APPENDIX-9 PRESENT CONDITIONS OF DOUBLE CIRCLED ITEMS IN THE PRELIMINARY REPORT

PRESENT SITUATION OF DOUBLE CIRCLED ITEMS

IN THE PRELIMINARY REPORT

I. GARDNER UNITS

ITEMS	GARDNER UNIT-1	GARDNER UNIT-2
1. Re-check and test of all equipments in accordance with recommended periodical inspection check sheet in "Preliminary Interim Report"	Under implementation planning during next overhauling	Under implementation based on the check list prepared by WEST JEC mechanical expert during on-going overhauling
2. Addition of HP heater by-pass	Originally installed	Installed
3. Calibration, loop check for local control system	Already finished during last overhauling	Under implementation during on-going overhauling
4. Re-check and test all equipments in accordance withcheck sheet for periodical inspection in "Preliminary Interim Report"	Under implementation planning during next overhauling	Under implementation based on the check list prepared by WEST JEC mechanical expert during on-going overhauling
5. Boiler trip interlock system (instruments and circuits) re-check	Already checked last overhauling, further detailed check will be done during next overhauling	Already checked during on-going overhauling
6. Turbine protection system (instruments and circuits) re-check	Same as boiler tripping interlock	Same as boiler tripping interlock
7. Addition of adequate instrument air dryer/ dehumidifier	Under planning, but not yet ordered March '83	Under planning, but not yet ordered March '83

ITEMS	GARDNER UNIT-1	GARDNER UNIT-2
8. Re-consideration and improvement in operation method	Under preparation of SOP on preventive maintainance	Same as G - 1 Unit
9. Practice of automatic operation	Already automatically operated except air flow control due to AH clogging	Loop check and calibration are being carried out during on-going overhauling
10. Re-check and improvement of pressure switches and temperature switches	Under planning Replacement March '83	Loop check and calibration are being carried out during on-going overhauling but not yet replaced. Replacement March '83
11. Re-check and improvement of EHG system including assistance by original manufacturer	———	———
12. Alarm and annunciation system reset	Several alarms are still lighted, some recommendations on alarm system will be presented,	Several alarms are still lighted, some recommendation on alarm system will be presented,
13. Re-wiring for defective wiring especially bare wiring around turbine supervisory system	Under implementation planning during next overhauling	Under implementation during on-going overhauling
14. Replace/repair of sampling system	Not yet replaced. Supplier's bids will be submitted on August 30, 1982	Under planning Same as G - 1 Unit
15. Replace/repair of continuous water	Not yet replaced. Supplier's bids will be submitted on August 30, 1982	Same as G - 1

ITEMS	GARDNER UNIT-1	GARDNER UNIT-2
16. Practice and follow-up of checking especially during unit start-up in accordance with the allowable valve limit	SOP was already prepared by MMRC Task Force, being implemented	Same as G - 1 Unit
17. Addition of re-generation facilities for each unit respectively	———	Awaiting the decision of the steering committee.
18. Practice of immediate shut down or emergency appropriate action in case of condenser leakage	Being implemented. Leak test/plugging of leaky tubes or retubing if necessary	Being implemented Same as G - 1 Unit
19. Addition of continuous conductivity meter	Under planning. Supplier's bids will be submitted on August 30, 1982	Under planning Same as G - 1 Unit
20. Overall relay tests when generator/transmission line is shut down	Already finished during last over-hauling (March 1982)	Already tested during on-going overhauling (June-July 1982)
21. Cleaning surface of light-ning arrester when trans-former is shut down	Planned during shutdown (March, 1982)	Already cleaned during on-going overhauling
22. Invitation of manufacturer's supervisor for the above checking/improvement/ replacement work	Already invited HITACHI from Japan, GE from USA	Already invited HITACHI from Japan, SIEMENS from West Germany under on-going overhauling
23. Adoption of double wall central control room (Addi-tion wall, window, air conditions)	Under planning	Same as G-1 Unit

