Attachment - 1.5 Minutes of Meeting (3.5th Mission)

MINUTES OF MEETING

OF

THE 3.5TH MISSION FOR THE EIA STUDY

OF

THE PREPARATORY STUDY FOR DEVELOPMENT OF SOUTHERN LARGE SCALE THERMAL POWER PLANT IN IRAQ

AGREED UPON BETWEEN

MINISTRY OF ELECTRICITY

AND

THE STUDY TEAM OF

JAPAN INTERNATIONAL COOPERATION AGENCY

Amman, 19th-22nd January 2012

MINISTRY OF ELECTRICITY	THE JICA STUDY TEAM
M. A. Salih 22/1/2012	22/Jan/2012
Dr. Mohammed Ahmed SALIH	Shunji USUI
EIA Team	EIA Group
Renewable & Environment Energy Center	JICA Study Team
Ministry of Electricity (MOE)	
Baghdad – Iraq	

The Study Team has been implementing the Preparatory Study for Development of Southern Large Scale Thermal Power Plant (referred to as the Study), and received the EIA Team of MOE in TEPSCO Amman Representative Office for the special mission on the EIA Study as the 3.5th Mission.

The EIA Team of MOE and the JICA Study Team have reviewed the current status and pending issues in the EIA Study of the Feasibility Study of the Nasiryah II Project (referred to as the F/S). The discussion followed the agenda below:

1. Confirmation of the information
   To confirm the current status of the information needed such as the 1st stakeholders meeting, the descriptions of Nasiryah and Nasiryah I and the contents of the fuel natural gas.
2. Confirmation of the contents of the draft EIA Report
   To confirm the current status and the contents of the draft EIA Report.
3. Verification between the assessment and the Project
   To verify the assessment by overviewing the Draft Final Report (DFR) of the entire study.
4. Formulation of the DFR of the EIA Report
   To formulate the draft final report of the EIA Report. It includes discussion on the recommendations in the EIA Report (to discuss what the EIA Report needs to recommend).
5. Confirmation of the schedule
   To discuss the schedule until the end of March 2012 and the responsibility and tasks of each party.

The main points of the discussion and agreements reached during the meeting are as follows:

1 Confirmation of the information

- The EIA Team will request the Management Unit of the Nasiryah TPP to send the latest information on the social environment of Nasiryah City, and the Anbar University will update the "Chapter 5. Baseline data" of the EIA Report with the information.

2 Confirmation of the contents of the draft EIA Report

- Both parties have agreed the contents of the draft EIA Report dated 13 January 2012.

3 Verification between the assessment and the Project

- Because of the delay of the progress of the F/S, the detailed verification has not been conducted during the mission. The JICA Study Team is responsible for verifying the assessment by overviewing the Draft Final Report (DFR) of the F/S. The final verification will be conducted by both parties in the 4th Mission in February 2012.

M.A. Salih

4 Formulation of the DFR of the EIA Report

- The formulation of the DFR of the EIA Report has not been completed because of time constraints. Both parties have agreed the following tasks. The deadlines of each task are described in the attached schedule.

EIA Team (MOE)		JICA Study Team
MOE	Anbar University	
To collect more information on the current waste management of the Nasiryah TPP and to discuss the options of the solid waste management for the Project in MOE.	To finalize "4. Approach and methodology" and the social environment section in Nasiryah City of the "5. Baseline data". To conduct air emission simulation.	To finalize "7. Environmental impacts", "8. Environmental Management plan", "9. Consultation" and "10. Conclusions". To provide the Anbar University with the necessary information for the air emission simulation.

5 Confirmation of the schedule

- The schedule until the end of March 2012 has been discussed and the both parties have agreed on the attached schedule.

(End of the document)

The Schedul of the EIA Study from January to March 2012

Date			MOE	Anber Univ. (AU)	Study Team (ST)
January	30	Mon	Collect more information on the current waste management of the Nasiryah TPP. Discuss the options of the solid waste management for the Project in MOE.	Submit the DFR of "4. Approach and methodology" and the social environment section of the "5. Baseline data" to ST.	Provide the Anbar University with the necessary information for the air emission simulation.
	31	Tue		Start conducting the simulation on the air	
February	1	Wed			
	2	Thu			
	3	Fri			Prepare the DFR for the discussion at the 4th mission.
	4	Sat			
	5	Sun			
	6	Mon		Submit the result of the simulation to ST.	
	7	Tue			
	8	Wed			
	9	Thu	4th mission: Discussion on the DFR of the EIA Report.		
	10	Fri	4th mission: Discussion on the DFR of the EIA Report.		
	11	Sat	4th mission: Discussion on the DFR of the EIA Report.		
	12	Sun	4th mission: Discussion on the DFR of the EIA Report.		
	13	Mon	4th mission: Discussion on the DFR of the EIA Report.		
	14	Tue			
	15	Wed	2nd Stakeholders meeting (tentative)		
	16	Thu			
	17	Fri			
	18	Sat			
	19	Sun		Submit the informaiton on the 2nd Stakeholders meeting to ST.	
	20	Mon			
	21	Tue			
	22	Wed			
	23	Thu			
	24	Fri			Finalize the EIA Report and send it to MOE and AU.
	25	Sat		Final confirmation of the EIA Report.	
	26	Sun		Final confirmation of the EIA Report.	
	27	Mon		Final confirmation of the EIA Report.	
	28	Tue		Final confirmation of the EIA Report.	
	29	Wed		Submit the Final Report to MOE	
March	1	Thu	Final confirmation within MOE		
	|	|			
	19	Mon			
	20	Tue	Submit the EIA Report to MOEN		

M.A. Salih

Attachment - 1.6 Minutes of Meeting (4th Mission)

MINUTES OF MEETING
OF
THE 4TH MISSION OF THE
PREPARATORY STUDY FOR DEVELOPMENT OF SOUTHERN LARGE SCALE
THERMAL POWER PLANT IN IRAQ

AGREED UPON BETWEEN
MINISTRY OF ELECTRICITY
AND
THE STUDY TEAM OF
JAPAN INTERNATIONAL COOPERATION AGENCY

ISTANBUL, 9TH-13TH FEBRUARY 2012

MINISTRY OF ELECTRICITY

Adel H. MAHDI
Minister Advisor
Ministry of Electricity
Baghdad – Iraq

THE JICA STUDY TEAM

Feb 13, 2012

Hideki YUKIMURA
Team Leader
JICA Study Team

JICA Study Team has been conducting the Preparatory Study for Development of Southern Large Scale Thermal Power Plant (referred to as the Study), and received the Ministry of Electricity (MOE) Team in Istanbul, Turkey, to further discuss and agree on the outcomes of the Study.

I. Introductory Meeting

The JICA Study Team inaugurated the meeting and welcomed Ministry of Electricity (MOE) Team led by Mr. Adel H. MAHDI.
Mr. Adel H. MAHDI has conveyed the Minister willingness for implementation of this project as it will support electricity sector at the Southern part of Iraq.

The JICA Study Team presented the following items.

1. JICA Study Team understanding of Hydrological and Meteorological Issues
2. Water Intake and Waste Water Discharge to Euphrates River
3. Facilities Design
   - 3.1 Overall Power Plant Design
   - 3.2 Cooling System Comparison
   - 3.3 Interface between GE Facility and JICA facility
   - 3.4 Instrumentation System
   - 3.5 Embankment Works
4. Project Cost
5. Operation and Maintenance
6. Economic and Financial Analysis
7. Environmental and Social Considerations

II. The outcome of main points of discussion and agreements

1. JICA Study Team understanding of Hydrological and Meteorological issues (Attachment – 1)

1.1 JICA Study Team expressed its concerns about steam turbine condenser cooling issues, such as remarkable decline of Euphrates river discharge, waste water treatment and disposal, and condenser vacuum problem by high ambient temperature in summer. In this regard, JICA Study Team suggested MOE Team apply a cooling option based on the design philosophy of least water consumption.

1.2 MOE Team shared the same concerns as above and therefore agreed upon application of the design philosophy presented by JICA Study Team.

2. Water Intake and Waste Water Discharge to Euphrates River

2.1 In response to JICA Study Team's request, MOE Team provided the information on Euphrates river water use and waste water disposal at the existing Nasiryah power plants. The main points are as follows:

- The highest salinity level of Euphrates river was recorded at 9,000 ppm at Nasiryah site in the summer of 2009 due to low flow level.
- At the existing Nasiryah power plants, each steam turbine condenser has stopped operation at least once three weeks for the cleaning purpose. Suspended solid such as mud is plugged the condenser tubes and therefore periodically removed. The removed mud is recycled as a gardening material.
- Nasiryah power plant has a plan to derive fresh water at the amount of 0.5m3/sec from Tigris River because its water quality is better than Euphrates. In fact, the plan has been approved by the irrigation authority. But it is not allowable to increase the authorized volume of water intake from Tigris for Nasiryah II project because the flow rate of Tigris River is also gradually declined. In addition, the provincial stakeholders along Tigris River probably oppose further river water diversion.
- MOE has participated in the committee of national water resource development strategy managed by Ministry of Water Resources. The first preliminary report will be issued in March. In the next meeting MOE intends to raise the actual figure of river water demand for all the thermal power projects planned over the country.
- There is an Iraqi national standard regarding waste water discharge. The standard was shared between two parties for the environmental consideration .

3. Facilities Design (Attachment 2)

3.1 Overall Power Plant Design **(Attachment No. 2.1)**

Conceptual design of the combined cycle power plant configuration is presented focusing mostly on what has been changed from the 3rd mission in Amman last year.

Overall schematic diagrams, plot plans and water balance diagrams are presented for 2 (two) alternative cases of steam turbine condenser cooling methods of wet cooling towers and air cooled condensers with water spray cooling (the hybrid

ACC).

The large capacity river water pre-treatment and desalination system is understood necessary in response to ongoing degradation of Euphrates river water quality.

MOE team implies that the reduction may become acceptable for emergency fuel (diesel oil) storage in site to a couple of days from the current 15 days depending on improved reliabilities of main fuel (natural gas) supply.

In accordance with the following comparison and discussion over the steam turbine condenser cooling options, the hybrid ACC case is agreed as the design applicable to Nasiryah II combined cycle power plant because mainly of the least water consumption with minimal impact to the plant performance.

3.2 Cooling System Comparison

A comparison study is explained in details for 2 (two) alternative cases of steam turbine condenser cooling methods.

3.3 Interface between Nasiryah I (GE) and Nasiryah II (JICA)

MOE Team explained the interface between Nasiryah I (GE) and Nasiryah II (JICA) in the Nasiryah I gas power station.

A) Single Line Diagram

Attachment-2.2 is the Single Line Diagram for Nasiryah I provided by MOE and Attachment-2.3 is the Single Line Diagram provided by JICA Study Team. Feeder connection of the diameters is typical only as JICA Study Team suggested such philosophy that one busbar is for generator connection and the other is for transmission lines. It shall be developed and concluded at the detail design of the Nasiryah I power station.

B) Plant Layout and Cable Routing

Attachment-2.4 is JICA Study Team mark-up of the Nasiryah I power station layout, DWG No. 143E9054_01_RevG, on which JICA Study Team suggested as follows by a mail on Jan-28-2012;-

1) JICA-GIS to be at the East of GE. 400kV GIS
2) Total six (6) 400kV OHLs to be provided from the GIS building. Four (4) from Nasiryah I and two (2) including one (1) spare from Nasiryah II GIS.
   The Rev.G layout shows those OHL gantries appropriately.

3) The best location for the 400kV/132kV Auto Transformer to be between the two GISs as shown on the Nasiryah I Conceptual Layout Rev. G.

4) The 400kV cable from 400kV GIS to the Auto Transformers to be routed at the North of the GIS building.

   As the two (2) Auto Transformers are located side by side without the space of 400kV OHL gantry on the Rev. G layout, it is considered the connection from 400kV GIS to the Auto Transformer to be by cable instead of OHL in the GE's design.

5) The 400kV cables from Nasiryah II generators should be routed from the South to the GIS building. Space between 400kV OHL gantry and 132kV OHL gantry should be sufficient (20m typical) to route the 400kV cables from Nasiryah II.

6) The 400kV Cables to be installed on cable ladder tray in concrete cable trench, as a typical installation method and preference may be specified in the tender document by MOE.

   Attachment-2.5 is the Cable Routing drawing which shows the right of way for the 400kV Cable Trench from Nasiryah II to Nasiryah I.

C) Cable Connection

MOE stated that oil-to-air bushing connection at the Generator Step-Up Transformer (GSUT) is preferable based on the experiences of existing substations, while JICA Study Team suggested the direct 400kV cable connection to the elephant style oil-to-cable bushing. It will be further investigated and specified in the tender document by MOE.

400kV cables shall be directly connected to the 400kV GIS via gas-to-cable bushing.

MOE express a concern on the charging current of the 400kV cable of more than 2000m, and JICA Study Team explained that the careful design of circuit breaker current rating and relay coordination is required.

3.4 Instrumentation System

An instrumentation system in facility design was explained with the plant control system configuration including the related control and field instruments per areas i.e. control room, rack room and field (Attachment No.2.6). Because the provided drawing represents the overall concept of instrumentation system, JICA Study Team explained that any specific requirement on instrumentation system will be included by MOE after this preparatory study (ex. tender document preparation stage).

3.5 Embankment Works

MOE Team has provided JICA Study Team with information on the Borrow area which is located at approximately 12km north west of Nasiryah II site.

MOE will consider to carry out the land formation (preparation) work by its budget to keep the project schedule on time.

4. Project Cost (Attachment 3)

1) GT-Pro/PEACE based approaches of Nasiryah II combined cycle power plant cost estimation are presented.
2) GT-Pro/PEACE program estimated the reference EPC and Owner's costs of the specified combined cycle power plant configuration assuming the project site in the USA.
3) Factors applied to convert the reference costs to the estimated costs of the project in Iraq for equipment and materials, labors, securities and contingencies to compensate risks and uncertainties associated with the project operation in Iraq.
4) Major items out of GT-Pro/PEACE estimation are added.
5) The estimated costs are discussed and understood that the risks and uncertainties will be clarified and reasonably minimized in the tendering process to follow the feasibility study.

5. Operation and Maintenance (Attachment 4.1)

Power Plant operation & maintenance consideration are presented and explained to keep operation effective under appropriate indicators considering;

- Concept of Maintenance Management
- Types of Maintenance
- Basic Operation Maintenance concerning the Plant Operation
- Plant diagnosis, Maintenance Plan and Budget, and work preparation implementations based on P-D-C-A cycle.

In addition to the above, recommended power plant management organization is also presented.

O &M cost for the project is presented to be used for financial and economic analysis.

For maintaining the plant reliability and well performance, roll- in/ roll-out repair method, and Long Term Maintenance service method are introduced.

Special consideration to Iraq power sector reform is introduced to promote more effective organization to be established.

Simplified Generating cost for the project is presented and explained as shown in attachment no. **(Attachment 4.2)**

All these explanations and introductions concerning O&M considerations have been understood and agreed upon by MOE.

6. Financial and Economic Analysis (Attachment 5)

1) The result of financial and economic analysis of 5.8% as FIRR and of 24.4% as EIRR was presented to MOE although these figures might be adjusted further to keep consistency with other basic figures.
2) Methodology was briefly presented to calculate FIRR and EIRR. It was explained that FIRR was imaginarily calculated for reference with assumptions that the Project would supposedly be implemented as a financially independent project although in reality it would be difficult for MOE. Meanwhile, EIRR was calculated based on the benefits made by the Project for Iraq such as willingness to pay.
3) Assumptions and basis of the calculation of FIRR and EIRR and also the calculation table was presented to MOE.

