchronized and put on the line. Electrical load is increased to 15% reactor power and when the turbine bypass control valves automatically close, the turbine can be placed in automatic control. Once the turbine is in automatic, the turbine bypass control valves automatically assume overpressure control at set point plus 50 psi.

As main turbine load is increased, the reheat steam pressure increases. At about 290 MWe main generator load, the steam generator feed pump turbine control will transfer from main to reheat steam operation.

3.2 Normal Operation

In normal operation, the turbine will be automatically controlled by the integrated control system (ICS) to follow load demand. The turbine header pressure set point is automatically varied in proportion to megawatt error.

Main steam flows from the steam generators to the HP turbine through the HP turbine stop and control valves. After passing through the HP turbine, the exhaust steam enters the moisture separator section of the four moisture separator-reheaters arranged for parallel flow. Moisture is removed from the exhaust steam in the moisture separators. The steam then flows through the first stage and second stage reheaters where it picks up heat from bleed steam and main steam respectively. The steam leaves the second stage reheaters and flows to the steam generator feed pump turbines and also through the LP turbine reheat stop valves and intercept valves to the two LP turbines.

Main steam is also supplied to the gland seal steam pressure regulator and as heating steam to the second stage reheaters of the moisture separator-reheaters.

3.3 Shutdown

Shutdown of the main and reheat steam system begins by placing the unit master station ICS1-MCS on Plant Control Panel 4 in the manual position. The rate of load change is then set with the rate of load change control station ICS4-MS on Plant Control Panel 4 and the low load limit control station ICS3-MS on Plant Control Panel 4 is set at 0%. The unit load is reduced to 15% by lowering the unit master station setting. The turbine generator load is decreased to the minimum specified in the Westinghouse Manual (Spec. 1.00) by using the turbine generator controls. Place the reactor control station ICS20-MS on Plant Control Panel 4 in manual. Remove the turbine generator from the line and shut down the reactor. Before main steam line pressure is reduced to 600 psig, place the feedwater latching system in bypass. Place the turbine bypass valve controls in manual, open the bypass valves and allow steam to flow from the steam generators to the condenser in order to cool the reactor coolant to 250°F. When the primary coolant temperature reaches 250°F, the decay heat removal system is put into operation to further reduce the reactor coolant temperature. Refer to the Decay Heat Removal System Description, Index No. 20.

3.4 Special or Infrequent Operation

3.4.1 Turbine Trip

If the turbine trips, the generator breakers will be automatically opened. The ICS will transfer to the tracking mode and reduce the unit load demand at 20% per minute to smoothly reduce steam production and avoid a reactor trip. The main steam safety valves, turbine bypass valves or atmospheric dump valves will relieve excess steam until the generated steam is reduced to the point at which the turbine bypass valves can handle all the generated steam.

3.5 Emergency

3.5.1 Main Steam Line Rupture

If a main steam line ruptures, the main steam pressure will decrease rapidly and the feedwater latching system will shut off the feedwater to the steam generator.

3.5.2 Steam Generator Tube Leak

If a steam generator tube leaks, the reactor coolant which is at a higher pressure than the secondary side of the steam generator will leak into the secondary side. The reactor coolant contains radioactivity and will contaminate the secondary side of the steam generator, the main and reheat steam system and the feedwater and condensate system. Such contamination will be detected by monitoring the off-gas in the air extraction system and samples from the secondary side of the steam generator.

If contamination of the secondary side is detected, it must be determined if the contamination level is within the acceptable allowance. If it is greater than the allowance, the plant must be shut down.

4.0 HAZARDS AND PRECAUTIONS

The greatest hazaad to the main and reheat steam system that will affect plant operation is a steam generator tube leak. Because the reactor coolant pressure exceeds the secondary side pressure during normal operation, the reactor coolant will pass into the secondary side. Radioactive contamination from the reactor coolant can be carried into the main and reheat steam system in the turbine building and could result in requiring the entire plant to be shut down.

TABLE 1

STEAM GENERATORS*

Identification	RC-H-1A, 1B	
Number installed	Two	
Vendor	Babcock and Wilcox	
Manufacturer	Babcock and Wilcox	
Design pressure, psig	Reactor Coolant side	2500
	Secondary Side	1050
Design Temperature, °F	Reactor Coolant side	650
	Secondary side	600
Design Code	Class A of ASME Code Section III	
Classification	N-1	
Cleanliness	Class B	
Quality Control	Level 1	
Seismic	Class I	

*Refer to FSAR Chapter 5.

TABLE 2

TURBINE-GENERATOR S

POOR ORIGINAL

TURBINE DETAILS

Manufacturer	Westinghouse
Type	Tandem, compound, quadruple flow condensing turbine, consisting of one H.P. & two L.P. turbines

OPERATING CONDITIONS (FULL LOAD)

LP/HP Turbine Inlet Press, psia	202/900
LP/HP Turbine Inlet Temp., ^{o}F	505/566
Exhaust Pressure, In. HgA	2.5
Steam Flow (Total), lb./hr	12.168×10^{6}

GENERATOR DETAILS

Manufacturer	Westinghouse
Type	Hydrogen inner cooled
Hydrogen Pressure	60 psig
KVA	1,068,000
Stator Amperes	28,028
Power Factor	.90
Rotor Amperes	6661
Stator Voltage	22,000
Exciter Voltage	535
Phase, Hertz, Speed (RPM)	3,60,1800

TABLE 3

STEAM GENERATOR FEED PUMP TURBINE CASING DRAIN TANKS

Identification	FW-T-1A, 1B
Number Installed	2
Manufacturer	M.W. Kellogg
Capacity, gallons	80
Installation	Vertical
Outside diameter & length, in.	20; 60
Shell Material	Steel, ASTM A106, Grade "B"
Shell thickness, in.	1/2
Design temperature, °F	120
Design Pressure, psig	150
Corrosion allowance, in.	None
Design code	None
Code Stamp required	No
Classification	Level
Code	C
Quality Control	4
Seismic	II
Cleanliness	B

TABLE 4 POOR ORIGINAL

H.P. TURBINE CROSS-UNDER PIPING DRAIN TANK

Identification	MS-T-1
Manufacturer	Richmond Eng. Co.
Capacity - gallons	200
Installation	Vertical
Outside diameter & length, ft.	3;4
Shell Material	Steel, ASME SA285, Grade C
Shell thickness, in.	7/16
Design temperature, °F	400
Design pressure, psig	225
Corrosion allowance, in.	1/16
Design code	ASME Section VIII
Code Stamp required	Yes
Classification	Level
Code	C
Quality Control	3
Seismic	II
Cleanliness	D