ITEMS	GARDNER UNIT-1	GARDNER UNIT-2
24. Replace/addition of ventilation system	Under planning	Already rehabilitated
25. Addition of N. R . Valves on bled steam line for deaerator (G-1 , G-2, S-1, S-2 and M-1)	Originally installed	Under planning Valve already delivered, will install on first opportunity
26. Re-balancing and re-alignment of T/G	Already finished during last overhauling	Planned during on-going overhauling
27. Addition of auxiliary steam back up system including pressure reducing-attemperator station	Already finished	Under study
28. Addition of adequate dissolved O_2 meter and practice of continuous monitoring/checking	Under planning Supplier's bids will be submitted on August 30, 1982	Under planning Same as G - 1 Unit Included in order for sampling rack equipments
29. Lead wire checking when generator/transmission line is shut down.	Already finished	Already finished during on-going overhauling

II. SNYDER UNITS

ITEMS	SNYDER UNIT-1	SNYDER UNIT-2
1. Re-check and test of all equipments in accordance with recommended periodical inspection check sheet in "Preliminary Interim Report"	Under implementation planning during next overhauling	Same as S - 1 Unit
2. Addition of HP heater by-pass	Materials already delivered, installation during scheduled overhauling October - December 1982	Already implemented during last overhauling
3. Calibration, loop check for local control system	Under planning during next overhauling	Under planning during next overhauling
4. Re-check and test all equipments in accordance with Check Sheet for periodical inspection in "Preliminary Interim Report"	Under planning during next overhauling	Same as S - 1 Unit
5. Boiler trip interlock system (instruments and circuits) recheck	Under planning during next,overhauling	Same as S - 1 Unit
6. Turbine protection system (instrument,and circuits) recheck	Same as boiler tripping interlock	Same as S - 1 Unit
7. Addition of adequate instrument air dryer/dehumidifier	Same as G-1 Unit Already ordered	Same as G - 1 Unit Already ordered
8. Reconsideration and improvement in operation method	Same as G - 1 Unit	Same as G - 1 Unit

ITEMS	GARDNER UNIT-1	GARDNER UNIT-2
9. Practice of automatic operation.	Loop check and calibration are being carried out during overhauling	New type ABC system being evaluated, and will be replaced during schedule overhauling.
10. Re-check and improvement of pressure switches and temperature switches.	Under planning but not yet ordered March '82	Same as G-2 Unit
11. Re-check and improvement of EHG system including assistance by original manufacturer.	Checking and repair will be done during schedule overhaul.	Same as S - 1
12. Alarm and annunciation system reset	Same as G - 1 Unit	Same as G - 1 Unit
13. Re-wiring for defective wiring especially bare wiring.	Same as G - 1 Unit	Same as G - 1 Unit
14. Replace/repair of sampling system	Same as G - 1 Unit	Same as G - 1 Unit
15. Replace/repair of continous water.	Same as G - 1 Unit	Same as G - 1 Unit
16. Practice and follow-up of checking especially during unit start-up in accordance with the allowable value limit.	Same as G - 1 Unit	Same as G - 1 Unit

ITEMS	SNYDER UNIT-1	SNYDER UNIT-2
17. Addition of re-generation facilities for each unit respectively.	Same as G - 1 Unit	Same as G - 1 Unit
18. Practice of immediate shut down or emergency appropriate action in case of condenser leakage.	Same as G - 1 Unit	Same as G - 1 Unit
19. Addition of continuous conductivity meter.	Same as G - 1 Unit	Same as G - 1 Unit
20. Overall relay tests when generator/transmission line is shut down.	Under planning during next overhauling	Already tested during last overhauling (1981).
21. Cleaning surface of lightning arrestor when transformer is shut down.	Under planning during next overhauling	Already cleaned during 1981 overhauling
22. Invitation of manufacturers supervisor for the above checking/imppovement/replacement work.	Under planning during next overhauling	Already invited Spanish (AH), Japan (Boiler) and West Germany (Turbine) engineers.
23. Adoption of double wall central control room (Additional wall, window, air conditions)	Only double door system completed.	Double wall not yet completed.
24. Replace/addition of ventillation system.	Overall planning including air-conditioning system are ongoing.	