7. Environmental and Social Considerations (Attachment 6)

JICA Study Team and MOE Team recognized that the EIA Study had been implemented smoothly, and understood that the EIA Report shall be finalized in close collaboration with the both parties, and the Anbar University according to the schedule as Attachment 7.

JICA Study Team requested MOE Team to hold the 2nd stakeholders meeting, and MOE Team accepted the request to hold the meeting on February 21st, 2012.

JICA Study Team requested the information on status of the waste water discharge (i.e. RO reject water) especially its amount (m3/s, or m3/h or m3/day) from other thermal power plants (TPPs) such as Hartha TPP , and the MOE Team agreed on sending the information by February 15th, 2012.

III. Next Step

a. Both parties have confirmed that there has been no significant obstruction in feasibility of Nasiryah II project under the scope of the JICA preparatory study.

b. MOE Team, JICA mission, and JICA Study Team confirmed remaining tasks up to the completion of JICA preparatory study and MOE's EIA study as shown in **Attachment 7.**
c. The JICA mission explained general procedures for formulating a new ODA project to be followed after the completion of the JICA preparatory study as shown in **Attachment 8.** JICA mission stated that, based on the result of the JICA preparatory study, JICA would proceed with further examinations on the possibility of financing the ODA loan project.
d. MOE Team expressed their willingness to implement the Project as soon as possible and expectation for JICA's continuing supports.

IV. Others

29 hectares of land has been dedicated by MOF in favor of the project. Furthermore, another 21 hectares of land is in process of dedication to MOE for the Project. And MOE will inform JICA Study Team officially by mid of March, 2012.

Attachment 1

4th Mission

JICA Team Understandings of Hydrological and Meteorological Issues

February 2012

Preface

- Options for steam turbine condenser cooling
  - Wet Cooling Tower (Typical) selected
  - Air Cooled Condenser (ACC)
  - HELLER
- Application for water allocation permit
- Rehabilitation project of cooling water facilities of Nasiryah TPP

A

Facts concerning Cooling Option

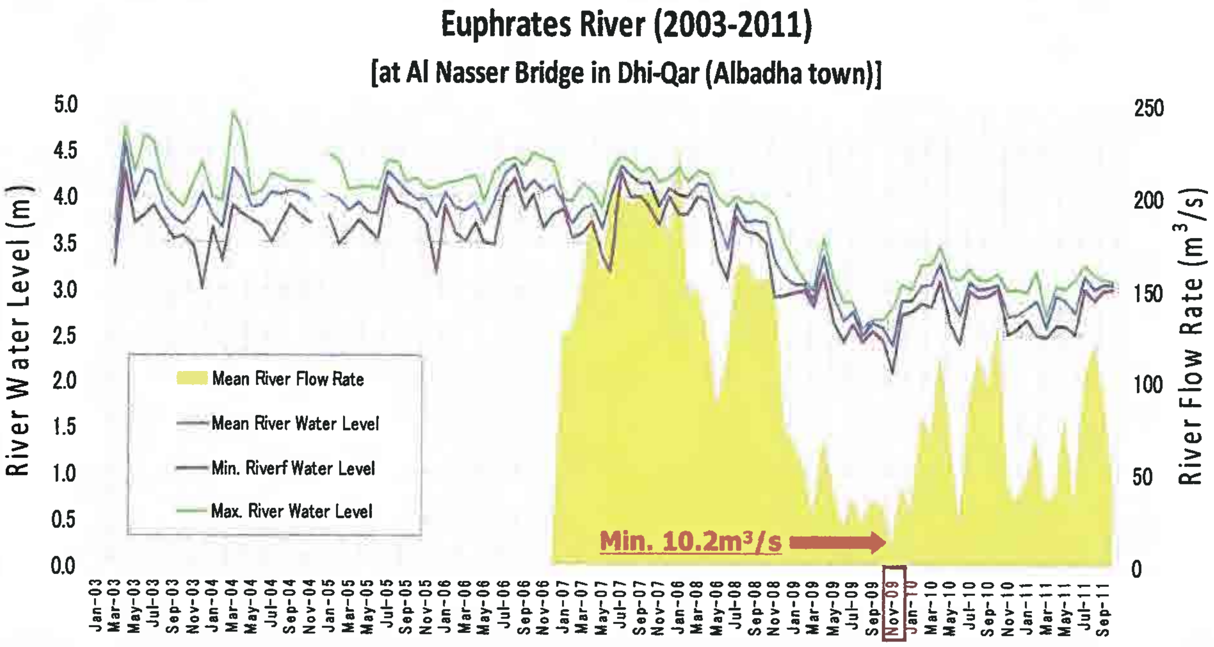
For Wet Cooling Tower,

- Remarkable decline of Euphrates River discharge
- Waste disposal plan of reject water from RO plant (river water pretreatment)

For ACC,

- Condenser vacuum problem by High ambient temperature in Summer

Euphrates River Water Monitoring



- Wet Cooling Tower requires 0.9m3/sec (nearly 10% of Min. flow rate)

Euphrates River Monitoring Point

Implication from MOWR's Water Resource Development Strategies

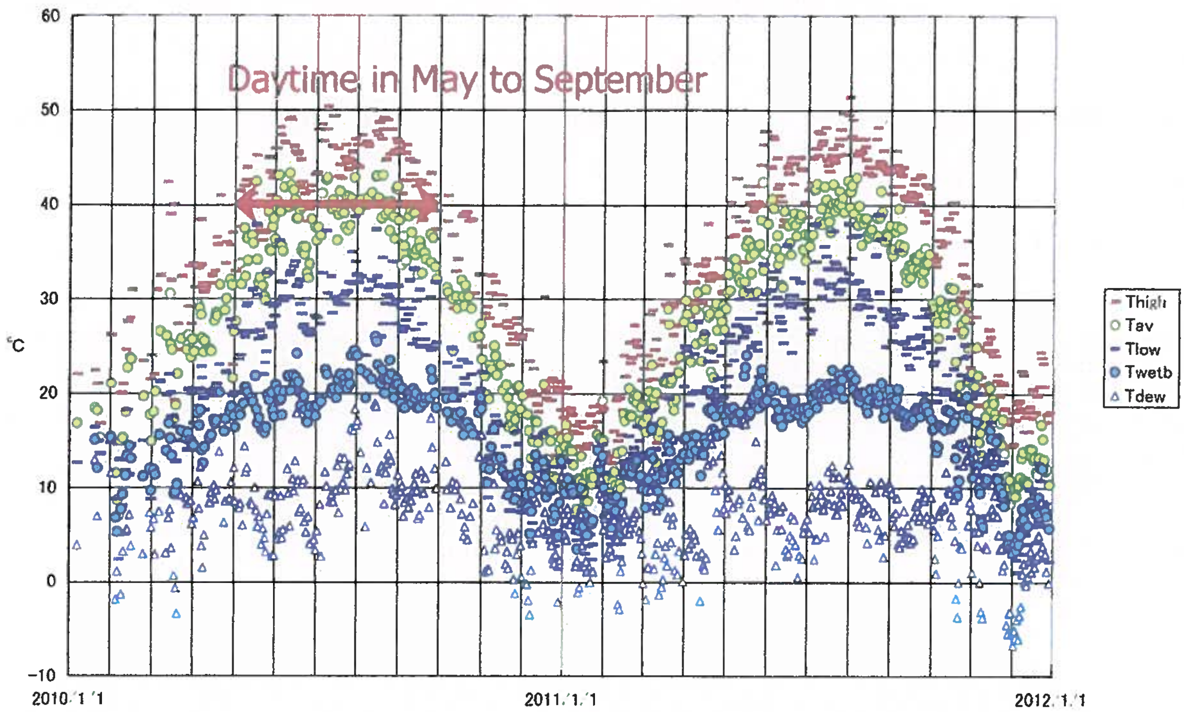
- The strategy paper was issued by Ministry of Water Resource in 2008 as a five-year plan from 2010 to 2014.

- Remarkable decline of Euphrates and Tigris river discharges did occur and is further expected in light of the multi-purpose water use. >>> Countrywide comprehensive strategy to be needed

Annual River Inflow Average at the borders	Until 1989	1990-2005	Until 2014 (Planned)
Euphrates River	27.4 BCM	17.4 BCM	8.5 BCM
Tigris River	-	19.4 BCM	9.2 BCM

- The deterioration of river water quality is expected due to continuing to discharge drainage water. The outfall drain projects are planned to convert the drainage water directly to the Gulf. >>> Waste water disposal to be more strictly regulated

Ambient Temperature Record



◆ For ACC, over 40 degree Celsius makes trouble to condenser vacuum.

Ambient Temperature Measuring Point

Pending Issues

For facility design and environmental considerations, you need to consider,

- Reducing volume requirement of river water, >>>How much water can you take?
- Planning appropriate waste treatment and disposal, >>>How to dispose waste water? (How much RO reject water can you discharge to the river?)
- Extremely high ambient temperature.
  >>>What cooling option is effective?

Thank you.

Attachment 2-1

3. Facilities Design

What has been changed
from the 3rd Mission

(1) Facilities Overall Configuration

Major Changes from the 3rd Mission

Power Block	Balance of Plant
• GT Exhaust Bypass (stack and damper) • ST Condenser Cooling (CTorACC)	• River Water Intake • Pre-Treatment and Desalination • Aux. Cooling (Fin-Fan Cooler for ACC) • 400kV Cable Trench

Ref. Overall Schematic Diagrams

(2) Plot Plan

Major Changes from the 3rd Mission

Power Block

- GT Exhaust Bypass (stack and damper)
- ST Condenser Cooling (CTorACC)

Balance of Plant

- River Water Intake
- Pre-Treatment and Desalination
- Aux. Cooling (Fin-Fan Cooler for ACC)

Ref. Plot Plans

(3) Water Balance

Major Changes from the 3rd Mission

Raw Water Treatment

- Settling Separation
- Pre-Filter (Sand Filter, DAF, etc.)
- Desalination
- Waste Water from Pre-Treatment

Water User

- ACC Hybrid Cooling Spray
- No Blow-down for ACC

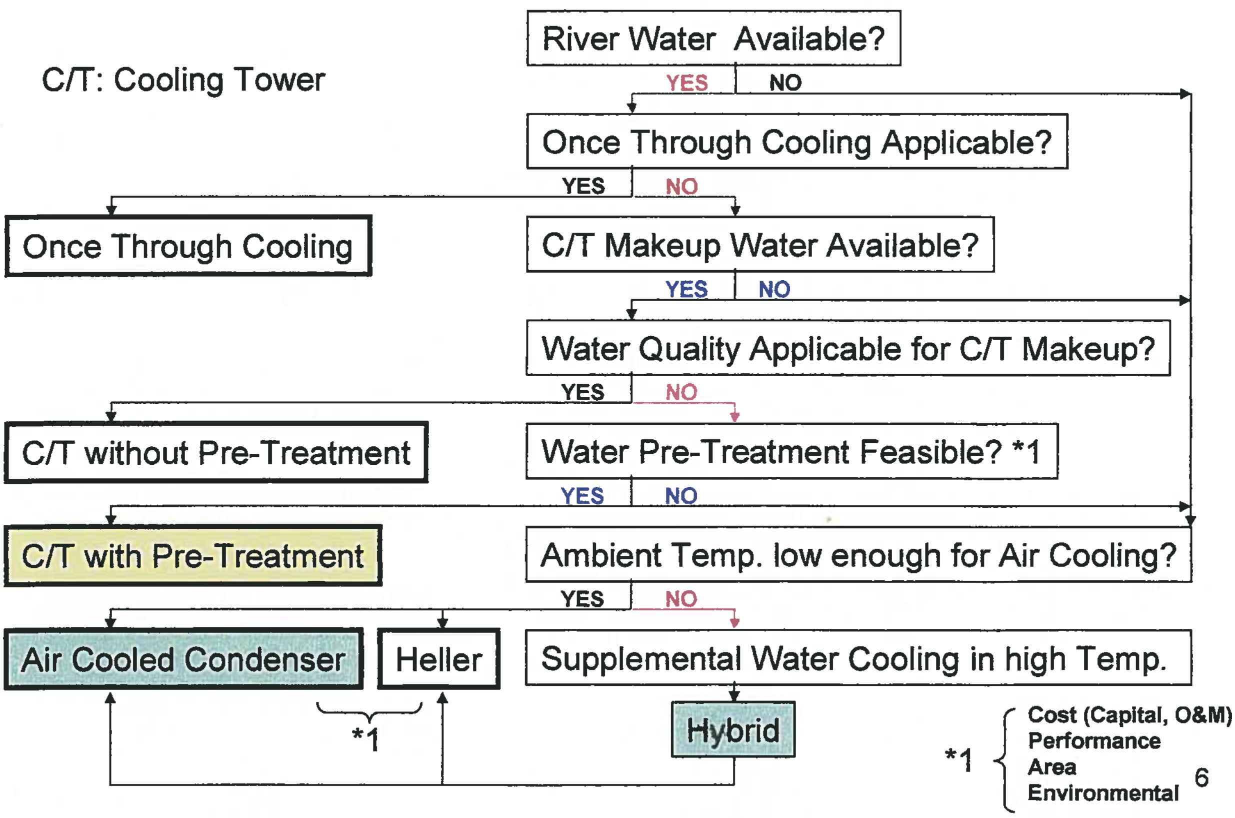
Ref. Water Balance Diagrams

(4) Major Options (Water Issue)

Alternative Options for Steam Turbine Condenser Cooling Methods

Cooling Tower	Air Cooled Condenser
• Evaporative Cooling	• Air Heat Exchanger
• Forced Draft	• Forced Draft
• Indirect Cooling	• Direct Cooling
• Circulating Water	• Water Spray (Hybrid option)
• Surface Condenser	

Steam Turbine Condenser Cooling Options



Conceptual Volumetric Evaluation of STG Cooling Water

(300MWe STG with 35% Efficiency as the evaluation basis)