TABLE 5

STEAM GENERATOR FEED PUMP TURBINE CASING DRAIN PUMPS

Pump Details	
Identification	FW-P-2A, 2B, 2C, 2D
Number Installed	4
Manufacturer	Crane-Deming
Model No.	3062
Type	Horizontal, single stage centrifugal
Rated Speed, rpm	3500
Rated Capacity, gpm	37
Rated Total Dynamic Head, ft.	65
NPSH required, ft.	5
Design Pressure, casing, psig	100
Design Temperature, °F	120
Lubricant/Coolant	Oil/Water
Min. Flow Requirements, gpm	3
Motor Details	
Manufacturer	Westinghouse
Type	Squirrel cage
Enclosure	Drip proof
Rated Horsepower	3
Speed, rpm	3500
Lubricant/Coolant	Grease/Air

TABLE 5 (Continued)

Power requirements	460V, 3Ø, 60 Hz. Full load amps - 4
Power Source (for each pump motor)	Pump 2A, 2C - Bus 2-31B 2B, 2D - Bus 2-41B

Classification	Level
Code	C
Quality Control	4
Seismic	II
Cleanliness	B

TABLE 6

MAIN AND REHEAT STEAM

MAJOR SAFETY VALVES

Identification	Size	Type	Service	ANSI Rating (lb)	Design Temp. °F	Opening Set Press. psig
MS-R1A,4A/1B,4B	8x10x10	dual discharge	steam generator RC-H-1B/1A main steam outlet relief	600/150	600	1050
MS-R2A,5A/2B,5B	8x10x10	dual discharge	steam generator RC-H-1B/1A main steam outlet relief	600/150	600	1070
MS-R3A,6A/3B,6B	8x10x10	dual discharge	steam generator RC-H-1B/1A main steam outlet relief	600/150	600	1102
MS-R7A,9A/7B,9B	16x18	single discharge	moisture separator-reheater MO-T-2A,2B/1A,1B HP turbine exhaust inlet relief	300/150	500	238/244

BY.....DATE..... SUBJECT..... SHEET NO.....OF.....
CHKD BY.....DATE..... JOB NO.....

TABLE 7

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Type	Location	Input Range	Output Range	Setpoint
MS-TE-103, 104/109, 110	Temperature element	Measure Steam Generator (SG) MC-H-1A/1B outlet steam temperature and send indication to temperature recorder MS-TR-1922 points MS-TR-103, 104/109,110	Dual RTD	One in each SG main steam line	0-600°F	92.92-219.58 OHMS	N/A
MS-TR-103,104/109,110	Temperature recorder	Record SG MC-H-1A/1B main steam temperature in each main steam line	Pen Recorder	Plant Equip. Temp.Recording Panel 10	91.92-219.58 OHMS	0-800°F	N/A
MS-HS-111,112	Hand Switch	Provide remote manual open/close operation of SG feed pump turbine FW-U-1B/1A exhaust block valve MS-V45,44	Pushbutton	Turbine Auxiliaries Monitoring Panel 17	N/A	N/A	N/A
MS-PT-3898,3899	Pressure Transmitter	Measure cold/hot condenser CO-C-1A/1B pressure and transmit indication to recorder MS-PR-3898, 3899	Diaphragm	At Condenser	0-30"Hg	10-50 ma dc	N/A
MS-PR-3899,3898	Pressure Recorder	Record the cold/hot condenser CO-C-1B/1A vacuum	Two pen Recorder	Turbine Auxiliaries Monitoring Panel 17	10-50 ma dc	0-30"Hg vac.	N/A
SP-10A/10B-PT1,PT2	Pressure Transmitter	Measure the main steam loop A/B pressure in each of the two loop main steam lines at the turbine header and transmit an indication to the computer, ICS and pressure recorder SP-10-PR through selector switch SP-10-MS and pressure recorder MS-PR-1095A,B/1094A,B	Electronic	Main Steam line at turbine header	600-1200 psig	10-50 ma dc	N/A
SP-10-MS	Selector Switch	Provide normal selection of main steam loop A and B pressure transmittance to pressure recorder SP-10-PR and ICS from pressure transmitters SP-10A and 10B-PT1 or SP-10A and 10B-PT2	manual	Plant Control Panel 4	N/A	N/A	N/A
SP-10-PR	Pressure recorder	Record main steam loop A and B pressure in either of the two loop main steam lines	two pen recorder	Plant Control Panel 4	10-50 ma dc	600-1200 psig	N/A
SP-10-PS	Pressure switch	Measure main steam loop A and B pressure at pressure recorder SP-10-PR and send signal to alarm for high and low pressure	Electronic	Plant Control Panel 4	600-1200 psig	N/A	high - 935 psig low - 835 psig

BY.....DATE..... SUBJECT..... SHEET NO.....OF.....
CHKD. BY.....DATE..... JOB NO.....

TABLE 7 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Type	Location	Input Range	Output Range	Setpoint
MS-PR-1095A,B/ 1094A,B	Pressure recorder	Record main steam loop A/B pressure in both main steam lines in each loop from SP-10A/10B-PT1, PT2	two pen recorder	Turbine Auxiliaries Monitoring Panel 17	10-50 ma dc	0-1200 psig	N/A
MS-TE-1096,1097	Temperature element	Measure loop B,A main steam temperature in one of the two loop main steam lines to temperature transmitter MS-TT-1096,1097 and computer	dual RTD	One main steam line of loop	250-650°F	147.28-229.56	N/A
MS-TT-1096,1097	Temperature transmitter	Transmit indication of loop B,A main steam temperature in one of the two loop main steam lines at the turbine header to temperature indicator MS-TI-1096,1097 and temperature switch MS-TS-1096,1097	Electronic	Cable Room	147.28-229.56 OHMS	10-50 ma dc	N/A
MS-TI-1096,1097	Temperature indicator	Indicate loop B,A main steam temperature in one of the two loop main steam lines at the turbine header	Electronic	Turbine Control Panel 5	10-50 ma dc	250-650°F	N/A
MS-TS-1096/1097	Temperature switch	Send a signal to alarm MS-TAH-1096 for high loop B,A main steam temperature in one of the two loop main steam lines at the turbine header	Electronic	Cable Room	10-50 ma dc	N/A	575°F
SP-4A, 4B-TE	Temperature element	Measure loop A,B main steam temperature in one of the two loop main steam lines at the turbine header and send an indication to temperature transmitter SP-TT-4A,4B	RTD	One main steam line or loop	100-650°F	114.93-229.56 OHMS	N/A
SP-4A,4B-TT	Temperature transmitter	Transmit an indication of loop A,B main steam temperature in one of the two loop main steam lines at the turbine header to temperature indicator SP-TT-4A,4B and computer	Electronic	Rack	114.93-223.56 OHMS	0-100 ma dc	N/A
SP-4A and 4B-TI	Dual temperature indicator	Indicate loop A,B main steam temperature in one of the two loop main steam lines at the turbine header	Electronic	Plant Control Panel 4	±10V DC*	100-650°F	N/A

*Input current changed to voltage input internally.