ITEMS	SNYDER UNIT-1	SNYDER UNIT-2
25. Addition of N.R. valves on bled steam line for deaerator (G - 1, G - 2, S - 1 S - 2 and M - 1).	OCT.----DEC. "82	Valve already delivered and be installed on first opportunity.
26. Re-balancing and re-alignment of T/G.	Planned during next overhauling	Same as S - 1 Unit.
27. Addition of auxiliary steam back-up system including pressure reducing-attemperator-station.	Same as G - 2 Unit	Same as G - 2 Unit
28. Addition of adequate dissolved 02 meter and practice of continuous monitoring/ checking	Under planning Same as G - 2 Unit	Under planning Same as G - 2 Unit
29. Lead wire checking when generator/transmission line is shut down.	Under planning during next overhauling	Under planning during next overhauling

III. MALAYA UNITS

ITEMS	MALAYA UNIT - 1 & 2	TARGET DATE
1. Re-check and test of all equipments in accordance with recommended periodical inspection chech sheet in "Preliminary Interim Report"	HITACHI procedure being implemented for M-2 T/B and M-1 B during annual overhaul. For KWU turbine, check list being prepared.	For implementation, during annual overhaul.
2. Addition of HP heater by-pass	Work order under process.	For implementation, during annual overhaul.
3. Calibration and loop check for local control system	Being implemented under standard practice.	During every opportunity.
4. Re-check and test of all equipments in accordance with check sheet for periodical inspection in "Preliminaly Interim Report"	HITACHI procedure being implemented for M-2 T/B and M-1 B. For KWU turbine, check list being prepared.	For implementation, during annual overhaul.
5. Boiler trip interlock system (instruments and circuits) re-check	Simulation of all protective device and trip interlock	Done during every scheduled shut-down.
6. Turbine protection system (instruments and circuits)	Being implemented.	During long shutdown