Circulating Water

Thermal Loads to Condenser
300 / 0.35 - 300 = 560MWth = 560MJ/s

Specific Energy of Water
~ 4.2MJ/ton/degC

Circulating Water Required
560 / 4.2 = 130ton·degC/s

ΔT = 7degC
130 / 7 x 3600 = 67,000ton/h

ΔT = 10degC
130 / 10 x 3600 = 47,000ton/h

Cooling Tower Makeup Water

Thermal Loads to Condenser
300 / 0.35 - 300 = 560MWth = 560MJ/s

Thermal Energy for Water Evaporation
~ 2.4MJ/kg

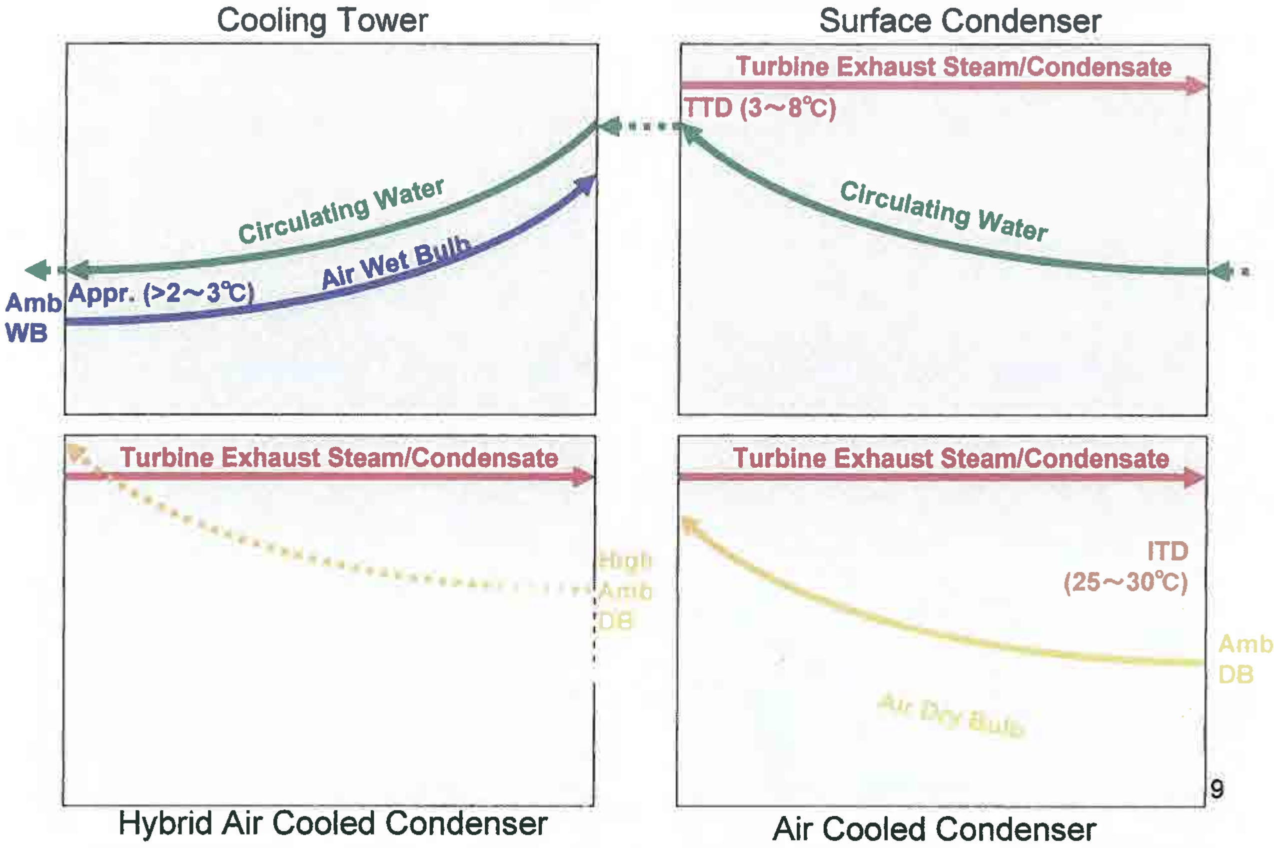
Evaporation Required for Cooling
560 / 2.4 = 230kg/s = 840ton/h = E

M: makeup, B: blowdown, C: concentration
M = E + B, M = C x B
B = E / (C – 1)
M = E x C / (C – 1)
where C ~ 5
M = 840 x 5 / 4 = 1,050ton/h

Cooling Tower Makeup Water Quality Guideline

ITEM	EFFECTs	Limits in Circ. Water
Calsium Hardness	Scaling	<120ppm as $CaCO_3$
COD, BOD	Slime	<20ppm
TDS	Corrosion	<3,000ppm
SS	Fouling	<10ppm
Conductivity	Corrosion	<4,000 μ V/cm

ST Condenser Cooling Heat Exchanging Scheme



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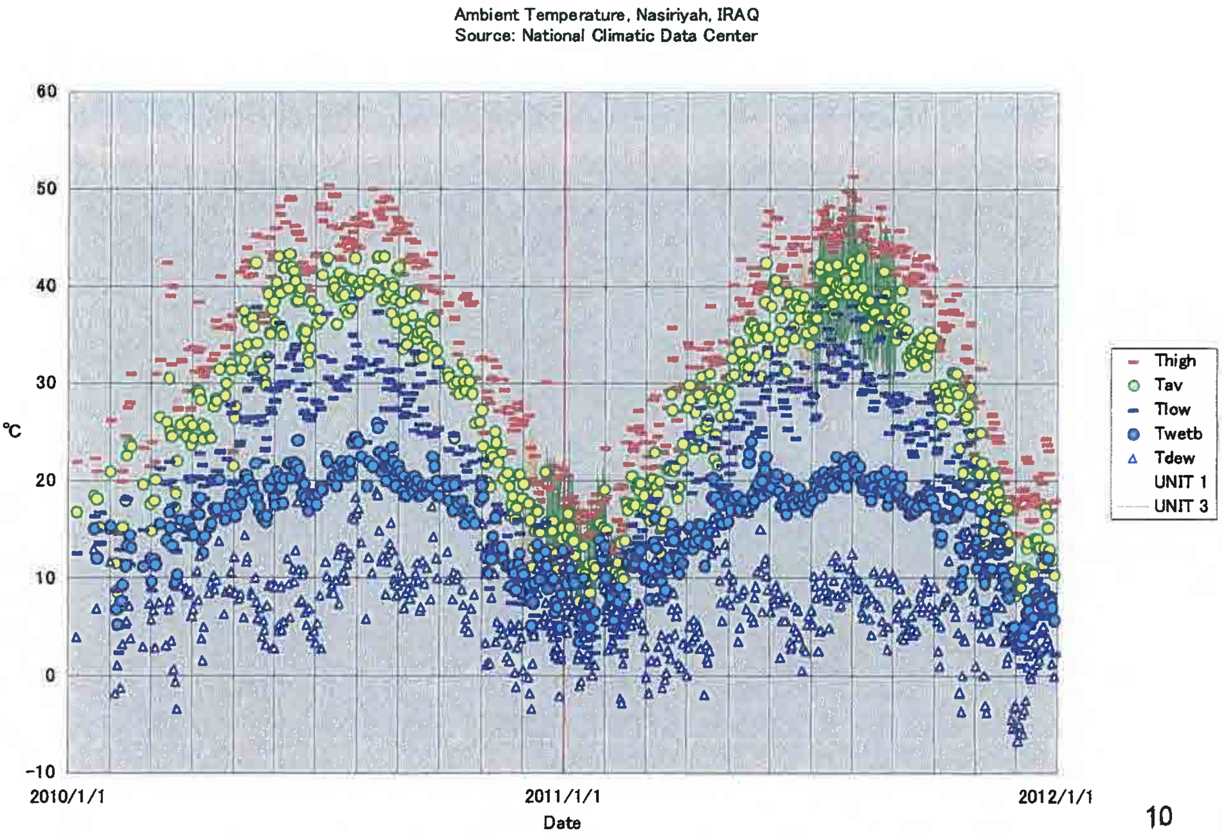
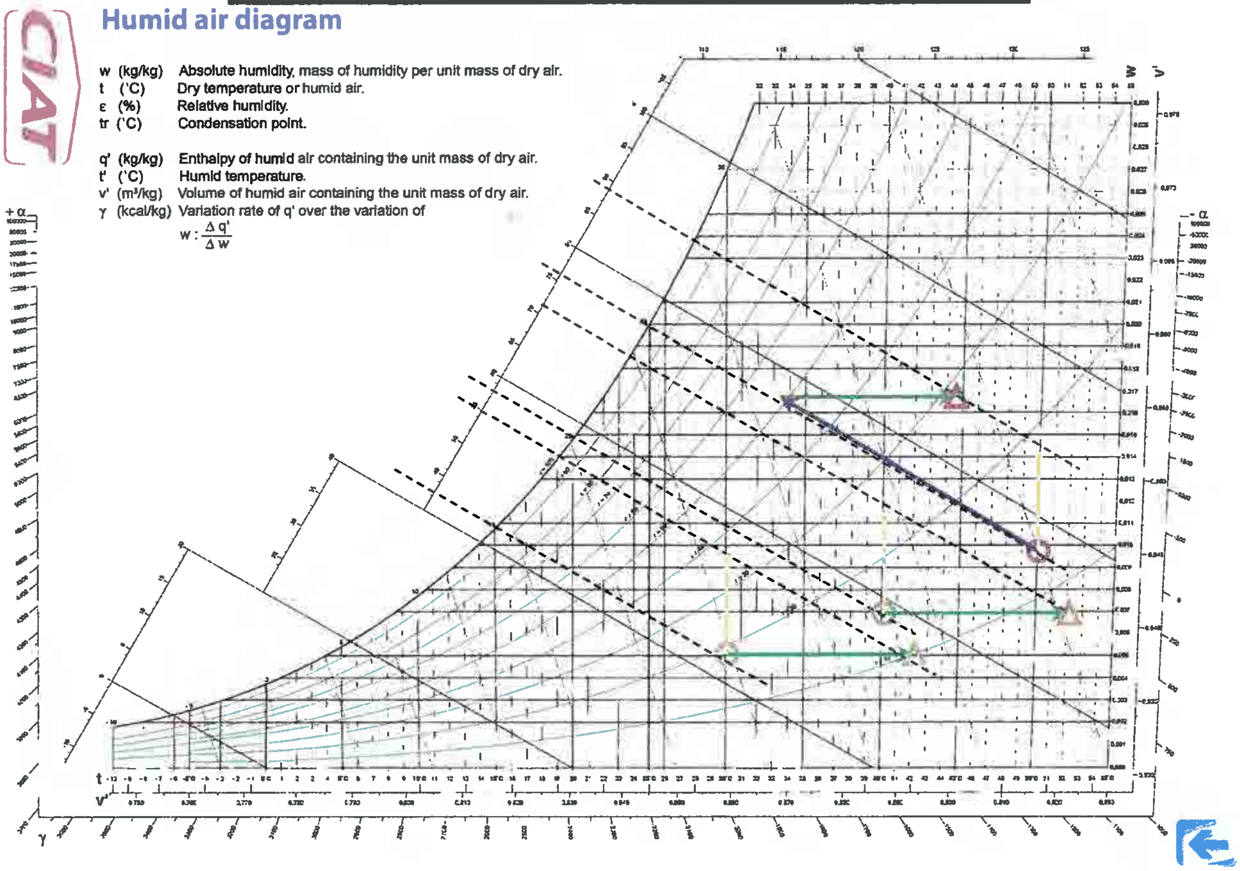
Nasiriyah Climatic Data for 2010-2011