BY.....DATE..... SUBJECT..... SHEET NO.....OF.....
CHKD. BY.....DATE..... JOB NO.....

TABLE 7 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Type	Location	Input Range	Output Range	Setpoint
SP-6A/6B-PT1,PT2	Pressure transmitter	Measure SG RC-H-1A/1B main steam outlet pressure in both main steam lines and transmit indication to ICS computer and pressure indicator SP-6A and 6B-PT1 through selector switch SP-6A/6B-MS	Electronic	Both SG main steam lines	0-1200 psig	10-50 ma	N/A
SP-6A/6B-MS	Selector switch	Provide manual selection of SG RC-H-1A/1B main steam outlet pressure transmittance from pressure transmitter SP-6A-PT1,PT2/ SP-6B-PT1,PT2	Manual	Plant Control Panel 4	N/A	N/A	N/A
SP-6A and 6B-PI1	Dual pressure indicator	Indicate SG RC-H-1B and 1A main steam outlet pressure in either of the two main steam lines	Electric	Plant Control Panel 4	2.5-12.5V DC*	0-1200 psi	N/A
MS-PT-1099,1100	Pressure transmitter	Measure and transmit an indication of each first stage pressure in the double flow HP turbine to pressure recorder MS-PR-1099,1100	Gage	Rack 413	0-1500 psig	10-50 ma dc	N/A
MS-PR-1099,1100	Pressure recorder	Record each first stage pressure in the double flow HP turbine	Pen Recorder	Turbine Auxiliaries Monitoring Panel 17	10-50 ma dc	0-1500 psig	N/A
MS-PS-1148, 1149	Pressure switch	Measure condenser CO-C-1B,1A vacuum and send signal to turbine bypass control system for low vacuum (high pressure)	Diaphragm	Rack 410/ 412	30" Hg vac - 10 psi	N/A	10" Hga
MS-FHS-1151, 1152	Hand Switch	Provide remote manual open/close operation of SG RC-H-1B/1A main steam turbine bypass to condenser isolation valve MS-V15B, 15A	Pushbutton	Turbine Control Panel 5	N/A	N/A	N/A
MS-FHS-1153,1154	Hand Switch	Provide remote manual open/close operation of SG RC-H-1B main steam turbine bypass to condenser CO-C-1B block valve MS-V24B,23B	Pushbutton	Turbine Control Panel 5	N/A	N/A	N/A

*Input current changed to voltage input internally.

BY.....DATE..... SUBJECT..... SHEET NO.....OF.....
CHKD. BY.....DATE..... JOB NO.....

TABLE 7 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Type	Location	Input Range	Output Range	Setpoint
MS-PHS-1155,1156	Hand Switch	Provide remote manual open/close operation of SG MC-H-1A main steam turbine bypass to condenser CO-C-1B block valve MS-V23A,24A	Pushbutton	Turbine Control Panel 5	N/A	N/A	N/A
MS-PC-1186	Pressure controller	Control main steam inlet pressure to emergency SG feed pump turbine EF-U-1 by controlling valve MS-V14	Bourdon tube	At turbine inlet steam line	0-265 psia	3-15 psi	215 psia
MS-PHS-1768,1769/ 1770,1771	Hand Switch	Provide remote manual open/close operation of SG MC-H-1A/B main steam to HP turbine isolation valve MS-V4A,7A/4B,7B	Pushbutton	Containment Isolation Panel 15	N/A	N/A	N/A
MS-LS-3265	Level Switch	Send a signal to alarm MS-1A-3265 for high level in SG feed pump turbine casing drain tank FW-T-1A	Displacer	At drain tank	Later	N/A	Later
MS-LS-3266	Level Switch	Send a signal to alarm MS-1A-3266 for high level in SG feed pump turbine casing drain tank FW-T-1B	Displacer	At drain tank	Later	N/A	Later
MS-LC-3383,3384	Level controller	Control the level in the SG feed pump turbine casing drain tank FW-T-1A,1B by controlling the casing drain tank pump discharge valve MS-V218B, 218A	Pneumatic	At drain tank	14" displacer	3-15 psig	3'-9" from bottom
MS-LG 3385, 3386	Level Gauge	Indicate locally the level in the SG feed pump turbine casing drain tank FW-T-1A, 1B	Gage Glass	At drain tank	0-15½"	0-15½"	N/A
MS-PS-3387, 3388	Pressure switch	Measure condenser CO-C-1A,1B pressure and send a signal to alarm MA-PAL-3467, 3468 for low vacuum (high pressure)	Diaphragm	Rack 412, 410	30" Hg vac. to 10 psig	N/A	24" Hg vac., 23" Hg vac.
MS-PHS-3389	Hand Switch	Provide remote manual open/close operation of turbine gland seal steam supply block valve.	Pushbutton	Turbine Auxiliaries Monitoring Panel 17	N/A	N/A	N/A

BY.....DATE..... SUBJECT..... SHEET NO.....OF.....
CHKD. BY.....DATE..... JOB NO.....