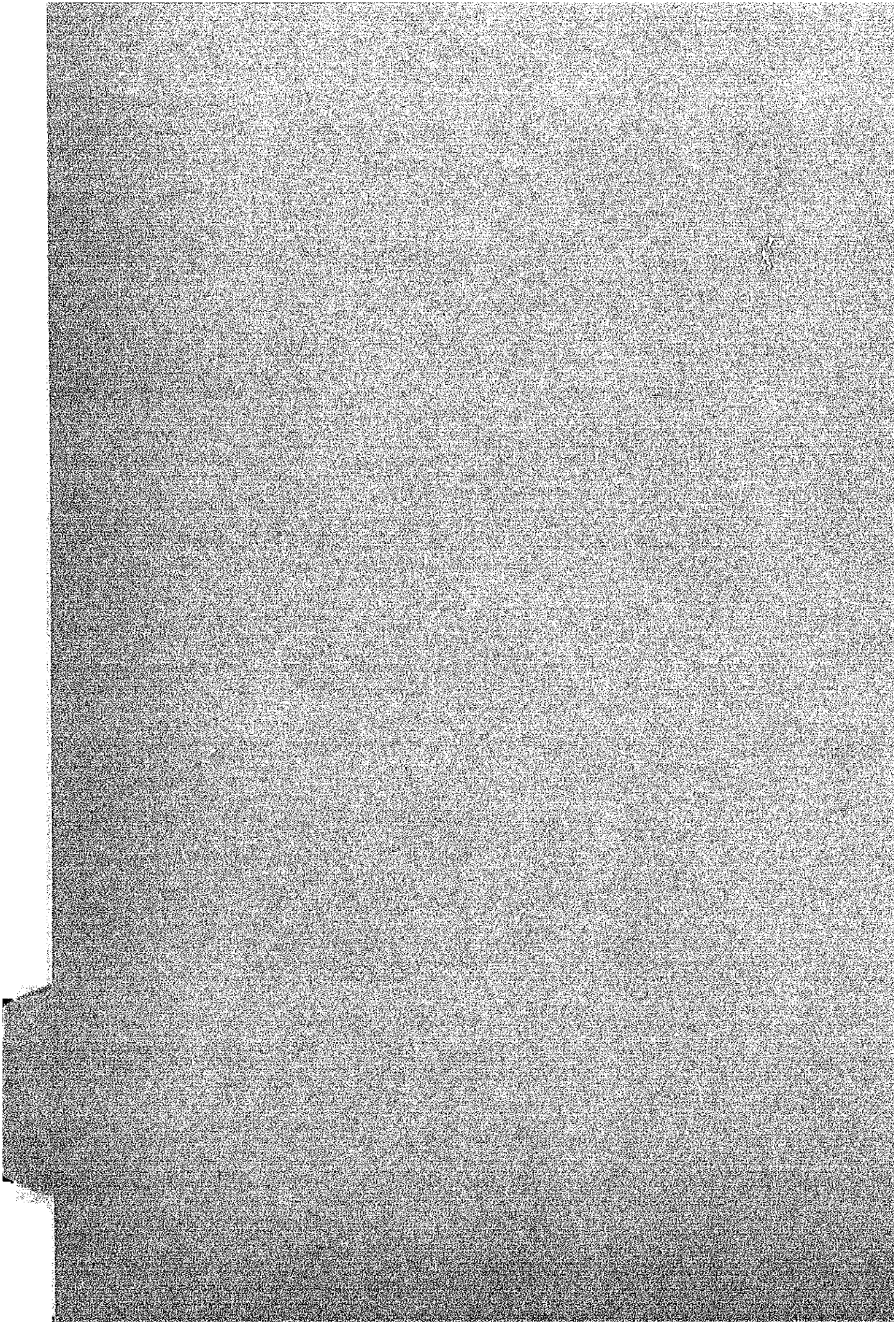
ITEMS	MALAYA UNIT - 1 & 2	TARGET DATE
7. Addition of adequate instrument air dryer/ dehumidifier	Prepared PR #3010 dated 6-13-82 for two additional heaterless dryers.	For installation in parallel with existing. Upon receipt of order.
8. Recommendation and improvement in operation method	1) Routine inspection of instruments on a weekly and monthly basis. 2) During shut-down - - - simulation of controls before start-up 3) Overhauling of unit, calibration simulation, fine tuning of controls of supervisory instruments during annual overhauling.	
9. Practice of automatic operation	Conducted investigation of existing conditions of the automatic controls for operation	Prepared PR's for improvement of automatic operation. Fine-tuning on boiler master done. Now on auto in M2
10. Re-check and improvement of pressure switches and temperature switches.	Standard practice during overhauling and scheduled shutdown.	
11. Re-check and improvement of EHG system including assistance by original manufacturer.	Needs assistance of a KWU engineer.	
12. Alarm and annunciation system reset	Recalibration of all sensors for false alarms.	Being implemented during every opportunity.
13. Re-wiring for defective wiring especially bare wiring around turbine supervisory system.	Main turbine metal and steam seal temperature sensor. Top and bottom HP casing temperature sensor.	Scheduled for re-wiring during the annual unit overhauling.

ITEMS	MALAYA UNIT - 1 & 2	TARGET DATE
14. Replace/repair of sampling system	Complete rehabilitation of monitoring instruments and recorders.	Ordered spare parts for the complete rehabilitation during overhauling.
15. Replace/ repair of continuous water	Ordered spare parts for conductivity of M.S. ECO. DEA. and CRH for M1 M2 conductivity recorder M2 Hydrazine analyzer	For installation upon arrival. For proper maintenance under repair and calibration for servicing.
16. Practice and follow-up of checking especially during unit start-up in accordance with the allowable value limit	It is a standard practice to follow-up and check allowable value limitation during unit start-up.	For strict implementation.
17. Addition of re-generation facilities for each unit respectively.	Recommended by JICA for GSTP only.	
18 Practice of immediate shut down or emergency appropriate action in case of condenser leakage	Continuous monitoring on trend of condenser leakage then inform operation when excessive for unit shutdown.	For strict compliance.
19. Addition of continuous conductivity meter	For complete rehabilitation.	Awaiting specification from TSD re-monitoring instruments
20. Overall relay tests when generator/transmission line is shut down.	Calibration, time setting, re-setting are being conducted annually or during occasional period.	For strict compliance
21. Cleaning surface of lightning arrester when transformer is shut down	Occasional cleaning by substation crew or electrical group when found dirty	For strict compliance