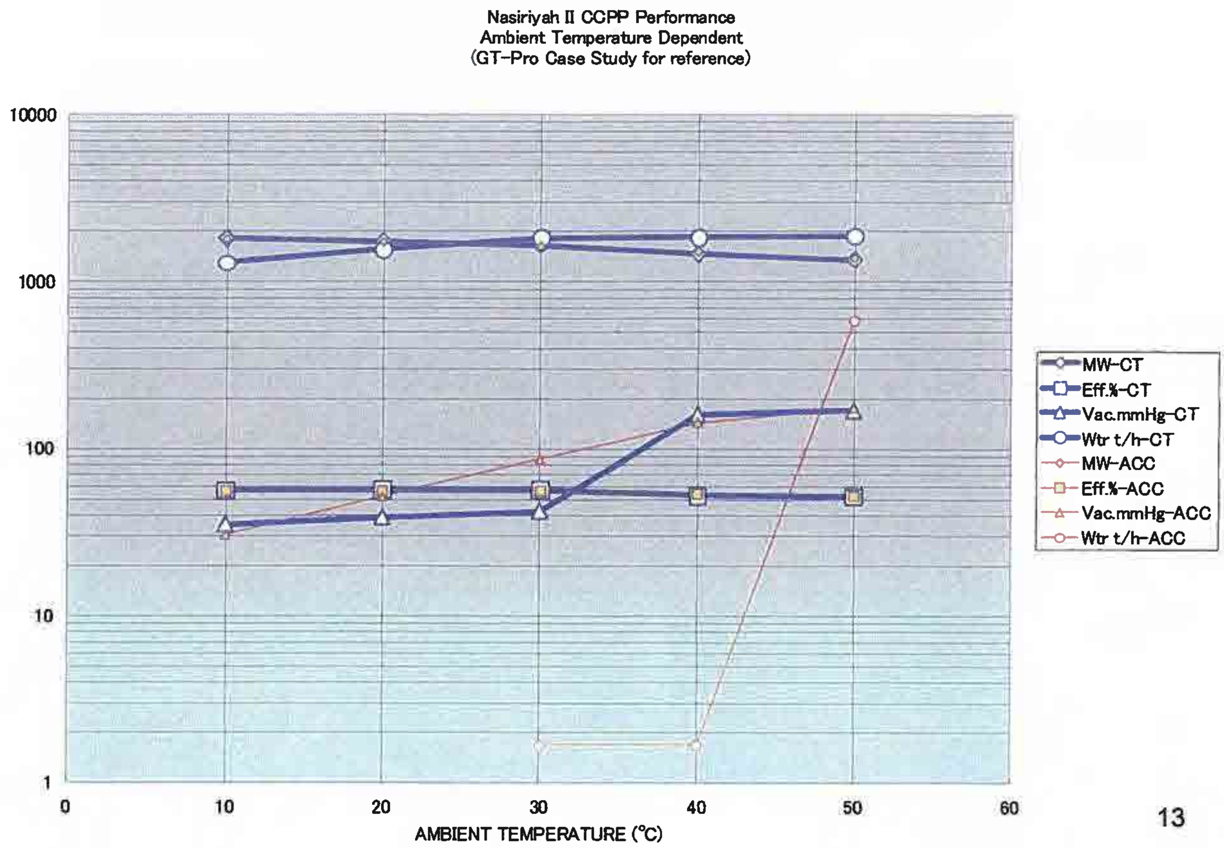
CT and ACC on the Humid Air Diagram

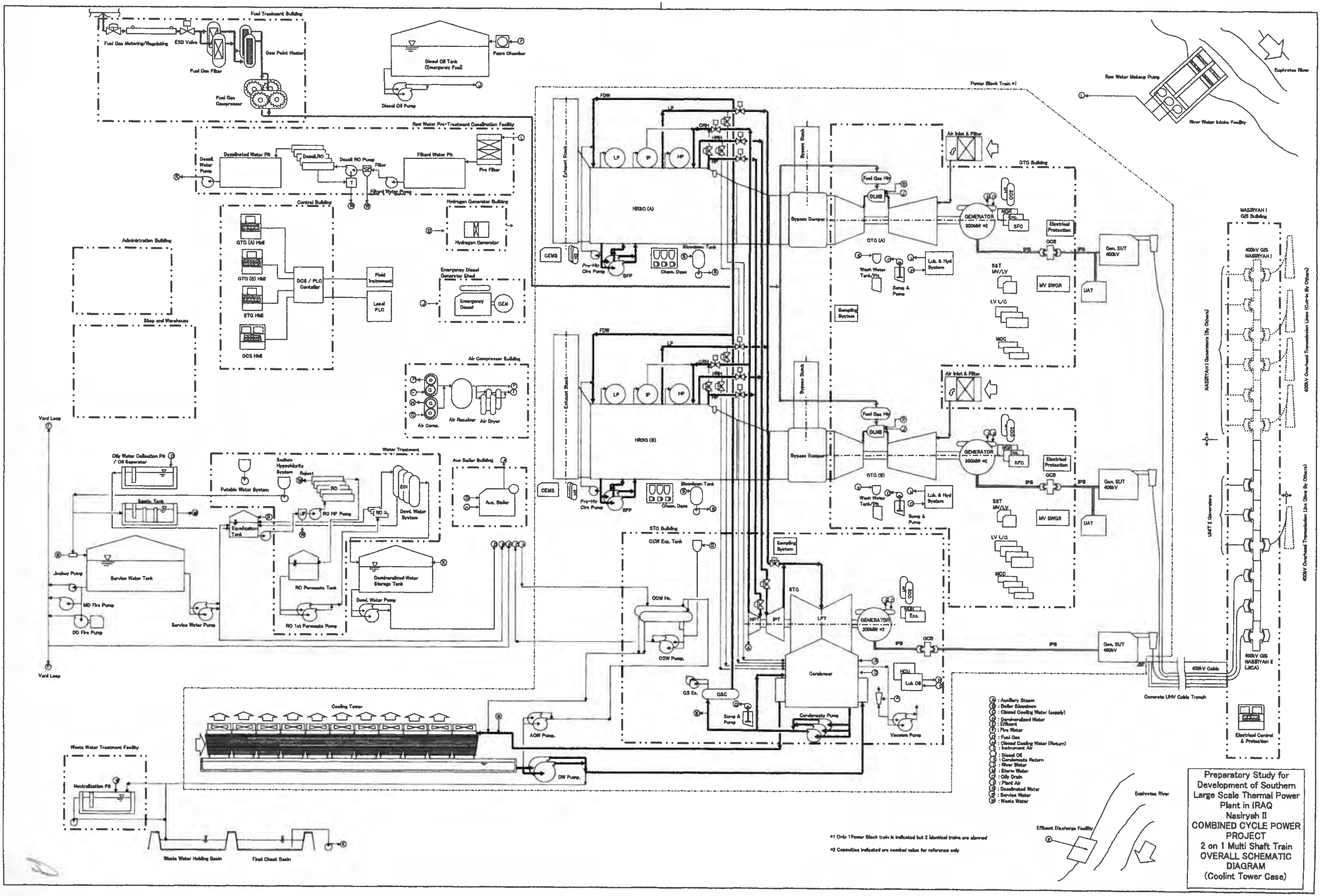


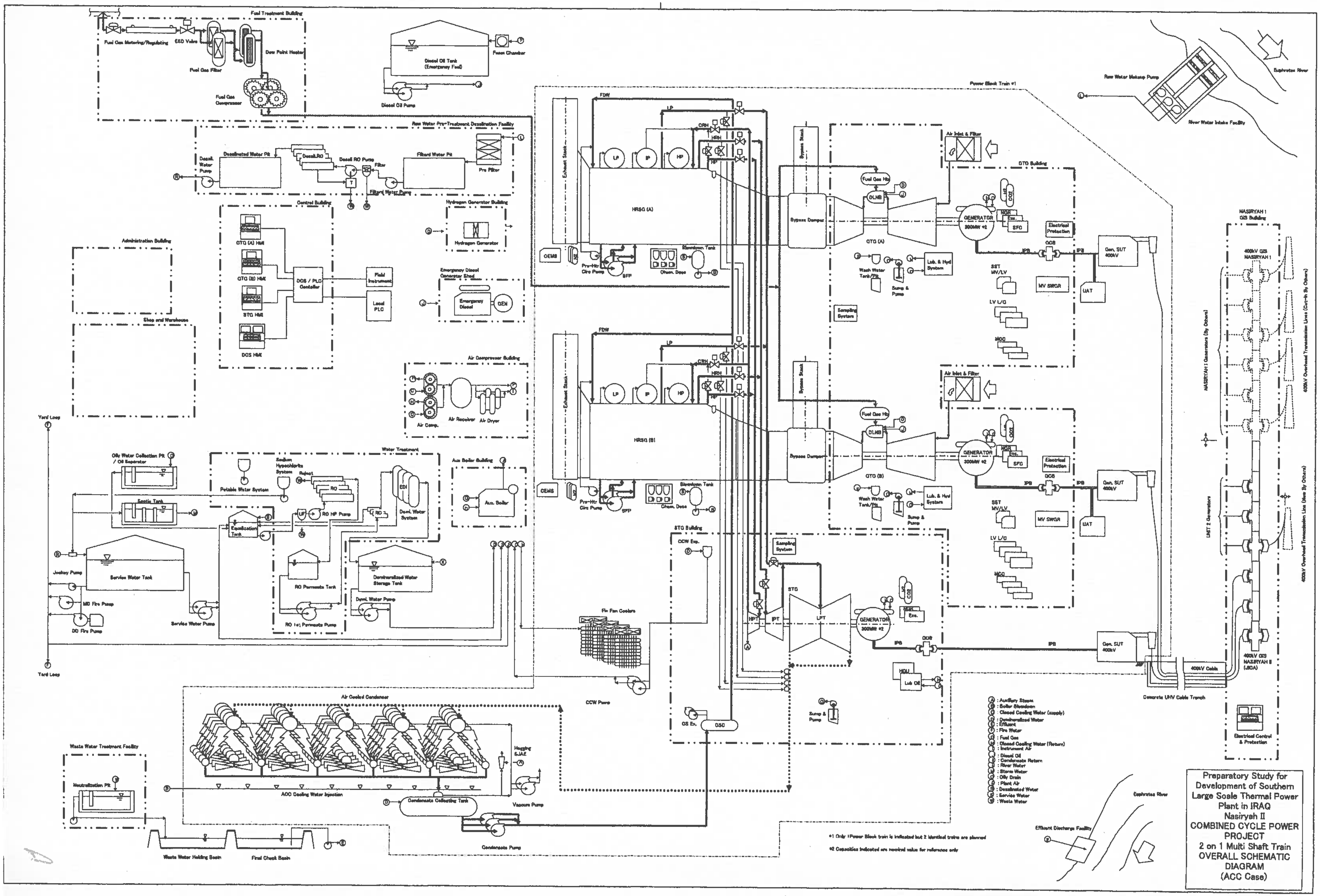
Combined Cycle Performance Summary

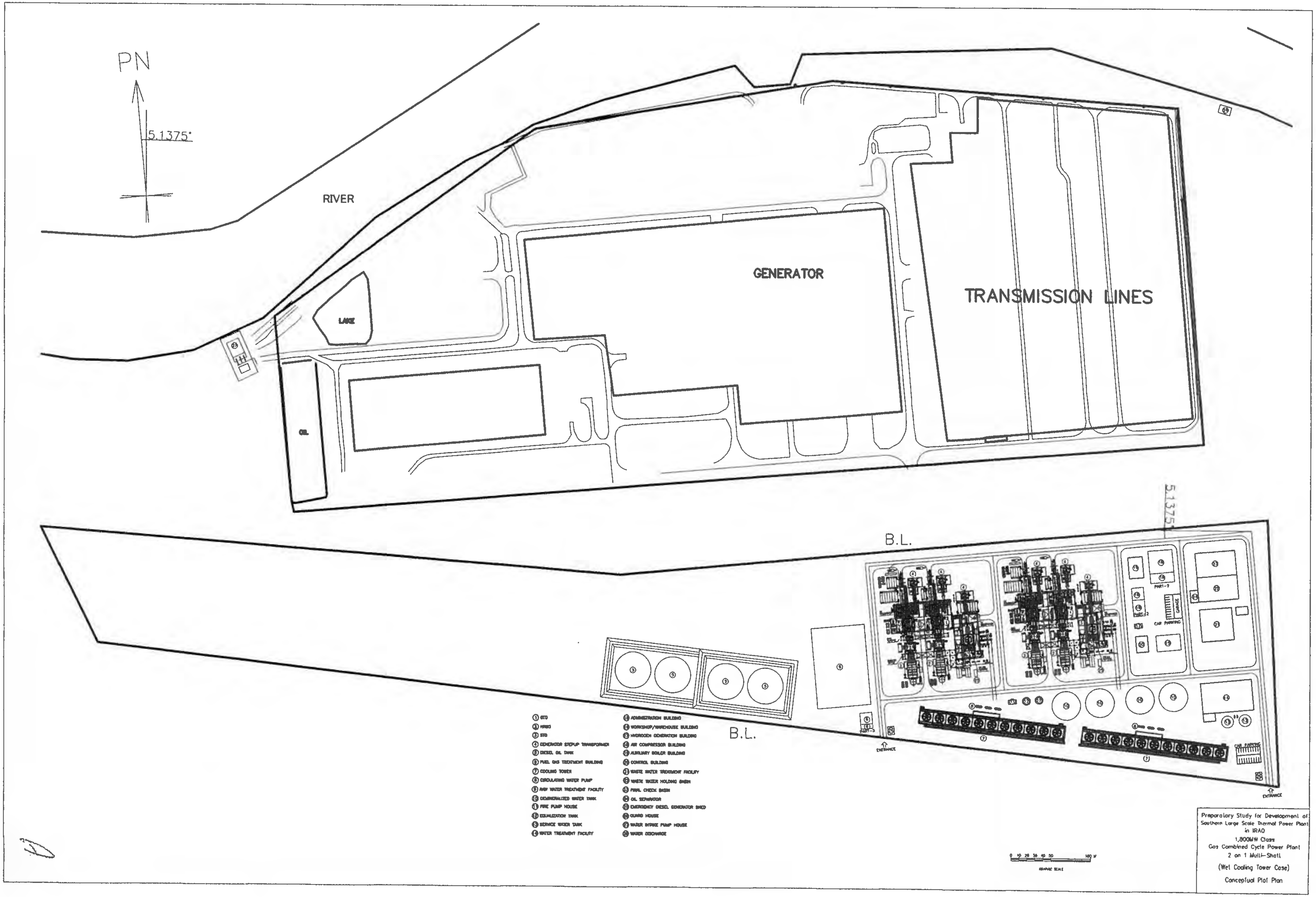
		Cooling Tower			Air Cooled Condenser (Hybrid)		
Amb. Temp	°C	10	30	50	10	30	50
Gross Output	MW	1880.9	1725.8	1411.3	1865.6	1688.5	1435.3
Gross Efficiency	%	58.8	59.0	54.0	58.3	57.8	55.0
Aux. Power	MW	57.9	58.7	51.6	57.6	55.1	54.3
Net Output	MW	1823.0	1667.1	1359.7	1807.8	1633.4	1381.0
Net Efficiency	%	56.9	57.0	52.1	56.5	55.9	52.9
Cooling Water Consumption	t/h	1310.0	1830.3	1885.6	0.0	0.0	590.8
Cooling Fan Power	MW	4.8	4.7	0.5	11.6	11.6	11.6
CWP Power	MW	6.8	6.8	6.8	0.0	0.0	0.0
Desali. Water Production	t/h	1200.0	2400.0	2400.0	400.0	400.0	1200.0
Desalination Power	MW	3.0	6.0	6.0	1.0	1.0	3.1