TABLE 7 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Type	Location	Input Range	Output Range	Setpoint
MS-PHS-3390	Hand Switch	Provide remote manual open/close operation of turbine gland seal steam supply bypass valve	Pushbutton	Turbine Auxiliaries Monitoring Panel 17	N/A	N/A	N/A
MS-PS-3405-1,-2, 3406-1,-2/3407-1,-2, 3408-1,-2	Pressure Switch	Measure SG RC-H-1B/1A main steam outlet pressure in each main steam line and send a signal to the feedwater latching system for low pressure in either steam line to shut off the feedwater supply to the SG if a main steam line rupture occurs	Diaphragm	At each SG main steam line	300-1500 psig	N/A	585 psig
MS-PHS-3409,3410	Hand Switch	Provide remote manual open/close operation of emergency SG feed pump inlet steam valve MS-V11B,11A from SG RC-H-1B,1A	Pushbutton	Turbine Auxiliaries Monitoring Panel 17	N/A	N/A	N/A
MS-LS-3808,3809	Level Switch	Send a signal to alarm MS-1A-3809 for high, 10% level in the crossunder drain tank MS-T-1	Float Gage	At crossunder drain tank	N/A	N/A	4'3/16" HI 1'4-3/16" lo from bottom
MS-LC-3810	Level Controller	Control the level in the crossunder drain tank MS-T-1 by regulating flow to condenser CO-C-1B through valve MS-V233	Pneumatic	At crossunder drain tank	32"	15-3 psi	2'8-3/16" from bottom
MS-PS-3551, 3934, 3936, 3935	Pressure Switch	Measure air pressure to turbine bypass control valves MS-V25A, 25B, 26A, 26B to condenser and send a signal to alarm MS-PAL-3551 for low air pressure	Diaphragm	In air piping	2-30 psig	N/A	2 psig
MS-PS-3552, 3923	Pressure Switch	Measure air pressure to main steam emerg. dump valves MS-V3A, 3B to atmosphere and send signal to alarm MS-PAL-3552 for low air pressure	Diaphragm	In air piping	2-30 psig	N/A	2 psig
MS-FE-3746	Flow Element	Senses steam flow from main steam to gland steam	Orifice	G.S. Supply Header	0-12,494 P.P.H.	0-100" H_2O	N/A
MS-FE-3747, 3748, 3749, 3750	Flow Element	Senses steam flow to moisture separator reheaters MSR-1A,2A,1B,2B	Orifice	M.S.R. Supply Header	0-98,693 P.P.H.	0-100" H_2O	N/A

BY.....DATE..... SUBJECT..... SHEET NO.....OF.....
CHKD BY.....DATE..... JOB NO.....

TABLE 7 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Type	Location	Input Range	Output Range	Setpoint
MS-FE-3751, 3752	Flow Element	Senses steam flow from MSR-1B to SGFP. Trbn. 1A, MSR-2B to SGFP tran. 1B	Orifice	SGFP Turbine L.P. Supply Header	0-56,927 P.P.H.	0-100" H_2O	N/A
MS-PT-3846	Pressure Transmitter	Transmits main steam pressure signal to E.H. Controller	Gage	MTG T-20	0-1000 psig	1-5V DC	N/A
MS-PT-3848	Pressure Transmitter	Transmits impulse chamber press. signal to E.H. Controller	Gage	Rack 413	0-1000 psig	1-5V DC	N/A
MS-PT-3855	Pressure Transmitter	Transmits Stm. Press. signal from between MSR-1B and L.P. Trbn. B to the overspeed protection control	Gage	Rack 413	0-300 psig	10-50 ma dc	N/A
MS-PT-3856	Pressure Transmitter	Transmits H.P. Turbine G.S. supply pressure to pressure indicator MS-PI-3856	Gage	Mtg. T-20	0-10 psig	4-20 ma dc	N/A
MS-PI-3856	Pressure Indicator	Indicates H.P. Trbn. Gland Seal supply pressure	Electric	Panel 5	4-20 ma dc	0-10 psig	N/A
TH-PT-3859	Pressure Transmitter	Transmits E.H. Control Pressure signal to pressure indicator TH-PI-3859	Gage	Rack T-20	0-3000	10-50 ma dc	N/A
TH-PI-3859	Pressure Indicator	Indicate turbine EH control pressure	Electric vertical	Turbine control Panel 5	10-50 ma dc	0-300 psig	N/A
LO-PT-3860	Pressure Transmitter	Transmits turb. lube oil pressure signal to pressure indicator LO-PT-3860	Gage	Rack T-20	0-30 psig	10-5- ma dc	N/A
LO-PT-3860	Pressure Indicator	Indicate turbine lube oil pressure	Electric vertical	Turbine Control Panel 5	10-50 ma dc	0-30 psig	N/A
MS-PT-3847	Pressure Transmitter	Transmits turb. steam chest pressure signal to pressure indicator MS-PI-3847	Gage	Mtg. 413	0-1000 psig	10-50 ma dc	N/A
MS-PI-3847	Dual Pressure Indicator	Indicate turbine steam chest pressure	Electric vertical	Turbine control Panel 5	10-50 ma dc	0-1000 psig	N/A

BY.....DATE..... SUBJECT..... SHEET NO.....OF.....
CHKD. BY.....DATE..... JOB NO.....

TABLE 7 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Type	Location	Input Range	Output Range	Setpoint
MS-PT-3857	Pressure Transmitter	Transmits turbine steam seal header pressure signal to pressure indicator MS-PI-3857	Gage	Mtg. 413	0-150 psig	10-50 ma dc	N/A
MS-PI-3857	Pressure Indicator	Indicate turbine steam seal header pressure	Electric vertical	Turbine control Pnl. 5	10-50 ma dc	0-150 psig	N/A
MS-PT-3900	Pressure Transmitter	Transmits turb. impulse chamber pressure signal to pressure indicator MS-PI-3900	Gage	Mtg. 413	0-1000 psig	1-5V DC	N/A
MS-PI-3900	Dual pressure	Indicate turbine impulse chamber pressure	Electric vertical	Turbine control Panel 5	1-5V DC	0-1000 psig	N/A
The following are Integrated Control System (ICS) controls used in the operation of the main and reheat steam system:							
ICS1-MCS	Unit load man/auto selector station	Provide a means of selecting manual or automatic unit load demand control and also provide unit load demand control in the manual position	Electronic	Plant Control Panel 4	0-100%	±10vdc	variable
ICS2-MS	High load Limit selector station	Provide a means of manually setting the unit high load limit	Electronic	Plant control Panel 4	0-100%	±10vdc	variable
ICS3-MS	Lo load limit selector station	Provide a means of manually setting the unit low load limit	Electronic	Plant control Panel 4	0-100%	±10v dc	variable
ICS4-MS	Rate of load change selector station	Provide a means of manually controlling the rate of unit load change	Electronic	Plant control Panel 4	0-10%/min.	±10v dc	variable
ICS10-MS	Turbine header Press. Selector	Provide a means of manually setting the main steam pressure (turbine header pressure) set point	Electronic	Plant control Panel 4	600-1200 psi	±10v dc	variable
ICS-12A/12B-MCS	Turbine bypass valve man/auto selector station	Provide remote manual or automatic operation of the turbine bypass valves MS-V25A,26A/25B,26B	Electronic	Turbine Control Panel 5	0-100%	±10 DC	variable
ICS-13-MS	Steam generator/ reactor master	Provide a means of selecting manual or automatic control of steam generator/ reactor demand	Electronic	Plant control Panel 4	0-100%	±10v dc	variable

BY.....DATE..... SUBJECT..... SHEET NO.....OF.....
CHKD. BY.....DATE..... JOB NO.....