ITEMS	MALAYA UNIT - 1 & 2	TARGET DATE
22. Invitation of manufacturer's supervisor for the above checking/improvement/replacement work		
23. Adoption of double wall central control room (addition wall, window, air condtions)	For implementation	Under Work Order No. 1486 expansion and rehabilitation of control room
24. Replace/addition of ventilation system	Under study to close the north side wall and provide additional windows on the east side.	Project will be referred to JICA and West JEC Team for approval. Fan belts were ordered for the roof exhaust fan. All fans will be rehabilitated.
25. Addition of N. R. valves on bled steam line for deaerator (G-1, G-2, S-1. S-2 and M-1)	TSD will prepare the correct specification	
26. Re-balancing and re-alignment of T/G	Ordered re-blading of M1-LPI-TE & GE. For the coming overhauling.	Balancing of M1 turbo-gen set will be done after re-blading.
27. Addition of auxiliary steam back up system including pressure reducing attemperator station	OK for MTP but needs rehabilitation of auxiliary boiler	
28. Addition of adequate dissolve O_2 meter and practice of continuous monitoring/checking	Scheme on M2 will be adopted in M1	For order and implementation

ITEMS	MALAYA UNIT - 1 & 2	TARGET DATE
29. Lead wire checking when generator/ transmission line is shut down		Recommend occasional Hi-Pot test by transmission or substation crew

APPENDIX-10 REANLYSIS OF THE PAST TROUBLE



APPENDIX - 10

RE-ANALYSIS OF THE PAST TROUBLE

TYPICAL TROUBLE	THE CAUSE	REMARKS
1. High conductivity of feedwater	a. Condenser tube leak b. Insufficient and defective senors for water analysis c. Function of conductivity meter and maintenance of cation filter resin d. Overloading on CPP due to tube damage/piping leakage and hotwell regulator erratic operation e. Insufficient maintenance/ operation of CPP service regeneration f. Insufficient capacity of water demeneralizing and storage	It is commenced to install additional regeneration. Complete retubing for Malaya #2 will be done during coming overhaul. Sump pump should be repaired and operated.

TYPICAL TROUBLE	THE CAUSE	REMARKS
	equipments due to too many plant start/stops	
	g. Imperfect drainage, sump arrangement around condenser, defective sump pump and insufficient maintenance	
2. Feed water chloride contamination	Same as Item 1	Same as Item 1
3. Water induction on turbine and heater drain line	a. Inadequate turbine bled steam system design	Defective heater will be replaced in the rehabilitation.
	b. Tube leakages in heaters	Additional feed water by-pass system are now under installation or in consideration. And related valve should be of motor-driven type.
	c. Defective interlock and annunciation system and no interlock with	

TYPICAL TROUBLE	THE CAUSE	REMARKS
	turbine protection d. Defective level controller and level switch e. Heater drain system overloading due to large amount of heater tube leakage f. Lack in knowledge and action for emergency case g. Insufficient feedwater heater by-pass system h. Inadequate extraction non-return valve	Drain level switches used for boiler tripping interlock are not placed in service and these level switches should be replaced with micro switch type ones.

TYPICAL TROUBLE	THE CAUSE	REMARKS
4. Excessive turbine vibration	a. Inadequate piping and support design connected to main turbine casing b. Insufficient rotor balancing c. Inadequate alignments d. Turbine bucket failure	Alignment of piping should be carried out again. Replacement of turbine blade should be planned.
5. BFP trip due to deaerator storage tank water level extremely low	a. Too large load increase rate b. Cascade drainage from HP heater into LP heater and condenser due to HP heater tube leak c. Excessive feed water flow rate due to HP heater tube leaks	

TYPICAL TROUBLE	THE CAUSE	REMARKS
	d. Less NPSH are due to BFP - deaerator layout	
	e. Overload on deaerator level control system capacity (LCV,CP) due to excessively high feed water flow rate due to the tube leak	
	f. Tripping due to malfunction of level monitor by deaerator vibration and controller is not placed into AUTO.	To put controller into AUTO after nepairing/replacement of control, system. To replace/relocate level switch.
6. HP heater and LP heater tube leakage	a. Defective design and manufacturing	a. Heater tubes should be replaced
	b. Worse water and steam quality	
	c. Drain attack due to extremely	