Temperature – Performance Curves

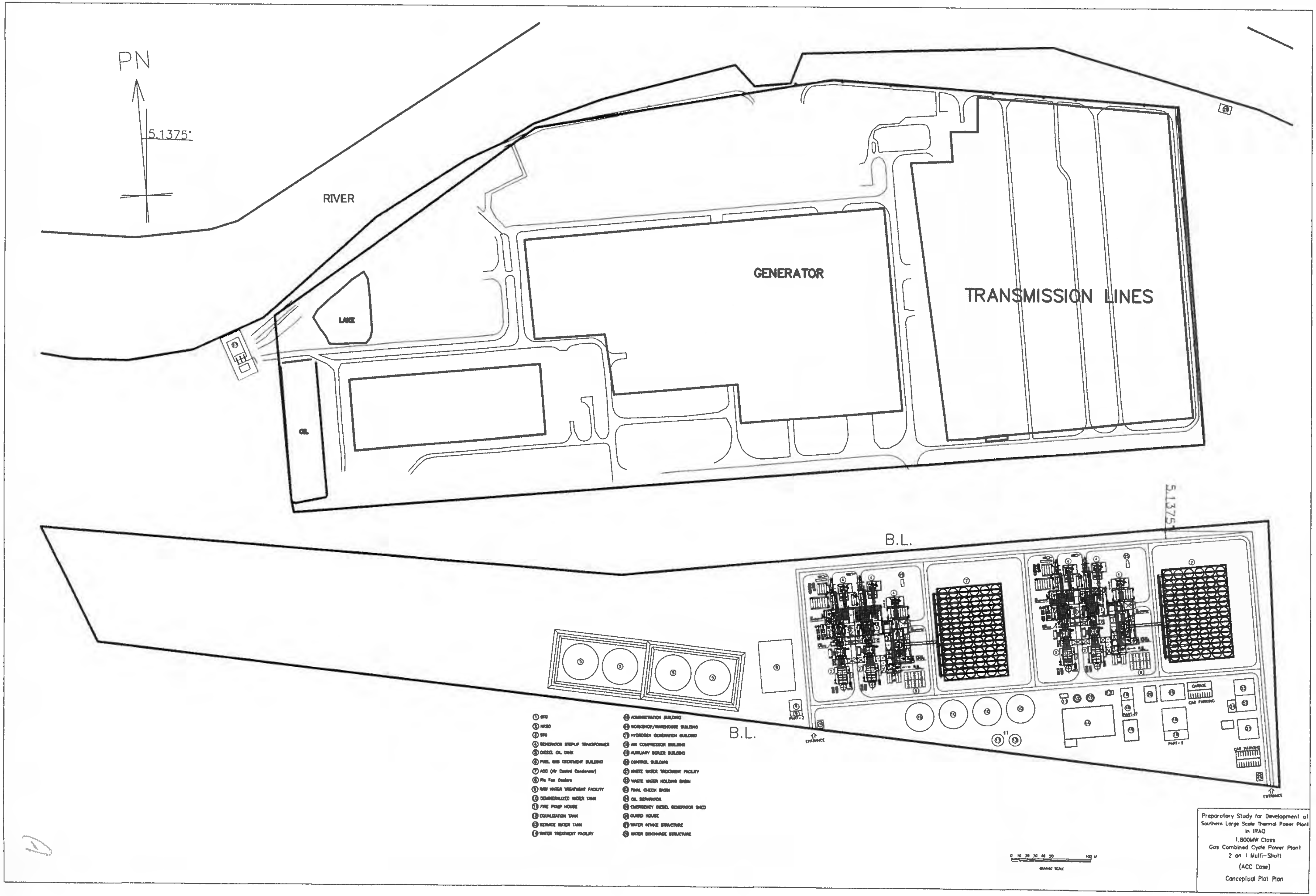


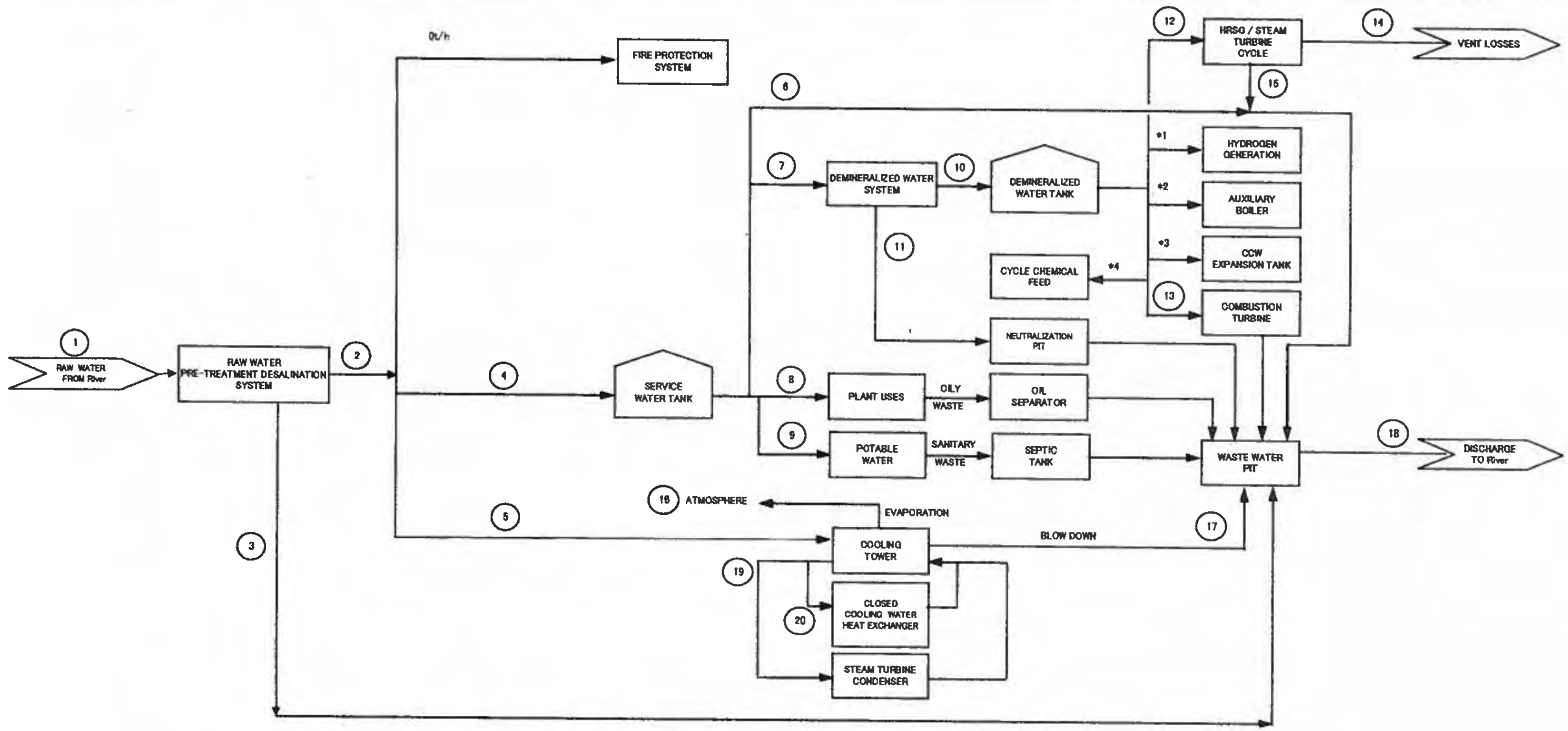

Preparatory Study for Development of Southern Large Scale Thermal Power Plant in IRAQ
Nasiryah II
COMBINED CYCLE POWER PROJECT
2 on 1 Multi Shaft Train
OVERALL SCHEMATIC DIAGRAM
(Coolint Tower Case)
*1 Only 1 Power Block train is indicated but 2 identical trains are planned
*2 Capacities indicated are nominal value for reference only
A : Auxiliary Steam
B : Boiler Blowdown
C : Closed Cooling Water (supply)
D : Demineralized Water
E : Effluent
F : Fire Water
G : Fuel Gas
H : Closed Cooling Water (Return)
I : Instrument Air
J : Diesel Oil
K : Condensate Return
L : River Water
M : Storm Water
N : Oily Drain
O : Plant Air
P : Desalinated Water
Q : Service Water
R : Waste Water
Fuel Treatment Building
Fuel Gas Metering/Regulating
ESD Valve
Fuel Gas Filter
Dew Point Heater
Fuel Gas Compressor
Diesel Oil Tank (Emergency Fuel)
Foam Chamber
Diesel Oil Pump
Raw Water Pre-Treatment Desalination Facility
Desalinated Water Pit
Filtered Water Pit
Pre Filter
Desali RO Pump
Filtered Water Pump
Control Building
GTG (A) HMI
GTG (B) HMI
STG HMI
DCS HMI
DCS / PLC Contoller
Field Instrument
Local PLC
Hydrogen Generator Building
Hydrogen Generator
Emergency Diesel Generator Shed
Emergency Diesel
Administration Building
Shop and Warehouse
Air Compressor Building
Air Comp.
Air Receiver
Air Dryer
Water Treatment
Potable Water System
Sodium Hypochlorite System
RO HP Pump
Demi. Water System
RO Permeate Tank
RO 1st Permeate Pump
Demineralized Water Storage Tank
Demi. Water Pump
Aux Boiler Building
Aux. Boiler
Oily Water Collection Pit / Oil Separator
Septic Tank
Equalization Tank
Service Water Tank
Jockey Pump
MD Fire Pump
DD Fire Pump
Service Water Pump
Yard Loop
Power Block Train #1
Exhaust Stack
HRSG (A)
HRSG (B)
CEMS
Pre-Htr Circ Pump
BFP
Chem. Dose
Blowdown Tank
FDW
Bypass Stack
Bypass Damper
Fuel Gas Htr
GTG (A)
GTG (B)
GTG Building
Air Inlet & Filter
GENERATOR 300MW *2
SFC
Electrical Protection
GCB
IPS
Wash Water Tank/Pit
Lub. & Hyd System
Sump & Pump
SST MV/LV
MV SWGR
LV L/C
MCC
UAT
Gen. SUT 400kV
Sampling System
STG Building
CCW Exp. Tank
CCW Hx.
CCW Pump.
STG
IPT
LPT
Condenser
Condensate Pump
Vacuum Pump
Lub Oil
GS Ex.
Cooling Tower
ACW Pump.
CW Pump.
Waste Water Treatment Facility
Neutralization Pit
Waste Water Holding Basin
Final Check Basin
Raw Water Makeup Pump
River Water Intake Facility
Euphrates River
Effluent Discharge Facility
NASIRYAH I GIS Building
400kV GIS NASIRYAH I
NASIRYAH I Generators (By Others)
400kV Overhead Transmission Lines (Cut-in By Others)
UNIT II Generators
400kV Overhead Transmission Line (Line By Others)
400kV GIS NASIRYAH II (JICA)
400kV Cable
Concrete UHV Cable Trench
Electrical Control & Protection
2012/1/20 Rev.00


Preparatory Study for
Development of Southern
Large Scale Thermal Power
Plant in IRAQ
Nasiryah II
COMBINED CYCLE POWER
PROJECT
2 on 1 Multi Shaft Train
OVERALL SCHEMATIC
DIAGRAM
(ACC Case)
Fuel Treatment Building
Fuel Gas Metering/Regulating
ESD Valve
Fuel Gas Filter
Dew Point Heater
Fuel Gas Compressor
Diesel Oil Tank (Emergency Fuel)
Foam Chamber
Diesel Oil Pump
Raw Water Pre-Treatment Desalination Facility
Desalinated Water Pit
Desal. RO
Desal RO Pump
Filtered Water Pit
Pre Filter
Filtered Water Pump
Control Building
Hydrogen Generator Building
Hydrogen Generator
Administration Building
Shop and Warehouse
GTG (A) HMI
GTG (B) HMI
STG HMI
DCS HMI
DCS / PLC Controller
Field Instrument
Local PLC
Emergency Diesel Generator Shed
Emergency Diesel
GEN
Air Compressor Building
Air Comp.
Air Receiver
Air Dryer
Water Treatment
Potable Water System
Sodium Hypochlorite System
RO
RO HP Pump
EDI
Demi. Water System
Equalization Tank
RO Permeate Tank
RO 1st Permeate Pump
Demineralized Water Storage Tank
Demi. Water Pump
Aux Boiler Building
Aux. Boiler
Oily Water Collection Pit / Oil Separator
Septic Tank
Service Water Tank
Jockey Pump
MD Fire Pump
DD Fire Pump
Service Water Pump
Yard Loop
Power Block Train #1
Exhaust Stack
FDW
LP
IP
HP
CRH
HRH
HRSG (A)
HRSG (B)
CEMS
Pre-Htr Circ Pump
BFP
Chem. Dose
Blowdown Tank
Bypass Stack
Bypass Damper
Fuel Gas Htr
DLNB
GTG (A)
GTG (B)
GTG Building
Air Inlet & Filter
GENERATOR 300MW *2
SFC
Electrical Protection
GCB
IPB
Gen. SUT 400kV
UAT
SST MV/LV
MV SWGR
LV L/C
MCC
Wash Water Tank/Pit
Lub. & Hyd System
Sump & Pump
Sampling System
STG Building
CCW Exp.
STG
HPT
IPT
LPT
Lub Oil
OS Ex.
GSC
Fin Fan Coolers
CCW Pump
Air Cooled Condenser
Hogging SJAE
Vacuum Pump
AOC Cooling Water Injection
Condensate Collecting Tank
Condensate Pump
Waste Water Treatment Facility
Neutralization Pit
Waste Water Holding Basin
Final Check Basin
Raw Water Makeup Pump
River Water Intake Facility
Euphrates River
NASIRYAH 1 GIS Building
400kV GIS NASIRYAH 1
NASIRYAH 1 Generators (By Others)
400kV Overhead Transmission Lines (Cut-In By Others)
UNIT 2 Generators
400kV Overhead Transmission Line (New By Others)
400kV GIS NASIRYAH II (JICA)
400kV Cable
Concrete UHV Cable Trench
Electrical Control & Protection
Effluent Discharge Facility
A : Auxiliary Steam
B : Boiler Blowdown
C : Closed Cooling Water (supply)
D : Demineralized Water
E : Effluent
F : Fire Water
G : Fuel Gas
H : Closed Cooling Water (Return)
I : Instrument Air
J : Diesel Oil
K : Condensate Return
L : River Water
M : Storm Water
N : Oily Drain
O : Plant Air
P : Desalinated Water
R : Service Water
S : Waste Water
*1 Only 1 Power Block train is indicated but 2 identical trains are planned
*2 Capacities indicated are nominal value for reference only
2012/1/20 Rev.0A



PN
5.1375°
RIVER
LAKE
OIL
GENERATOR
TRANSMISSION LINES
B.L.
B.L.
5.1375°
PART-2
PART-3
GARAGE
CAR PARKING
ENTRANCE
ENTRANCE
ENTRANCE
1 GTG
2 HRSG
3 STG
4 GENERATOR STEPUP TRANSFORMER
5 DIESEL OIL TANK
6 FUEL GAS TREATMENT BUILDING
7 COOLING TOWER
8 CIRCULATING WATER PUMP
9 RAW WATER TREATMENT FACILITY
10 DEMINERALIZED WATER TANK
11 FIRE PUMP HOUSE
12 EQUALIZATION TANK
13 SERVICE WATER TANK
14 WATER TREATMENT FACILITY
15 ADMINISTRATION BUILDING
16 WORKSHOP/WAREHOUSE BUILDING
17 HYDROGEN GENERATION BUILDING
18 AIR COMPRESSOR BUILDING
19 AUXILIARY BOILER BUILDING
20 CONTROL BUILDING
21 WASTE WATER TREATMENT FACILITY
22 WASTE WATER HOLDING BASIN
23 FINAL CHECK BASIN
24 OIL SEPARATOR
25 EMERGENCY DIESEL GENERATOR SHED
26 GUARD HOUSE
27 WATER INTAKE PUMP HOUSE
28 WATER DISCHARGE
GRAPHIC SCALE
Preparatory Study for Development of Southern Large Scale Thermal Power Plant in IRAQ
1,800MW Class
Gas Combined Cycle Power Plant
2 on 1 Multi-Shaft
(Wet Cooling Tower Case)
Conceptual Plot Plan


PN
5.1375°
RIVER
LAKE
OIL
GENERATOR
TRANSMISSION LINES
B.L.
5.1375°
B.L.
ENTRANCE
ENTRANCE
CAR PARKING
GARAGE
GTG
HRSG
STG
GENERATOR STEPUP TRANSFORMER
DIESEL OIL TANK
FUEL GAS TREATMENT BUILDING
ACC (Air Cooled Condenser)
Fin Fan Coolers
RAW WATER TREATMENT FACILITY
DEMINERALIZED WATER TANK
FIRE PUMP HOUSE
EQUALIZATION TANK
SERVICE WATER TANK
WATER TREATMENT FACILITY
ADMINISTRATION BUILDING
WORKSHOP/WAREHOUSE BUILDING
HYDROGEN GENERATION BUILDING
AIR COMPRESSOR BUILDING
AUXILIARY BOILER BUILDING
CONTROL BUILDING
WASTE WATER TREATMENT FACILITY
WASTE WATER HOLDING BASIN
FINAL CHECK BASIN
OIL SEPARATOR
EMERGENCY DIESEL GENERATOR SHED
GUARD HOUSE
WATER INTAKE STRUCTURE
WATER DISCHARGE STRUCTURE
Preparatory Study for Development at
Southern Large Scale Thermal Power Plant
in IRAQ
1,800MW Class
Gas Combined Cycle Power Plant
2 on 1 Multi-Shaft
(ACC Case)
Conceptual Plot Plan



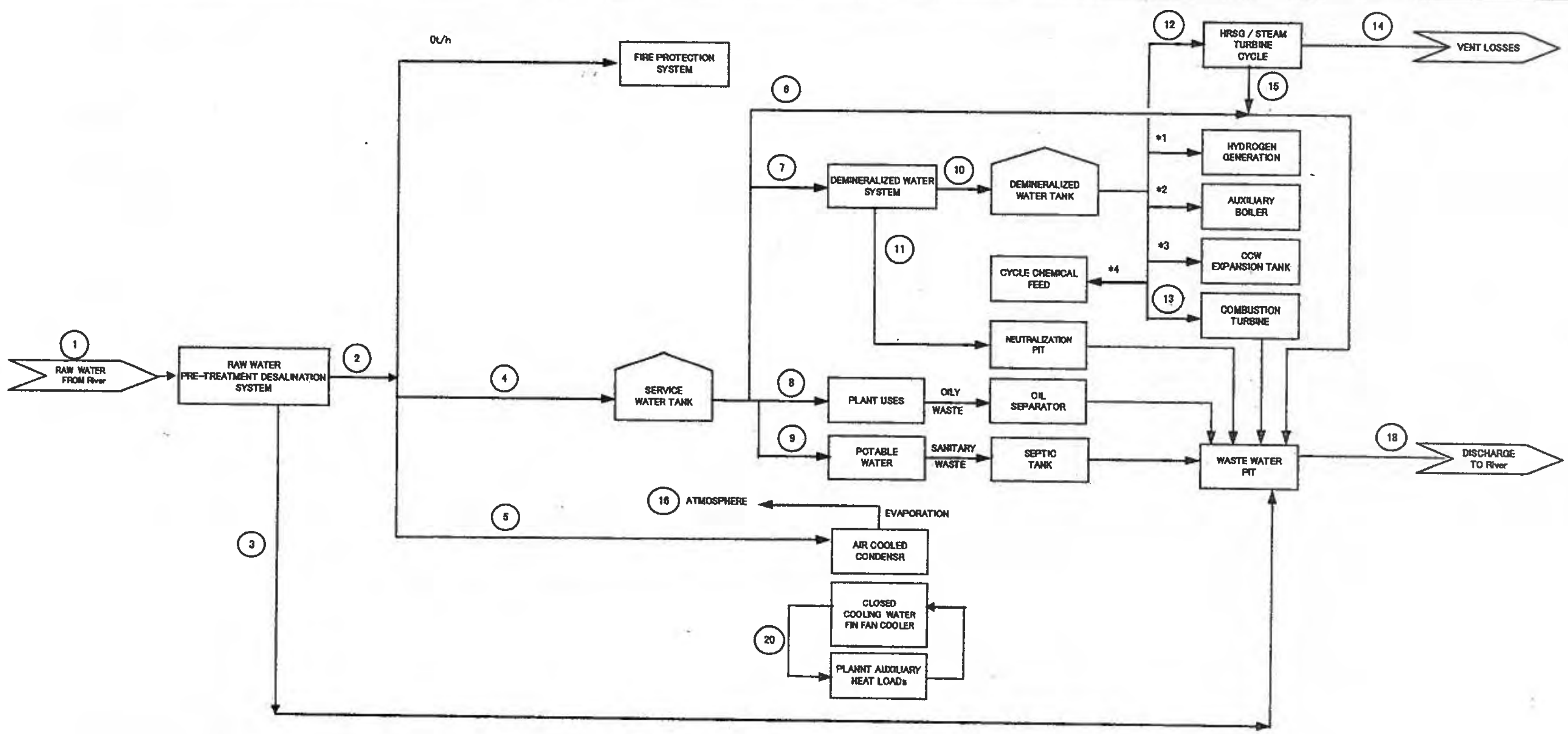
per 2 on 1 Multi Shaft 900MW class CCPP one (1) Train

Number	Description	Unit	Water Flow
1	Raw water from river	t/h	1,500
2	Desalinated Water	t/h	1,194
3	Pre-Treatment Back-Wash and Rejection Water	t/h	306
4	Service water	t/h	74
5	Cooling tower makeup	t/h	1,120
6	Quench water	t/h	20
7	Inlet to makeup demineralizer system	t/h	46
8	Miscellaneous service water uses	t/h	4
9	Potable water	t/h	4
10	Demineralized water produced	t/h	40
11	Demineralizer system waste water	t/h	6
12	HRSG/steam turbine cycle makeup	t/h	40
13	Combustion turbine wash water	L/day	52
14	Vent losses from HRSG/steam turbine cycle	t/h	8
15	HRSG blowdown	t/h	32
16	Cooling tower loss to atmosphere	t/h	900
17	Cooling tower blow down	t/h	220
18	Discharge to river	t/h	644
19	Condenser circulating water	t/h	45,800
20	Closed cooling water system cooling water	t/h	3,800

Notes:
1. All flows except combustion turbine wash water are average ton per hour.
2. Combustion turbine wash water flow is average liters per day.
3. HRSG blowdown is assumed to be 4% of total steam flow.
4. Vent losses are assumed to be 1% of total steam flow.
5. Demineralized water flow of *1, *2, *3 and *4 are included in ⑦.