TABLE 7 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Type	Location	Input Range	Output Range	Setpoint
		Turbine Supervisory Instrumentation					
Turbine Trip	Manual trip	Provide means of tripping turbine manually	Pushbutton	Turbine control Panel 5	N/A	N/A	N/A
Turbine vibration, eccentricity, expansion, differential expansion	Recorder	Record turbine vibration, eccentricity, casing expansion and casing-rotor differential expansion	Printing dual chart	Turbine supervisory Panel 16	0-4v dc	0-15 mils/ 0-15 mils/ 0-1 in./ Gov. end 0-1000 mils Gen. end 0-2000 mils	N/A
Turbine speed, Gov. valve position	Recorder	Record speed-governor valve position	Inking	Turbine supervisory Panel 16	0-4v dc	speed 0-1800 rpm valve position closed to fully open	N/A
Turbine vibration phase angle	Indicator	Indicate turbine vibration phase angle	Electric	Turbine supervisory Panel 16	0-5 ma dc	270° to 0 to 270°	N/A
Turbine eccentricity phase angle	Indicator	Indicate turbine eccentricity phase angle	Electric	Turbine supervisory Panel 16	0-5 ma dc	270° to 0 to 270°	N/A
Turbine rotor position	Recorder	Record turbine rotor position	Inking	Turbine supervisory Panel 16	0-4v dc	0 to 120 mils	N/A

BY.....DATE..... SUBJECT..... SHEET NO .....OF.....
CHKD. BY.....DATE..... ..... JOB NO .....

TABLE 8

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

PANEL MOUNTED ANNUNCIATORS:

Identification	Measured variable, units	Alarm setpoints High	Alarm setpoints Low	Source	Variable Range	Panel Name and Number
MS-TAH-1096	Loop A, B main steam temperature at turbine header, °F	575	N/A	Temperature switch MS-TS-1096,1097	250-600°F	Turbine Auxiliaries Monitoring Panel 17
MS-PAL-3551	Air pressure to turbine bypass control valves MS-V25A, 25B 26A, 26B to condenser, psig	N/A	2 psig	MS-PS-3351, 3934, 3935, 3936	2-30 psig	17
MS-PAL-3552	Low air pressure to main steam emergency dump valves MS-V3A, 3B psig	N/A	2 psig	MS-PS-3552, 2973	2-30 psig	17
MS-LA-3265/3266	SG feed pump turbine casing drain tank SW-T-1B/1A level, inches	later	N/A	Level switch MS-LS-3265/3266	later	17
MS-LA-3809	H.P. turbine crossunder piping drain tank high/low level, inches	48-3/16"	16-3/16"	Level switch MS-LS-3808/3809	later	17
MS-KA-4612	HP turbine main stop valve closed	N/A	N/A	33/T1, 33/T2 and 33/T3, 33/T4	N/A	17
MS-KA-4613	LP turbine reheat stop valve closed	N/A	N/A	33/1RL, 33/1RR 33/2RL, 33/2RR	N/A	17
MS-KA-4614	LP turbine intercept valve closed	N/A	N/A	33/1IL, 33/1IR, 33/2IL, 33/2IR	N/A	17
CO-TAH-4615	LP turbine exhaust hood temperature, °F	175°F increasing	N/A	26/HHT-1, 26/HHT-2	later	17
MS-PAL-3943	LP turbine gland seal steam pressure low at bearing 1,2,3,4,5, or 6--psig.	N/A	15.5 psia decreasing	63/GS2, 63/GS3, 63/GS4, 63/GS5, 63/GS6	later	17
TM-KA-4645	Turbine Auto Stop Reset Switch Off-Normal.	N/A	N/A	33X/RO	N/A	17
TM-KA-4617	Turning gear engaged	N/A	N/A	33/TGE-2	N/A	17

BY.....DATE..... SUBJECT..... SHEET NO .....OF.....
CHKD. BY.....DATE..... JOB NO .....

TABLE 8 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

Identification	Measured variable, units	Alarm setpoints High	Alarm setpoints Low	Source	Variable Range	Panel Name and Number
TM-TAH-4618	Turbine oil temperature, °F	140°	N/A	26/OCO	later	17
TM-EA-4619	Turbine DC system control failure	N/A	N/A	80/TM, 80/eHC	N/A	17
TM-EA-4620	Turbine overspeed trip	1950 RPM	N/A	12E/TM and 43E/AST	later	17
TM-SAL-4621	Turbine zero speed	N/A	N/A	14/ZSE	N/A	17
LO-EA-4622	Turbine oil reservoir vapor extractor trip	N/A	N/A	vapor extractor motor OLX	N/A	17
TM-EA-4625	Turbine EH system main pump trip	N/A	N/A	EH main pump OLX(1), OLX (2)	N/A	17
TM-EA-4626	Turbine turning gear oil pump trip	N/A	N/A	pump motor OLX	N/A	17
TM-EA-4627	Turbine seal oil back-up pump trip	N/A	N/A	back-up pump motor OLX	N/A	17
TM-EA-4628	Bearing lift pump trip	N/A	N/A	pump motor OLX	N/A	17
MS-TA-4363	Turbine turning gear trip	N/A	N/A	turning gear motor OLX	N/A	17

BURNS AND ROE, INC.