TYPICAL TROUBLE	THE CAUSE	REMARKS
	high flow rate drain into LP heater due to cascade drainage from HP heater to deaerator, LP heater in case of HP heater tube leak.	
7. Turbine exhaust hood rupture diaphragm burst due to CWP trip	a. Chronic less margin in condenser vacuum due to inadequate condenser design condition. b. Insufficient circulating water system arrangement and design c. Unexpected much heater drain into condenser d. Deterioration of ejector capacity due to lower working steam pressure	

TYPICAL TROUBLE	THE CAUSE	REMARKS
	and higher sealing water temperature, by which the vacuum pressure is restricted (saturated pressure of the temperature)	
8. Boiler tube leakage	a. Insufficient feed water and steam purity	Secondary superheater tube under the most severe condition will be replaced with higher withstand temperature material.
	b. Inadequate combustion control/ feed water control	
	c. Inadequate spray control and defective spray stop valve	Water wall tubes and reheater tubes having pitting and thin tubes will be replaced.
	d. Unexpected feed water temperature fluctuation due to high pressure heater tube leak	Data on valve opening vs. flow rate should be actually obtained and either replacement or repair of the
	e. Misoperation	

TYPICAL TROUBLE	THE CAUSE	REMARKS
		control valve should be determined.
9. Condenser low vacuum	a. Inadequate condenser design condition - inlet circulating water temperature, cleanness factor	Deteriorated gasket, diaphragm of condenser will be replaced in the rehabilitation.
	b. High CW inlet temperature due to circulating water recirculation (distance of in/out sheet pile)	Deteriorated gland seal element will be replaced in the rehabilitation.
		Reverse washing valves should be inspected and repaired.
0. Fire on around turbine	a. Lube and control oil leakage from the oil piping	Through maintenance of pipings and repair of damaged heat insulation should be carried out.
	b. Insufficient maintenance to	

TYPICAL TROUBLE	THE CAUSE	REMARKS
	eliminate the piping leakage c. Insufficient heat insulation on high temperature pipes including small drain and steam leak pipes d. Insufficient leak oil collection and drainage system	
11. Turbine oil leakage	a. Insufficient installation, sealing or design of lube oil piping b. Insufficient maintenance c. Misoperation of the oil centrifuge	Through maintenance of pipings should be carried out.
12. T-BFP planetary gear trouble	a. Overloading due to HP heater tube leakage-severe condition thru	

TYPICAL TROUBLE	THE CAUSE	REMARKS
	design condition	
	b. Ordinal high vibration	
13. Main fuel oil pump trouble	a. Overloading due to plant performance deterioration	° Prevention of unit trip due to malfunction of pressure switch
	b. Unstable combustion/fuel consumption	° Fuel oil transfer operation should be carefully carried out and operating procedure should be rechecked.
14. Fire at A.H., frequent A.H. washing	a. Unstable combustion-carbon deposits accumulation	° At this stage thermal cleaning of AH is applied.
	b. Inadequate ash collecting and handling system inluding system design and materials	° Washing up water

TYPICAL TROUBLE	THE CAUSE	REMARKS
15. Carry over	a. For B-T: Inadequate load down rate b. For CPP resin carry over: Defect of resin trap c. Fluctuation in flow, pressure in condensate due to hotwell level control rangeability	
16. Boiler casing	a. Low temperature corrosion attack (sulphur attack) due to high sulfer contents in fuel b. Unstable combustion which leads to corrosive deposits accumulation c. Water washing which accelerates the H_2SO_4 attack	Countermeasures to decrease the corrosive are recommended in the QA group overhaul record. Gas leak from boiler casing should be repaired.

TYPICAL TROUBLE	THE CAUSE	REMARKS
	d. Insufficient gas tight water wall	
	e. Incomplete repair during over-hauling	
17. Shortage in make up demineralized water	a. Too much plant shut-down and start-up due to above troubles - much larger make up water consumption than planned in plant design stage	Demineralizing plant is under planning.
	b. Raw water supply inadequate due to receding deepwell water table.	
18. Dust handling system trouble	a. Clogging of dust conveying line due to inadequate capacities of piping and hydrovectors	Dust handling system should be replaced.