Preparatory Study for Development of Southern Large Scale Thermal Power Plant in IRAQ
Nasiryah II
COMBINED CYCLE POWER PROJECT
2 on 1 Multi Shaft Train
WATER BALANCE DIAGRAM
(Coooling Tower Case)

Jan. 21, 2012 Rev. 0A



per 2 on 1 Multi Shaft 900MW class CCPP one (1) Train

Number	Description	Unit	Water Flow
1	Raw water from river	t/h	470
2	Desalinated Water	t/h	374
3	Pre-Treatment Back-Wash and Rejection Water	t/h	96
4	Service water	t/h	74
5	ACC cooling water injection (@ ambient temperature of 50 C)	t/h	300
6	Quench water	t/h	20
7	Inlet to makeup demineralizer system	t/h	46
8	Miscellaneous service water uses	t/h	4
9	Potable water	t/h	4
10	Demineralized water produced	t/h	40
11	Demineralizer system waste water	t/h	6
12	HRSG/steam turbine cycle makeup	t/h	40
13	Combustion turbine wash water	L/day	52
14	Vent losses from HRSG/steam turbine cycle	t/h	8
15	HRSG blowdown	t/h	32
16	ACC cooling water evapolation to atmosphere	t/h	300
17	N/A	t/h	-
18	Discharge to river	t/h	228
19	N/A	t/h	-
20	Closed cooling water system cooling water	t/h	3,800

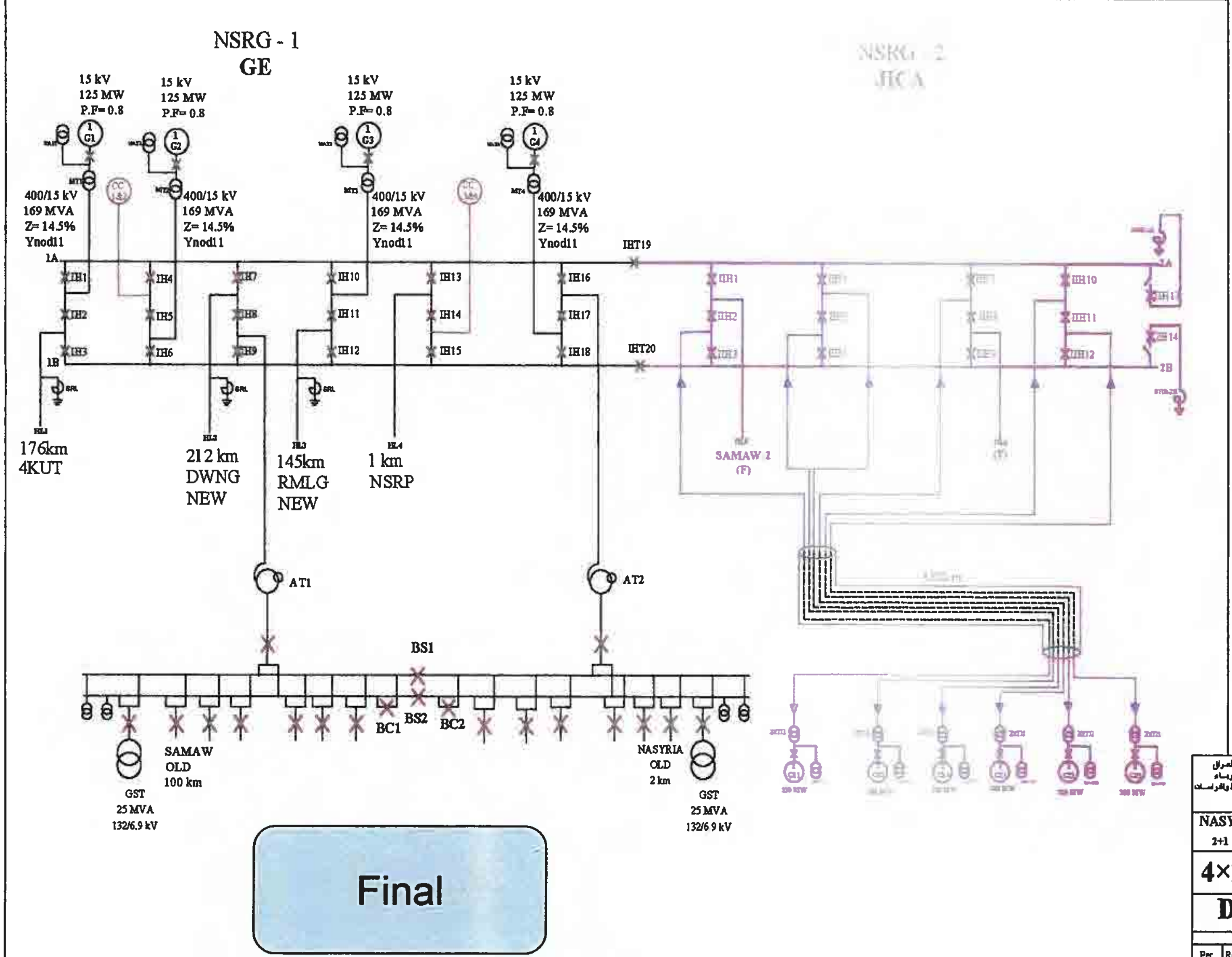
Notes:
1. All flows except combustion turbine wash water are average ton per hour.
2. Combustion turbine wash water flow is average liters per day.
3. HRSG blowdown is assumed to be 4% of total steam flow.
4. Vent losses are assumed to be 1% of total steam flow.
5. Demineralized water flow of *1, *2, *3 and *4 are included in ⑦.

Preparatory Study for Development of Southern Large Scale Thermal Power Plant in IRAQ
Nasiryah II
COMBINED CYCLE POWER PROJECT
2 on 1 Multi Shaft Train
WATER BALANCE DIAGRAM
(ACC with Cooling Case)

Jan. 21, 2012 Rev. 0A

Attachment 2.2

Field Bay	= CO1	= CO2	= CO3	= CO4	= CO5
Serial No.					



DATA G.I.S 400 kV	
System Voltage	420kV
Rated Voltage	400kV
Rated frequency	50Hz
Rated lightning impulse Voltage	1425 kV
Rated power frequency Voltage	650kV
Rated Switching impulse Voltage	1050kV
Rated current busbar	4800A
Rated Current of All Circut Breaker	4000A
Rated Current Feeder	2000A
Rated Short time withstant Current (1 s)	50KA

DATA G.I.S 132 kV	
Rated System Voltage	145kV
Rated Normal Voltage	132kV
Rated frequency	50Hz
Rated lightning impulse Voltage	650 kV
Rated power frequency Voltage	275kV
Rated Short time withstant Current (1 s)	40KA
Rated current busbar	3150A

LEGEND	
G	Generator
MT	Main Transformer
UAT	Unit Auxiliary Transformer
AT	Auto Transformer 250-250-75 MVA,400-132-11kV
H	Circuit Breaker 400 kV
PT	Potential Transformer
BS	Bus-Section 132kV
G.S.T	General Servic Transformer
BC	Bus-Copuler Circuit Breaker 132 kV
CC	Combine Cycle
SRL	Line Shunt Reactor 50 MVAR
F	Future
SRB	Bus Bar Shunt Reactor 50 MVAR
HT	Bus -Tie Circuit Breaker 400 kV
▷	400kV XLPE CABLE

جمهورية العراق
وزارة الكهرباء
دائرة التخطيط والدراسات

Republic Of Iraq
Ministry Of Electricity
Planning and Studies Office

NASYRIA Gas power Plant 1&2
محطة الناصرية الغازية 1+2

4×125 GE + 1800 JICA

DRWG. No. 7- 2010

Per	Remarks	Date	Name
		14-Dec-2011	Ahmed J.

Rev.No.8

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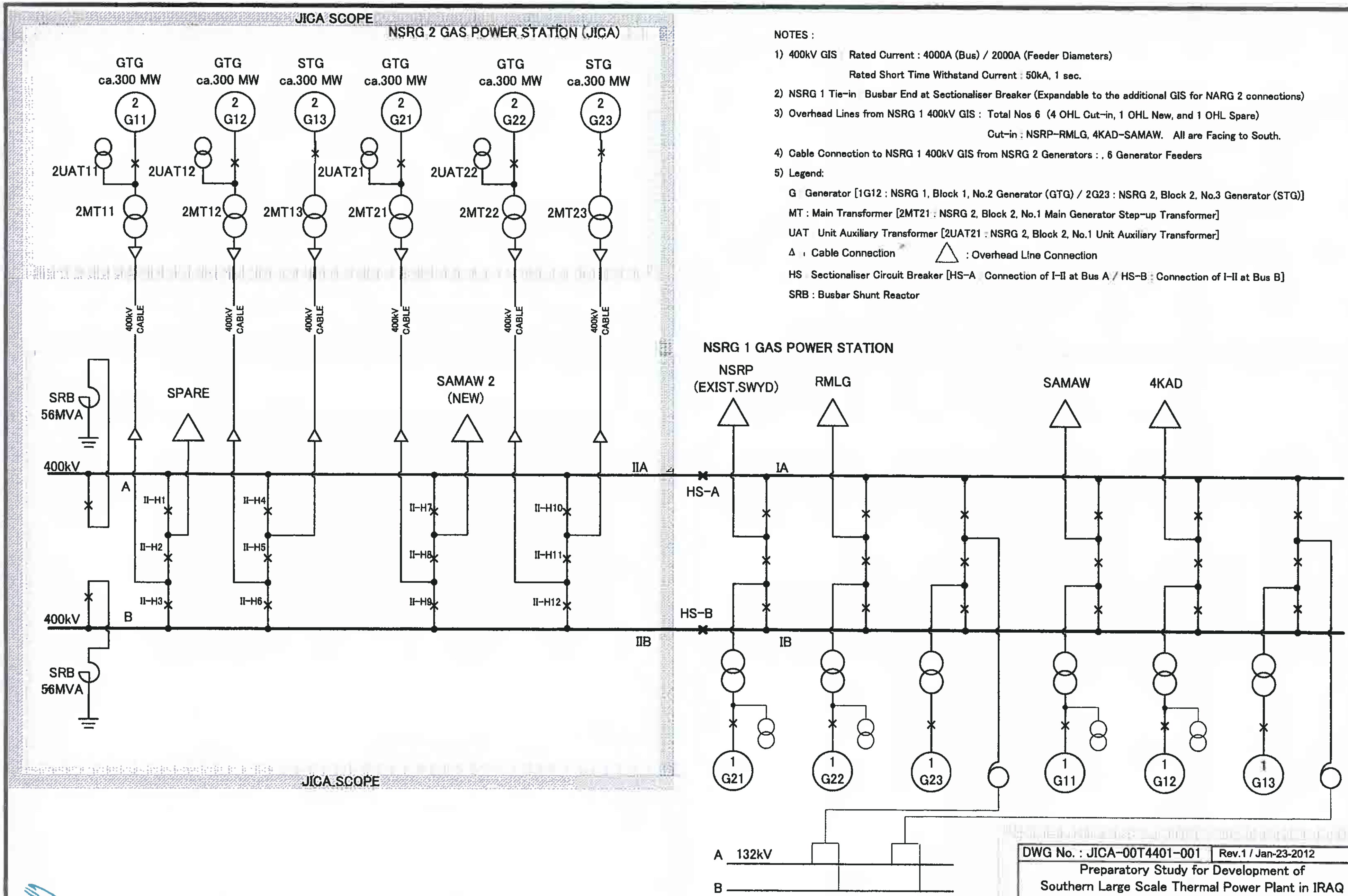
Attachment 2.



NOTES :

1) 400kV GIS Rated Current : 4000A (Bus) / 2000A (Feeder Diameters)

Rated Short Time Withstand Current : 50kA, 1 sec.

2) NSRG 1 Tie-in Busbar End at Sectionaliser Breaker (Expandable to the additional GIS for NARG 2 connections)

3) Overhead Lines from NSRG 1 400kV GIS : Total Nos 6 (4 OHL Cut-in, 1 OHL New, and 1 OHL Spare)

Cut-in : NSRP-RMLG, 4KAD-SAMAW. All are Facing to South.

4) Cable Connection to NSRG 1 400kV GIS from NSRG 2 Generators : , 6 Generator Feeders

5) Legend:

G Generator [1G12 : NSRG 1, Block 1, No.2 Generator (GTG) / 2G23 : NSRG 2, Block 2, No.3 Generator (STG)]

MT : Main Transformer [2MT21 : NSRG 2, Block 2, No.1 Main Generator Step-up Transformer]

UAT Unit Auxiliary Transformer [2UAT21 : NSRG 2, Block 2, No.1 Unit Auxiliary Transformer]

Δ : Cable Connection △ : Overhead Line Connection

HS Sectionaliser Circuit Breaker [HS-A Connection of I-II at Bus A / HS-B : Connection of I-II at Bus B]