W.O. No. _____ Date _____ Book No. _____ Page No. _____
Drawing No. _____ Calc. No. _____ Sheet _____ of _____
By _____ Checked _____ Approved _____
Title _____

TABLE 8 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

Identification	Measured variable, units	Alarm setpoints High	Alarm setpoints Low	Source	Variable Range	Panel Name and Number
TM-LAH-4636 TM-LAL-4630	Turbine EH fluid high, low level-inches	22	17.25	71/FL1, 71/FL2	later	17
TM-LALL-4637	Turbine EH fluid low-low level, inches	N/A	low-low 11.6	71/FL1	later	17
TM-EA-4631	Turbine EH fluid low level EH pump trip, inches	N/A	7.63	86/LFT	N/A	17
TM-DPAH-4632 TM-DPAH-4633	Turbine main EH pump No. 1, 2 filter differential pressure, psi	100 psi increasing	N/A	63D/MFF-1, 63D/MFF-2	later	17
TM-PAH-4634	Turbine EH fluid drain return pressure, psig	30 psig increasing	N/A	63/PR	later	17
LO-LA-4635	Turbine oil reservoir level, inches	+6	-6	71/OL	later	17
LO-PAL-3967	Turbine oil vapor extractor pressure, inches H_2O	N/A	2 inches H_2O, vacuum increasing	63/VELP	later	17
LO-DPAH-3966	Turbine oil vapor extractor demister differential pressure, inches H_2O	12 inches H_2O vac. increasing	N/A	63D/VEDM	later	17
LO-EA-4638	Generator oil vapor extractor trip	N/A	N/A	extractor motor OIX	N/A	17
MS-PA-4363	Turbine throttle pressure, psig	935 psig	835 psig	SP-10-MS	600-1200 psig	17

Form BR 9807A

BURNS AND ROE, INC.

Oradell, N.J. • Hempstead, N.Y. • Los Angeles, Calif.

W.O. No. _____ Date _____ Book No. _____ Page No. _____

Drawing No. _____ Calc. No. _____ Sheet _____ of _____

By _____ Checked _____ Approved _____

Title _____

TABLE 8 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

Identification	Measured variable, units	Alarm setpoints High	Alarm setpoints Low	Source	Variable Range	Panel Name and Number
TM-PAH-3639	Turbine thrust bearing oil pressure, psig	35 psig increasing	N/A	63/TB	later	17
TM-ZA-4640	Turbine thrust bearing oil pressure trip	60 psig increasing	N/A	63/TB and 63X/AST	later	17
TM-PAH-4641	Condenser vacuum, inches Hg	N/A	25 inches Hg decreasing	63/LV	later	17
TM-ZA-4642	Turbine low condenser vacuum trip	N/A	18-22 inches Hg vac. decreasing	63LV and 63X/AST	later	17
TM-PAL-4643	Turbine bearing oil pressure, psig	N/A	6-8 psig decreasing	63/LBO	later	17
TM-ZA-4644	Turbine low bearing oil pressure trip	N/A	5-7 psig decreasing	63LBO and 63 X/AST	later	17
TM-LA-4676	Turbine tripped.	N/A	N/A	74RA	N/A	17
TM-ZA-4646	Turbine vacuum trip latch switch off normal	N/A	N/A	33/VTL	N/A	17
TM-ZA-4647	Emergency DC bearing oil pump in service	N/A	N/A	relay MX	N/A	17
TM-ZA-4648	Emergency DC bearing oil pump overload	N/A	N/A	26BOP/OL	N/A	17

Form BR 800/3A

BURNS AND ROE, INC.

W.O. No. _____ Date _____ Book No. _____ Page No. _____
Drawing No. _____ Calc. No. _____ Sheet _____ of _____
By _____ Checked _____ Approved _____
Title _____

TABLE 8 (Continued)

Identification	Measured variable, units	Alarm setpoints High	Alarm setpoints Low	Source	Variable Range	Panel Name and Number
CS-EA-4623	Gland Steam exhauster trip	N/A	N/A	OLX/1A OLX/1B	N/A	17
VA-PAH-3858	Gland Steam Cond. vac. low	N/A	10" H_2O vac	VA-PS-3858-1	1-60" in O vac	17
MS-LA-3809	Reheat Stm. Crossunder piping drain tank level, in.	48-3/16"	16-3/16"	MS-LA-3808, 3809	Later	17
TM-KA-4834	Turbine rotor off position, Gov. end Gen. end	95 mils 35 mils	N/A	PU/RP	0-120 mils	Turbine supervisory Panel 16
TM-KA-4835	Turbine differential expansion governor end: Rotor long Rotor short	223 mils 615 mils	N/A	PU/DR-1	0-1000 mils	16
TM-KA-4836	Turbine differential expansion generator end: Rotor long Rotor short	305 mils 1405 mils	N/A	PU-DR-2	0-2000 mils	16
TM-VAH-4837	Turbine rotor high vibration pick-up point 1	7 mils	N/A	Panel 16 Vibration Power Drawer	0-15 mils	16
TM-VAH-4838	Turbine rotor high vibration pick-up point 2	7 mils	N/A	Panel 16 Vibration Power Drawer	0-15 mils	16
TM-VAH-4839	Turbine rotor high eccentricity	3 mils	N/A	PU-RX	0-15 mils	16
EE-EA-4713	Generator field ground	N/A	N/A	relay 64/X	N/A	Station electric aux. monitoring Panel 18
EE-EA-4719	Generator field forcing	N/A	N/A	Excitation cubicle	N/A	18

Form BR 8302 2A

BURNS AND ROE, INC.

Oradell, N.J. • Hempstead, N.Y. • Los Angeles, Calif.

W.O. No. _____ Date _____ Book No. _____ Page No. _____

Drawing No. _____ Calc. No. _____ Sheet _____ of _____

By _____ Checked _____ Approved _____

Title _____

TABLE 8 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

Identification	Measured variable, units	Alarm setpoints High	Alarm setpoints Low	Source	Variable Range	Panel Name and Number
EN-EA-4707	Generator field breaker auto trip	N/A	N/A	relay 41/A	N/A	18
EN-LA-4720	Generator voltage regulator trip	N/A	N/A	relay 94/MB	N/A	18
EE-EA-4708	Exciter loss of pulse, blown fuse, or loss of power	N/A	N/A	Firing circuit drawer	N/A	18
EE-TAH-4703	Isolated phase bus duct temperature, °F	190°F	N/A	TE (any of 6)	later	18
EE-FAL-4704	Isolated phase bus duct cooling water flow, gpm	N/A	later	FE-WF1 & 2	later	18
EE-LA-4702	Hydrogen leak into isolated phase bus duct	later	N/A	Hyd. Det. 1 & 2	later	18
EE-EA-4714	Excitation switchgear DC loss	N/A	N/A	relay 80	N/A	18
EE-EA-4732	Generator transformer protection lockout relay DC loss	N/A	N/A	relay 80	N/A	18
EE-EA-4729	Generator transformer protection lockout relay trip	N/A	N/A	relay 86	N/A	18
EE-EA-4701	Generator field loss	N/A	N/A	relay 40E	N/A	18

BURNS AND ROE, INC.
Oradell, N.J. • Hempstead, N.Y. • Los Angeles, Calif.