TYPICAL TROUBLE	THE CAUSE	REMARKS
	b. Design deficiency of slurry pump c. Inadequate maintenance d. Irregular operation of dust handling system	
19. Generator directional relay (67) actuation	a. Due to loss of excitation b. Generator back-up relay (86GB) actuation after turbine trip	In the existing plant tripping interlock, turbine tripping signal does not trip the generator circuit breaker instantaneously. 86GB Turbine Trip → Reverse Power relay → Generator circuit breaker open Generator breaker should be tripped instantaneously after turbine trip.

TYPICAL TROUBLE	THE CAUSE	REMARKS
		not through reverse power relay, and the reverse power relay should be applied to protect motoring of the generator.
20. System disturbance (high/ low frequency)	a. Unbalance between power demand and supply b. Inadequate power regulation and load cutting out at emergency case, and defective coordination of power plants and load dispatching center. c. Poor transmission line system and capacity	A definite evidence was observed at Gardner/Snyder and Malaya Thermal Power Stations on 8 September, 1982. Reinforcement of transmission and distribution lines and prompt construction of load dispatching center are expeted.

TYPICAL TROUBLE	THE CAUSE	REMARKS
21. Uncontrollable steam temperature	a. Defective maintenance of temperature sensors, and defective spray control valve b. Manual operation due to defective sensors and control valves c. Inadequate operation at unit start-up	The steam temperature can not be maintained properly only by manual operation at sudden load changes and unit start-up. Defective sensors and control valves should be repaired.
22. Boiler trip interlock action	a. Defective maintenance of BTI sensors b. Inadequate installation of BTI sensors c. Poor pre-alarm system and maintenance	The existing mercury type BTI sensors will be easily initiated by slight vibration. The mercury type BTI sensors should be replaced with micro switch type and BTI sensors should be installed in local cubicle. To furnish pre-alarm annunciators to give notice

TYPICAL TROUBLE	THE CAUSE	REMARKS
		to operators before unit trip
23. BTI by low economizer inlet feed water pressure	a. Tube/piping leakage	In almost all plants, the BTI, Economizer inlet feed water pressure low is not placed into service due to reduced pressure operation.
24. Main and all auxiliaries switch gear, motor c/c failure.	a. Bad circumstances for station electrical facilities	Station service auto bus transfer test should be carried out every shut-down.
	b. Insufficient layout engineering and poor maintenance of building and ventilation system	To repair roof leakage
	c. Insufficient maintenance of switch gears and control centers	To replace the existing auxiliary relays with seal-in type ones.
	d. Poor electrical contact due to	

TYPICAL TROUBLE	THE CAUSE	REMARKS
	open-type auxiliary relay.	
25. Master trip solonoid malfunction	a. Inadequate arrangement in cabling wiring and instruments and sensors b. Insufficient maintenance	Turbine tripping interlock test should be strictly carried out every unit shut-down.
26. Thrust bearing safety device test	a. Malfunction of testing device	Carry out the thrust bearing safety device test after through repair and calibration.
27. Major trouble due to back-up system failure	a. Insufficient routine back-up test and poor maintenance	Back-up tests for emergency equipments should be strictly carried out as routine work.
28. Loss or over excitation of generator	a. Exciter failure	Insulation of exciter should be checked during unit shut-down.

TYPICAL TROUBLE	THE CAUSE	REMARKS
29. Low feed water flow/BFP minimum flow	a. Malfunction of BFP minimum flow flow control system. b. Erosion of minimum flow control valve	The existing minimum flow control valves are replaced with new hydraulic type valves for units: G-2, S-2 (T-BFP), and M-1 (T-BFP) other defective minimum flow control valves should be replaced.
30. Instrument air contamination by fuel oil	a. Inadequate or insufficient instrument air supply due to plenty of air leak. b. Leakage from non-return valve on back-up line. c. Misoperation of valve during burner purge.	To repair air leak urgently. To blow out the instrument air and station service airlines. To install an additional instrument air compressor.

TYPICAL TROUBLE	THE CAUSE	REMARKS
31. Turbine electrohydraulic control fault	———	To inspect the EHG with manufacturers engineer's during every annual shut-down.