SRB : Busbar Shunt Reactor

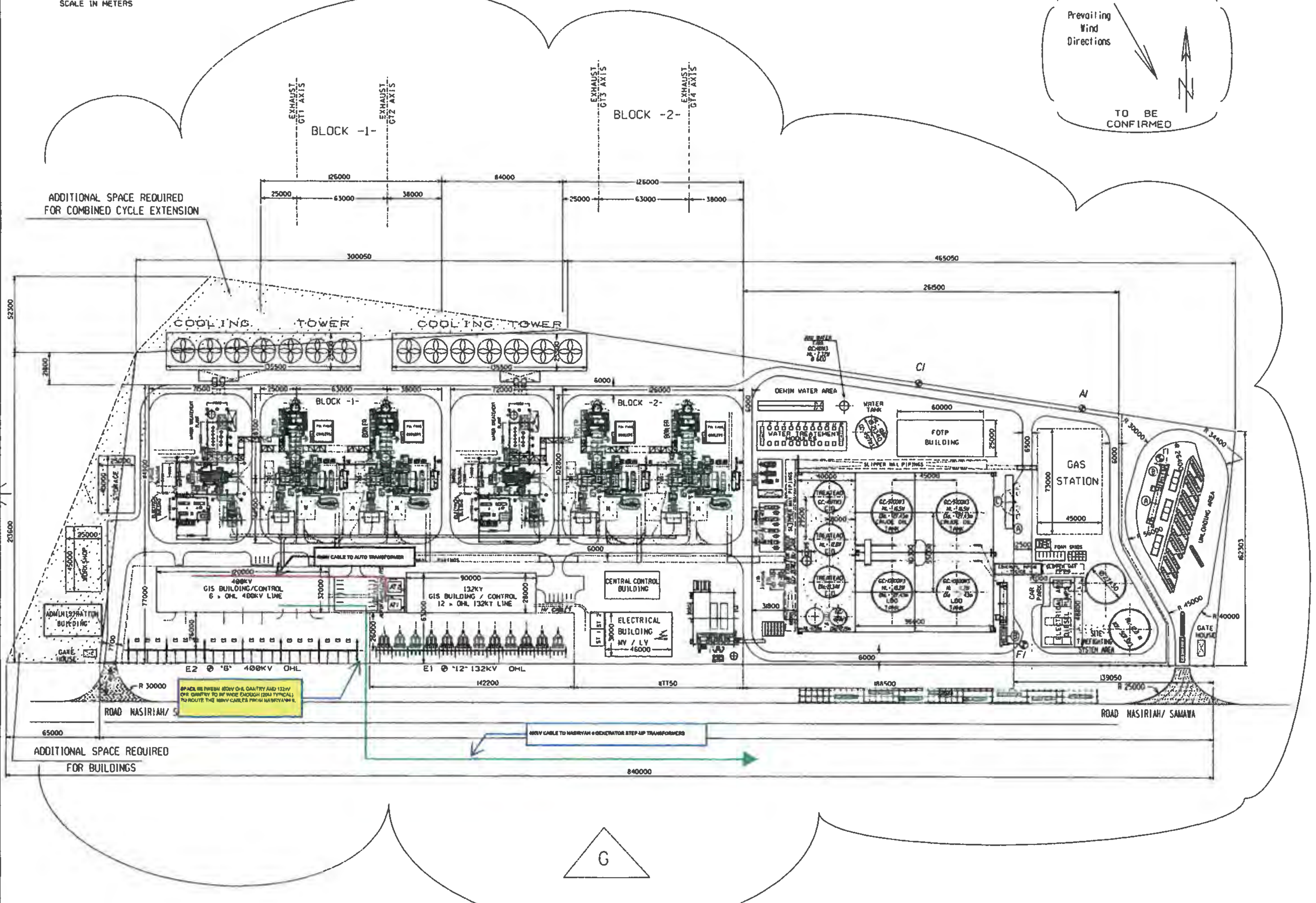
DWG No. : JICA-00T4401-001	Rev.1 / Jan-23-2012
Preparatory Study for Development of Southern Large Scale Thermal Power Plant in IRAQ JICA	
SKELETON DIAGRAM NASIRYAH GAS POWER STATION 1 & 2	

NSRY2-SLD-R0D3.VSD

Attachment 24

PLANT VIEW

Scale : 1/1000



NOTES:

1. THE PURPOSE OF THIS DRAWING IS TO PROPOSE A CONCEPTUAL LAYOUT OF A POWER PLANT BASED ON THE BELOW CONFIGURATION AND ASSUMPTIONS:

1.1. CONFIGURATION:

- 1ST PHASE. INSTALLATION OF 4X9E GT UNITS IN SC (SIMPLE CYCLE). RUNNING WITH DISTILLATE OIL, CRUDE OIL AND NATURAL GAS.
- 2ND PHASE. ADD ON OF 4X9E GT UNITS IN COMBINED CYCLE, RUNNING WITH DISTILLATE OIL, CRUDE OIL AND NATURAL GAS.

1.2. ASSUMPTIONS:

1.2.1) THIS DOCUMENT IS BASED ON MOE SITE SURVEY AND INFORMATION HANDED OVER TO GE.

1.2.2) LIQUID FUEL STORAGE CAPACITY ENOUGH FOR 5 DAYS LDO AND 5 DAYS CRUDE OIL FOR 4 GT CONSUMPTION.

1.2.3) THE CONSTRUCTION AREA IS SUPPOSED FREE OF ANY ABOVE AND UNDERGROUND OBSTRUCTION AND NETWORK. ALL EXISTING ABOVE AND UNDERGROUND STRUCTURES TO BE REMOVED BY MOE

2. PREVAILING WINDS DIRECTION TO BE CONFIRMED BY MOE. WIND FROM SOUTH IS VERY DUSTY AND SANDY.

3. PROPOSAL TAPPING POINTS

A1: NATURAL GAS PROPOSED TAPPING POINT.
B1: (NOT APPLICABLE)
C1: RIVER WATER SUPPLY.
(RAW WATER WILL BE BROUGHT FROM THE RIVER BY EPC TO PLANT BATTERIES LIMITS UNTIL POINT C1)

E1: 132 KV OUTGOING LINES
E2: 400 KV OUTGOING LINES

F1: SITE DRAINAGE NETWORK DISCHARGE

4. THE SIZE (FOOT PRINT) OF ALL EQUIPMENT THAT ARE NOT SUPPLIED BY GE, ARE ASSUMED SIZES AND NEED TO BE CONFIRMED BY MOE AND OWNER ENGINEER ONCE THE EQUIPMENT HAS BEEN SELECTED AND ACTUAL FOOT PRINT HAS BEEN DETERMINED.

5. GAS PIPE LOCATION AND DISTANCE FROM THE SITE TO BE CHECKED (SURVEY) AND CONFIRMED BY OWNER ENGINEER AND MOE.

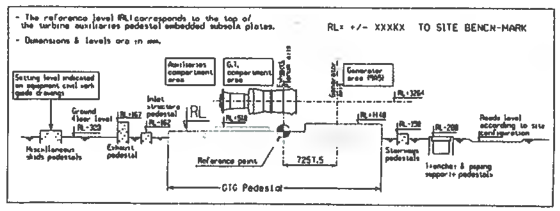
6. BASED ON THE SITE INFORMATION RECEIVED FROM MOE, THIS CONCEPTUAL DESIGN DRAWING IS PROPOSED TO THE EPC CONTRACTOR FOR DEVELOPING HIS PROPOSAL FOR THIS PROJECT. PREPARATION OF THE SITE SPECIFIC POWER PLANT DETAILED DESIGN IS THE SOLE RESPONSABILITY OF THE EPC CONTRACTOR.

7. SITE BENCHMARK AND BONDARY COORDINATES TO BE CONFIRMED BY MOE.

(A) OIL AND PETROL SEPARATOR According To API 421

(B) OIL AND PETROL SEPARATOR According To NFEN 858 PART 1 CLASS 1 (5 mg / L)

(D) CONCRETE PITS FOR UNLOADING SKIS



MINISTRY OF ELECTRICITY
- IRAQ -

MEGA DEAL POWER PLANT

NASIRIAH 4 x GT9E

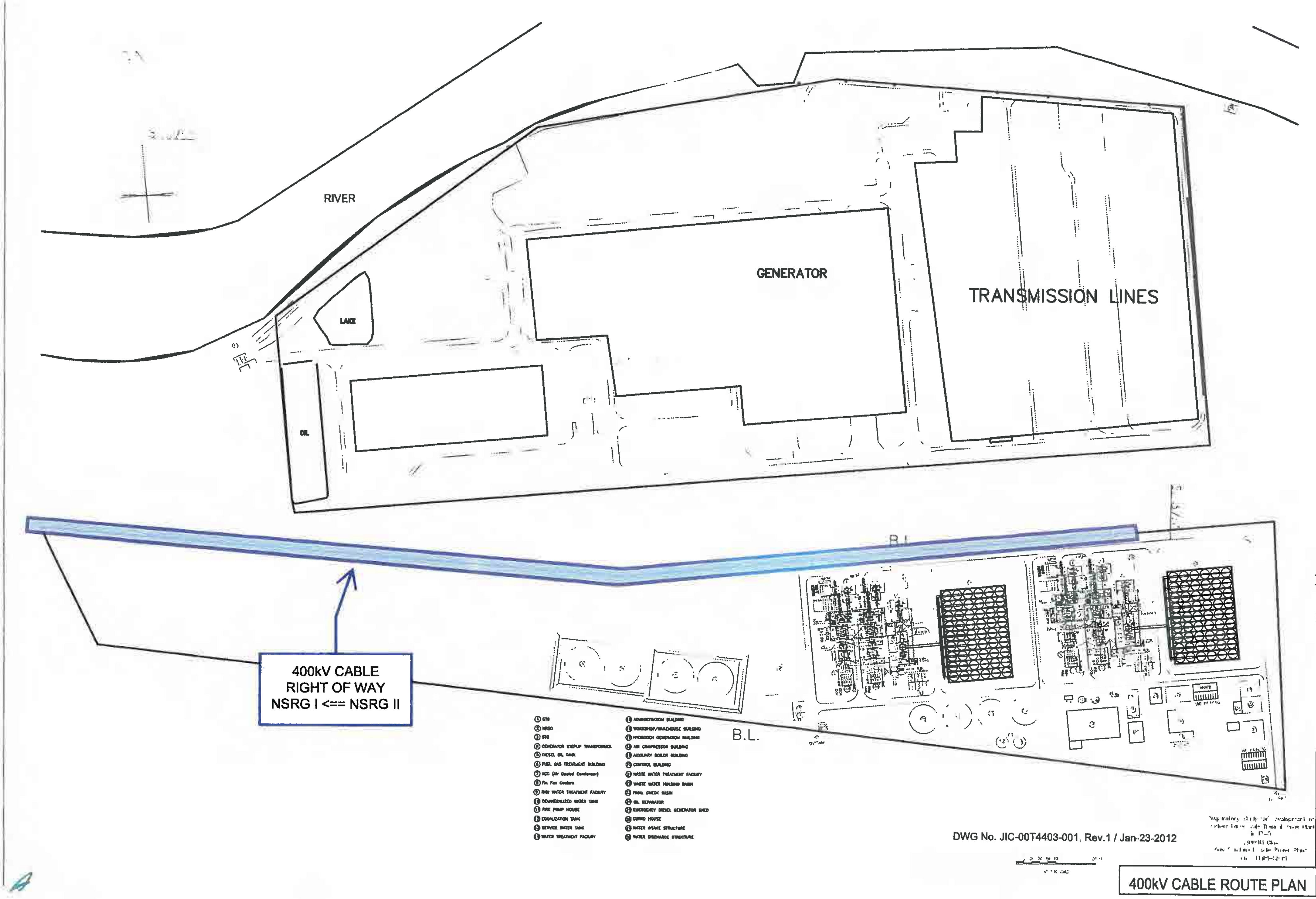
1/1000	24/01/12 ZWISLER	24/01/12 PREVITALI	24/01/12 DELATOUR
A0			

ENGINEERING DOCUMENTATION
CONCEPTUAL
PLANT LAYOUT

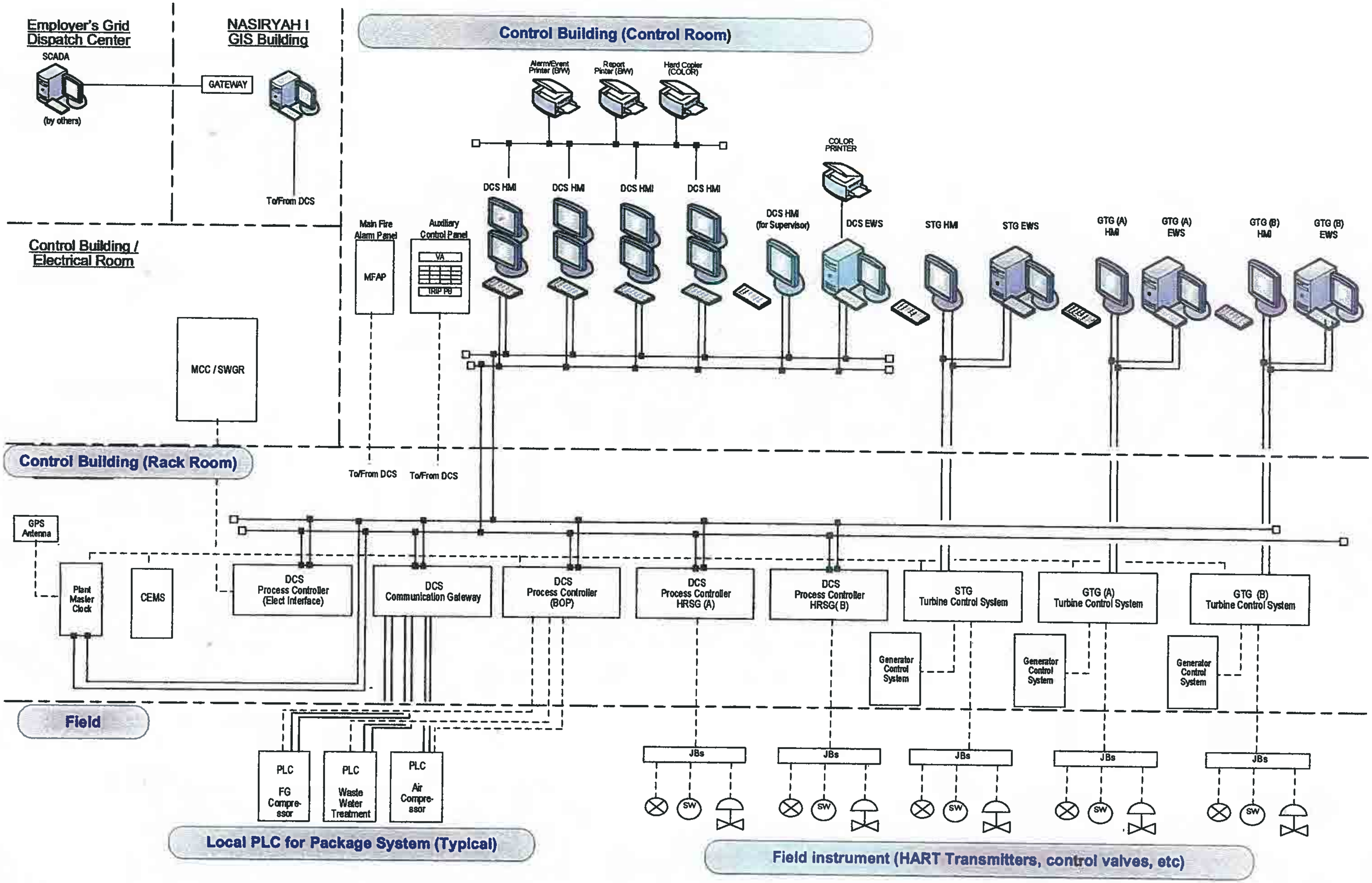
GE Energy

N° 143 E 9054
1 / F

Attachment 2.5



Plant Control System Configuration (Train 1 Only)