W.O. No. _____ Date _____ Book No. _____ Page No. _____
Drawing No. _____ Calc. No. _____ Sheet ____ of ____
By _____ Checked _____ Approved _____
Title _____

TABLE 8 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

Identification	Measured variable, units	Alarm setpoints High	Alarm setpoints Low	Source	Variable Range	Panel Name and Number
2 Alarms ER-UA-4716 ER-UA-4715	Generator breaker B2-2602, B2-02 stuck	N/A	N/A	Supervisory Master Station Cab. 178	N/A	18
2 Alarms ER-UA-4722 ER-UA-4721	Generator breaker B2-2602, B2-02 trouble	N/A	N/A	Supervisory Master Station Cab. 178	N/A	18
2 Alarms ER-EA-4710 ER-EA-4709	Generator breaker B2-2602 B2-02 trip	N/A	N/A	Supervisory Master Station Cab. 178	N/A	18
2 Alarms ER-EA-4728 ER-EA-4727	Generator breaker B2-2602, B2-02 position switch mismatch	N/A	N/A	relay 30D, 30D	N/A	18
ER-EA-4725	Generator Fault Trip	N/A	N/A	86/G, M, 1, H, N	N/A	18
ER-EA-4726	Generator Motoring or Out of Step	N/A	N/A	86 BR	N/A	18
ER-EA-4732	Generator/Transformer Protection Panel EC Loss	N/A	N/A	80	N/A	18
ER-EA-4797	Generator over-excitation, Volts /Herts	N/A	N/A	59H	N/A	18

Form BR 8007 7A

BURNS AND ROE, INC.

W.O. No _____ Date _____ Book No _____ Page No. _____
Drawing No _____ Calc No _____ Sheet _____ of _____
By _____ Checked _____ Approved _____
Title _____

TABLE 8 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

Identification	Measured variable, units	Alarm Setpoints High	Alarm Setpoints Low	Source	Variable Range	Panel Name and Number
3129	Turbine Stop Valve No. 1 Closed	N/A	N/A	33/SVL	N/A	--
Computer Inputs:						
SP-B-PIA (4 inputs)	Loop A/B main steam pressure in each main steam line at turbine header, psig	915	815	pressure transmitter SP-10A/10B-PT1, PT2	600-1200 psig	--
0155, 0154 (2 inputs)	Loop A, B main steam temperature in one of the two loop main steam lines at the turbine header, °F	575	N/A	temperature element MS-TE-1097, 1096	250-650°F	--
SP-B-PIA (2 inputs)	SG MS-PIA, B main steam outlet pressure, psig	960	860	pressure transmitter SP-6B-PT	0-1200 psig	--
0152	Cold Condenser CO-C-1A, in. Hg. Vac.	24	N/A	MS-PT-3899	0-30 in Hg. vac.	--
0153	Hot Condenser CO-C-1B, in. Hg. vac.	22	N/A	MS-PT-3898	0-30 in. Hg. vac.	--
0156	H.P. Turbine, 1st Stage pressure, side B, psig	N/A	N/A	MS-PT-1099	0-1500 psig	--
0157	H.P. Turbine, 1st Stage pressure, side A, psig	N/A	N/A	MS-PT-1100	0-1500 psig	--
3072	E.H. Fluid main pump M/MP-1, trip	N/A	N/A	OIX/MP-1	N/A	--
3078	E.H. Fluid main pump M/MP-2, trip	N/A	N/A	OIX/MP-2	N/A	--
3126	Turbine Tripped	N/A	N/A	76RA	N/A	--
2808	Turbine Reset	N/A	N/A	33X-1/RO	N/A	--
3127	Overspeed trip MK	N/A	N/A	12X/OS	N/A	--
3128	Overspeed Trip (EHMPM)	N/A	N/A	14X/OSA	N/A	--
3129	Turbine Stop Valve No. 1 Closed	N/A	N/A	33/SVL	N/A	--

Form BR 8077A

BURNS AND ROE, INC.

Oradell, N.J. • Hempstead, N.Y. • Los Angeles, Calif.

W.O. No. _____ Date _____ Book No. _____ Page No. _____

Drawing No. _____ Calc. No. _____ Sheet _____ of _____

By _____ Checked _____ Approved _____

Title _____

TABLE 8 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

Identification	Measured variable, units	Alarm Setpoints High	Alarm Setpoints Low	Source	Variable Range	Panel Name and Number
3130	Turbine Stop Valve No. 2 Closed	N/A	N/A	33/1RR	N/A	—
3131	Turbine Stop Valve No. 3 Closed	N/A	N/A	33/2RL	N/A	—
3132	Turbine Stop Valve No. 4 Closed	N/A	N/A	33/2RR	N/A	—
3133	Turbine Intercept Valve No. 1 Closed	N/A	N/A	33/11L	N/A	—
3134	Turbine Intercept Valve No. 2 Closed	N/A	N/A	33/11R	N/A	—
3135	Turbine Intercept Valve No. 3 Closed	N/A	N/A	33/21L	N/A	—
3136	Turbine Intercept Valve No. 4 Closed	N/A	N/A	33/21R	N/A	—
2809	Main Steam Isolation Valve MS-V4A Closed	N/A	N/A	20-IC/MS-V4A	N/A	—
2810	Main Steam Isolation Valve MS-V7A Closed	N/A	N/A	20-IC/MS-V7A	N/A	—
2811	Main Steam Isolation Valve MS-V4B Closed	N/A	N/A	20-IC/MS-V4B	N/A	—
2812	Main Steam Isolation Valve MS-V7B Closed	N/A	N/A	20-IC/MS-V7B	N/A	—
2813	Turbine Bypass Isolation Valve MS-V15A Closed	N/A	N/A	20-IC/MS-V15A	N/A	—
2814	Turbine Bypass Isolation Valve MS-V15B Closed	N/A	N/A	20-IC/MS-V15B	N/A	—
0948, 0949 (2 inputs)	SG 1A Steam Outlet Hdr. Temp., °F	N/A	N/A	MS-TE-109, 110	0-600	—
0950, 0951 (2 inputs)	SG 1B Steam Outlet Hdr. Temp., °F	N/A	N/A	MS-TE-103, 104	0-600	—

BURNS AND ROE, INC.

Oradell, N.J. • Hackensack, N.Y. • Los Angeles, Calif.

W.O. No. _____ Date _____ Book No. _____ Page No. _____

Drawing No. _____ Calc. No. _____ Sheet _____ of _____

By _____ Checked _____ Approved _____

Title _____

TABLE 8 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

Identification	Measured variable, units	Alarm Setpoints High	Alarm Setpoints Low	Source	Variable Range	Panel Name and Number
0190	Turbine Generator Bearing No. 1 Vibration, Mils	7 Mils	N/A	TM-VE-4460-1	0-15 mils	—
0191	Turbine Generator Bearing No. 2 Vibration, Mils	7 Mils	N/A	TM-VE-4460-2	0-15 mils	—
0192	Turbine Generator Bearing No. 3 Vibration, Mils	7 Mils	N/A	TM-VE-4460-3	0-15 mils	—
0193	Turbine Generator Bearing No. 4 Vibration, Mils	7 Mils	N/A	TM-VE-4460-4	0-15 mils	—
0194	Turbine Generator Bearing No. 5 Vibration, Mils	7 Mils	N/A	TM-VE-4460-5	0-15 mils	—
0195	Turbine Generator Bearing No. 6 Vibration, Mils	7 Mils	N/A	TM-VE-4460-6	0-15 mils	—
0196	Turbine Generator Bearing No. 7 Vibration, Mils	7 Mils	N/A	TM-VE-4460-7	0-15 mils	—
0197	Turbine Generator Bearing No. 8 Vibration, Mils	7 Mils	N/A	TM-VE-4460-8	0-15 mils	—
0198	Turbine Generator Bearing No. 9 Vibration, Mils	7 Mils	N/A	TM-VE-4460-9	0-15 mils	—
1497	TG Bearing No. 1 Metal Temp., °F	210	N/A	TM-TE-1925-3	70-250°F	—
1498	TG Bearing No. 2 Metal Temp., °F	210	N/A	TM-TE-1925-4	70-250°F	—
1499	TG Bearing No. 3 Metal Temp., °F	210	N/A	TM-TE-1925-5	70-250°F	—
1500	TG Bearing No. 4 Metal Temp., °F	210	N/A	TM-TE-1925-6	70-250°F	—

Form BR 8W27A

BURNS AND ROE, INC.

W.O. No. _____ Date _____ Book No. _____ Page No. _____
Drawing No. _____ Calc. No. _____ Sheet ____ of ____
By _____ Checked _____ Approved _____
Title _____

TABLE 8 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUTS

Identification	Measured Variable, Units	Alarm Setpoints High	Alarm Setpoints Low	Source	Variable Range	Panel Name and Numbers
1501	TG Bearing No. 5 Metal Temp., °F	210	N/A	TM-TE-1925-7	70-250°F	--
1502	TG Bearing No. 6 Metal Temp., °F	210	N/A	TM-TE-1925-8	70-250°F	--
1503	TG Bearing No. 7 Metal Temp., °F	210	N/A	TM-TE-1925-9	70-250°F	--
1504	TG Bearing No. 8 Metal Temp., °F	210	N/A	TM-TE-1925-10	70-250°F	--
1505	TG Bearing No. 9 Metal Temp., °F	210	N/A	TM-TE-1925-11	70-250°F	--
1508	TG Thrust Brg. Front Face Metal °F	210	N/A	TM-TE-7184	70-250°F	--
1509	TG Thrust Brg. Rear Face Metal °F	210	N/A	TM-TE-7185	70-250°F	--
1510	TG Thrust Brg. Front Face Oil Drain, °F	170	N/A	TM-TE-1925-12	70-180°F	--
1511	TG Thrust Brg. Rear Face Oil Drain, °F	170	N/A	TM-TE-1925-13	70-180°F	--
1512	TG Brg. No. 1 Oil Drain, °F	170	N/A	TM-TE-1925-14	70-180°F	--
1513	TG Brg. No. 2 Oil Drain, °F	170	N/A	TM-TE-1925-15	70-180°F	--
1514	TG Brg. No. 3 Oil Drain, °F	170	N/A	TM-TE-1925-16	70-180°F	--
1515	TG Brg. No. 4 Oil Drain, °F	170	N/A	TM-TE-1925-17	70-180°F	--
1516	TG Brg. No. 5 Oil Drain, °F	170	N/A	TM-TE-1925-18	70-180°F	--
1517	TG Brg. No. 6 Oil Drain, °F	170	N/A	TM-TE-1925-19	70-180°F	--
1518	TG Brg. No. 7 Oil Drain, °F	170	N/A	TM-TE-1925-20	70-180°F	--
1519	TG Brg. No. 8 Oil Drain, °F	170	N/A	TM-TE-1925-21	70-180°F	--
1520	TG Brg. No. 9 Oil Drain, °F	170	N/A	TM-TE-1925-22	70-180°F	--

Form BR 8002 7A

TABLE B

MALFUNCTIONS WHICH CAUSE A TURBINE TRIP*

ITEM

Reactor Trip

Turbine Associated

Low Condenser Vacuum
Low Bearing Oil Pressure
High Turbine Thrust Bearing Oil Pressure
Turbine Overspeed

Generator Associated

Generator Overexcitation Protection Relay 59/81T & K3 (OXP-1)
Generator Differential Relay, 86 G
Generator Neutral Overvoltage Relay, 86G
Generator Overexcitation Relay, 86H
Generator Neutral Overvoltage (Low Frequency) Starting Relay, 86I
Generator Neutral Overcurrent Relay, 86N
Generator Overall Differential Relay, 86O
Main Transformer 2A Differential Relay, 86-2A
Main Transformer 2A Sudden Internal Pressure Relay, 86-2A1
Main Transformer 2A Neutral Overcurrent Relay, 86-2A2
Main Transformer 2B Differential Relay, 86-2B
Main Transformer 2B Sudden Internal Pressure Relay, 86-2B1
Main Transformer 2B Neutral Overcurrent Relay, 86-2B2

*Refer to B&R Dwg. 3079 Sheets 2 and 2A

TMI DOCUMENTS

DOCUMENT NO: TM-0422

COPY MADE ON _____ OF DOCUMENT PROVIDED BY

METROPOLITAN EDISON COMPANY.

_____

Wilda R. Mullinix, NRC

7906150445

223 153