Attachment 2.1

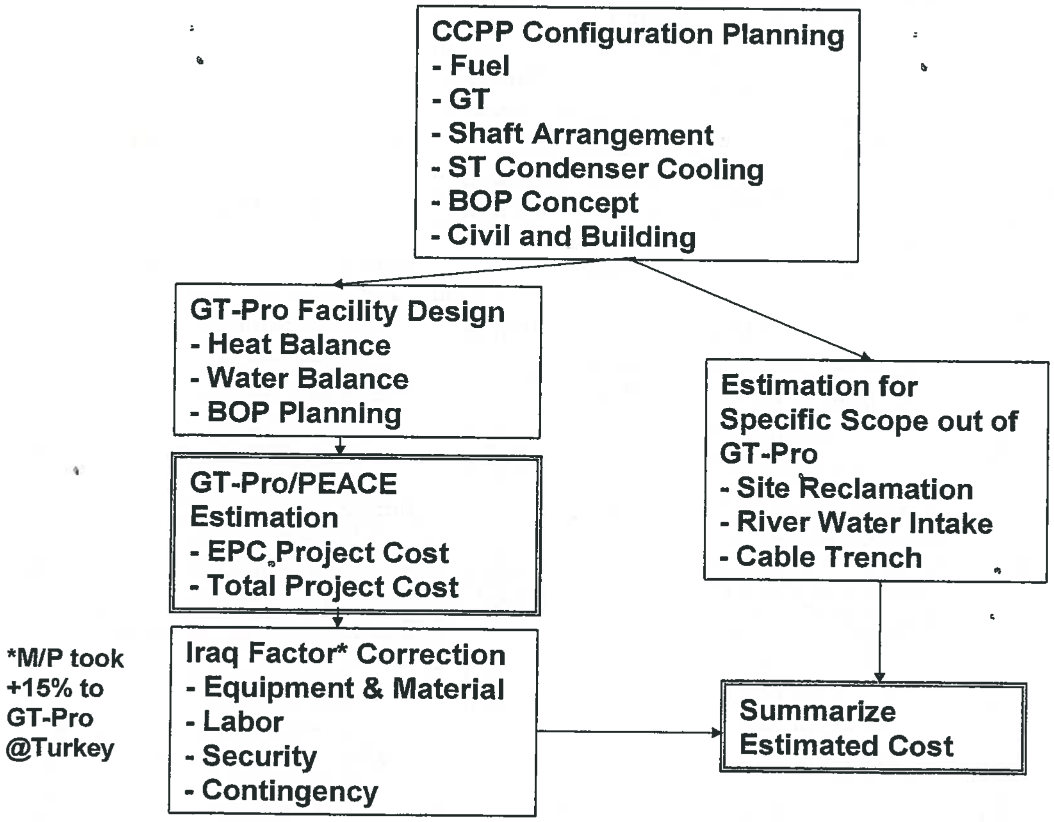
A

Attachment 3

4. Project Cost

GT-Pro/PEACE Based Estimation

Approach for Cost Estimation



Estimated Cost Summary

ACC (Hybrid) Case

Project Cost Summary (Preliminary, MM USD)	GT-Pro Reference	Estimated	NOTES
Power Plant (ACC with Water Cooling)			
I. Specialized Equipment	702	843	Equip. & Mat. cost adjusted for transportation
II. Other Equipment	38	45	ditto
III. Civil	94	166	Mat. & Labor cost adjusted, Specific Scope added
IV. Mechanical	140	195	Mat. & Labor cost adjusted
V. Electrical Assembly & Wiring	34	48	ditto
VI. Buildings & Structures	13	17	ditto
VII. Engineering & Plant Startup	29	37	Adjusted proportionally to direct cost
Desalination Plant	20	24	Equip. & Mat. And Lablr cost adjusted
Subtotal – Contractor's Internal Cost	1,070	1,375	
VIII. Contractor's Soft & Miscellaneous Costs	244	417	Adjusted for site security and contingency
Contractor's Price	1,313	1,792	
IX. Owner's Soft & Miscellaneous Costs	118	118	
Total – Owner's Cost (1 USD per US Dollar)	1,432	1,910	
Nameplate Net Plant Output MW	1,650	1,650	
$ per kW – Contractor's	796	1,086	
$ per kW – Owner's	868	1,158	

Cooling Tower Case

Project Cost Summary (Preliminary, MM USD)	GT-Pro Reference	Estimated	NOTES
Power Plant (Wet Cooling Tower)			
I. Specialized Equipment	624	749	Equip. & Mat. cost adjusted for transportation
II. Other Equipment	45	54	ditto
III. Civil	96	169	Mat. & Labor cost adjusted, Specific Scope added
IV. Mechanical	124	172	Mat. & Labor cost adjusted
V. Electrical Assembly & Wiring	23	31	ditto
VI. Buildings & Structures	18	24	ditto
VII. Engineering & Plant Startup	28	36	Adjusted proportionally to direct cost
Desalination Plant	45	57	Equip. & Mat. And Lablr cost adjusted
Subtotal – Contractor's Internal Cost	1,003	1,291	
VIII. Contractor's Soft & Miscellaneous Costs	221	386	Adjusted for site security and contingency
Contractor's Price	1,223	1,677	
IX. Owner's Soft & Miscellaneous Costs	110	110	
Total – Owner's Cost (1 USD per US Dollar)	1,334	1,787	
Nameplate Net Plant Output MW	1,660	1,660	
$ per kW – Contractor's	737	1,010	
$ per kW – Owner's	803	1,077	

Attachment 4.1

4th MISSION

THERMAL POWER PLANT OPERATION & MAINTENANCE CONSIDERATION

FEBRUARY, 2012

JICA STUDY TEAM

OPERATION EFFECTIVE INDICATOR FOR MAINTENANCE Purpose

The operation performances can be assessed in terms of overall facility efficiency. Assessment items in a power plant include:

- Operation performance
  - Availability factor
  - Maintaining of plant performances (output) and efficiency
  - Percentage of unplanned outage

CONCEPT OF OPERATION & MAINTENANCE (1)

- **The thermal power plant is required to implement facility management with consideration given to facility reliability and efficiency maintenance after the construction.**
- **Amid the drastic speed of computerization and improvement of working environment in the 1980s, there has been a growing demand for the effective operation management of the facilities in a thermal power plant. The efforts for meeting such demands have resulted in easier operation, greater power saving and improved working conditions. However, this will bring about an increase in investment funds for new facilities and maintenance management expenditures.**
- **Computerization of the facilities contributes to improved availability factor of facilities, stabilized quality of generated power and reduced production costs. At the same time, computerization of the facilities is also intended to promote power saving, increase the degree of safety and improve the environment.**

CONCEPT OF MAINTENANCE MANAGEMENT (2)

- The target of the management technique should cover the range from a single corrective maintenance (repair of a trouble) to improvement in the capacity factor and availability factor of the power generation facility.
- The area of facility management, in the meantime, has been expanded to include an introduction plan and facility layout, and a greater importance has been attached to the management of the jigs, tools and measuring instruments for the machinery and equipment.
- In recent years, consideration is being given to the selection and layout of the equipment for easier repair work subsequent to installation of the facilities, beyond conventional method of merely creating a spare parts delivery plan. However, the subsequent maintenance management is characterized by a trade-off relationship between mutually conflicting targets of higher productivity (economic efficiency in terms of servicing advantages by facility management) and lower costs for facility maintenance management.

TYPE OF MAINTENANCE (1)

1.Corrective Maintenance

- This is a conventional concept of the maintenance management where a product is repaired after having been broken. This method is adopted in many of the developing countries at present.

- This is the method for repairing a product after a failure has occurred. According to this method, repair work occurs sporadically and a plan cannot be easily worked out in advance. Arrangement of the personnel and procurement of the equipment and material are not efficient. However, this method is adopted when parts replacement cost on a periodic basis is very high.

- In this case, unplanned outage is applied in an extenuating circumstance where there is a breakdown of a boiler tube, a feedwater pump and others which constitute the major equipment playing a critical role in the heat cycle of power generation

TYPE OF MAINTENANCE (2)

2.Preventive maintenance

- **Preventive maintenance is based on the concept of providing maintenance to the facilities before they are subjected to a failure subsequent to their production. The preventive maintenance is intended to prevent sporadic failure and shutdown of the facilities, and provides maintenance of the facilities and their operations by replacement of parts and apparatuses at economical time intervals.**
- **The facilities are subjected to periodic inspection, repair and overhaul at prescribed time intervals of the maintenance, in conformity to the size and service life of the particular facilities. It should be noted that a plan that ignores economic efficiency (in an overall study of availability factor and maintenance cost) may be worked out, if one is too careful in the periodic inspection of the power generation facility (at intervals of one year, two years or four years) or in the preventive inspection in a typical example of the power plant.**

TYPE OF MAINTENANCE (3)

3.Production maintenance

Production maintenance to the service life of the LCC (Life cycle cost) facilities, and by minimizing the loss resulting from deterioration of the facilities.
Production maintenance is based on two concepts:

- **One concept is intended to provide improvement maintenance where the facilities are improved in such a way as to ensure easier maintenance and repair, and to minimize the need for maintenance. Going a step further, this concept intends to improve the productivity.**

- **Another concept is intended to ensure maintenance prevention. To achieve a radical cutdown of the facility maintenance cost, this concept encourages production of the facilities that do not require maintenance, rather than making efforts for improved maintenance method. This concept puts priority to procurement. This concept is applied to procurement and improvement of the facilities wherever possible. This is the method of maintenance prevention. Adoption of this concept in the phase of designing is Production maintenance offers the most economical method for maintenance management in terms of improving the facility productivity. This is intended to enhance the overall efficiency by reducing all costs involved in the operation maintenance related equivalent to application of the method of maintenance prevention.**

TYPE OF MAINTENANCE (4)

4.Predictive maintenance

- **In recent years, the concept of predictive maintenance (PM) is coming to be adopted. This concept is to determine the conditions of deterioration and status of performances of the faculties. Maintenance work is started based on this decision.**

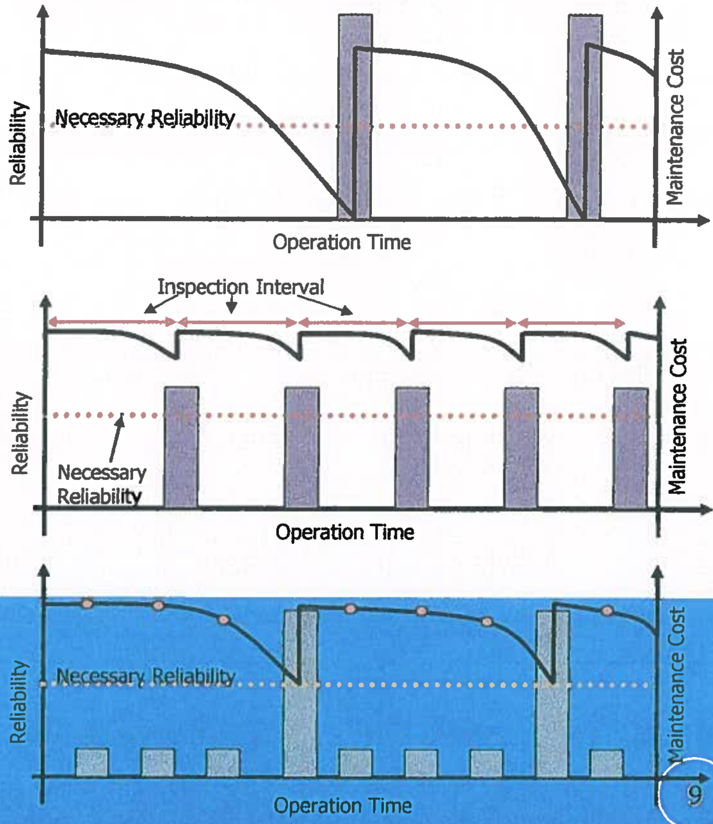
- **To implement this concept, it is necessary to get accurate information on the condition of deterioration of the facilities. The CBM (Condition-based maintenance) is the concept of providing maintenance whenever required, based on the accurate observation of the conditions of deterioration. Due to the development of the facility diagnostic technology capable of capturing quantitative information of the status of the facilities, this technique has been converted from the time-based inspection and repair procedures to the procedures based on the information on the status of the facilities.**

Conditioned based Maintenance

BDM
Break Down Maintenance

TBM
Time Based Maintenance

CBM
Condition Based Maintenance



BASIC OPERATION & MAINTENANCE MANAGEMENT

- **Plant Operation**
- **Daily Maintenance**
- **Period Inspection Program**
- **Plant Engineering and Plant Diagnosis**
- **Maintenance Plan and Budget**
- **Work Preparation/Implementation /Commissioning**

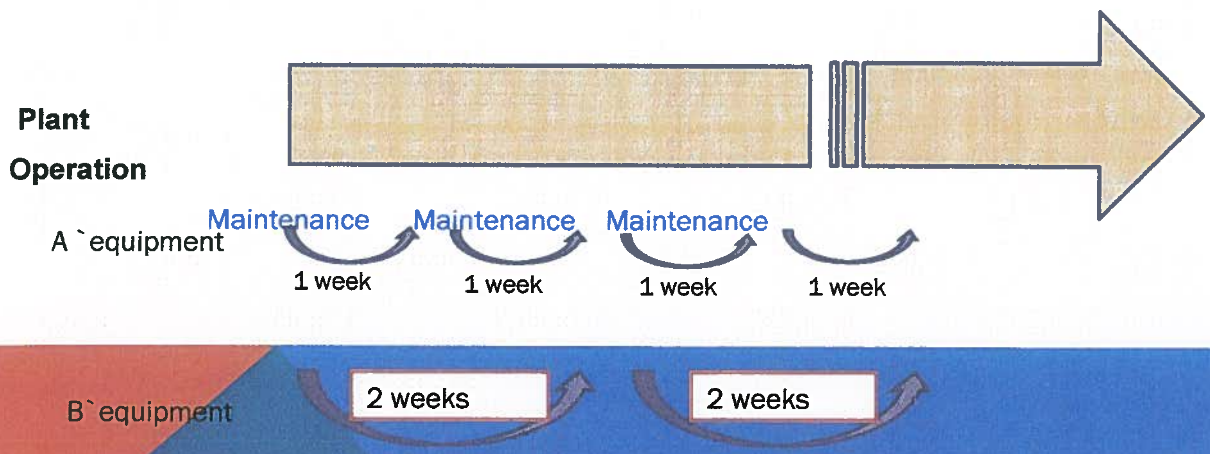
PLANT OPERATION

➢ In order to Keep Plant Efficiency, Plant availability, and avoid Plant outage;

- Monitoring critical parameters
- Site inspection
- Standard operation procedure
- Thermal efficiency/condition monitoring

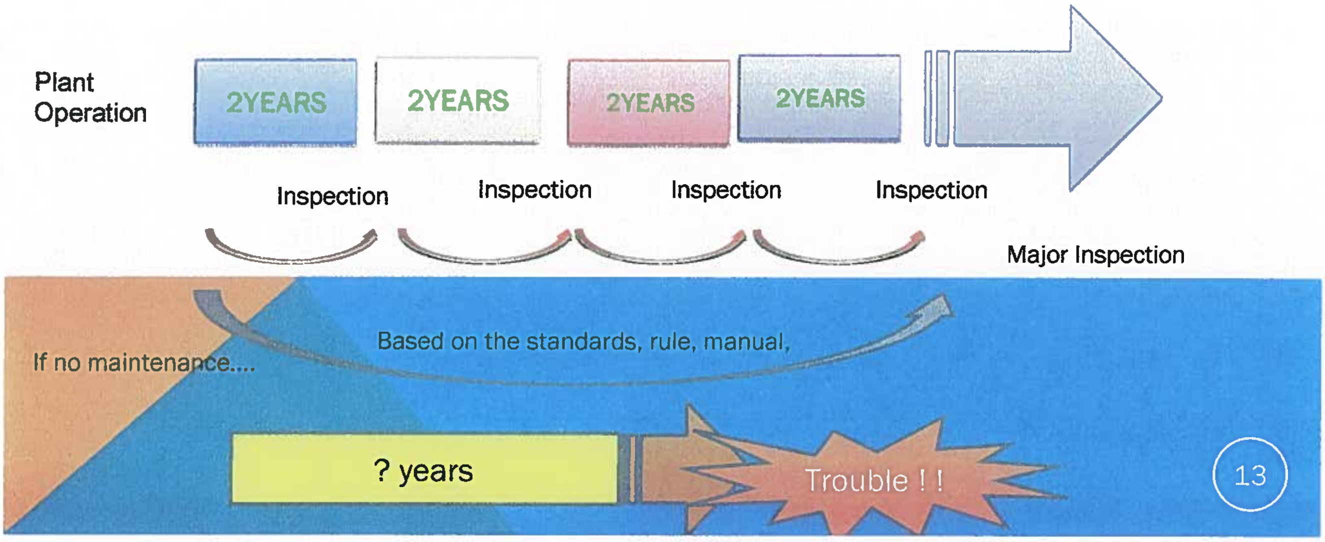
DAILY MAINTENANCE

- **Daily maintenance standards**
  - -Preventive maintenance
  - -Condition Based
  - -Time Based

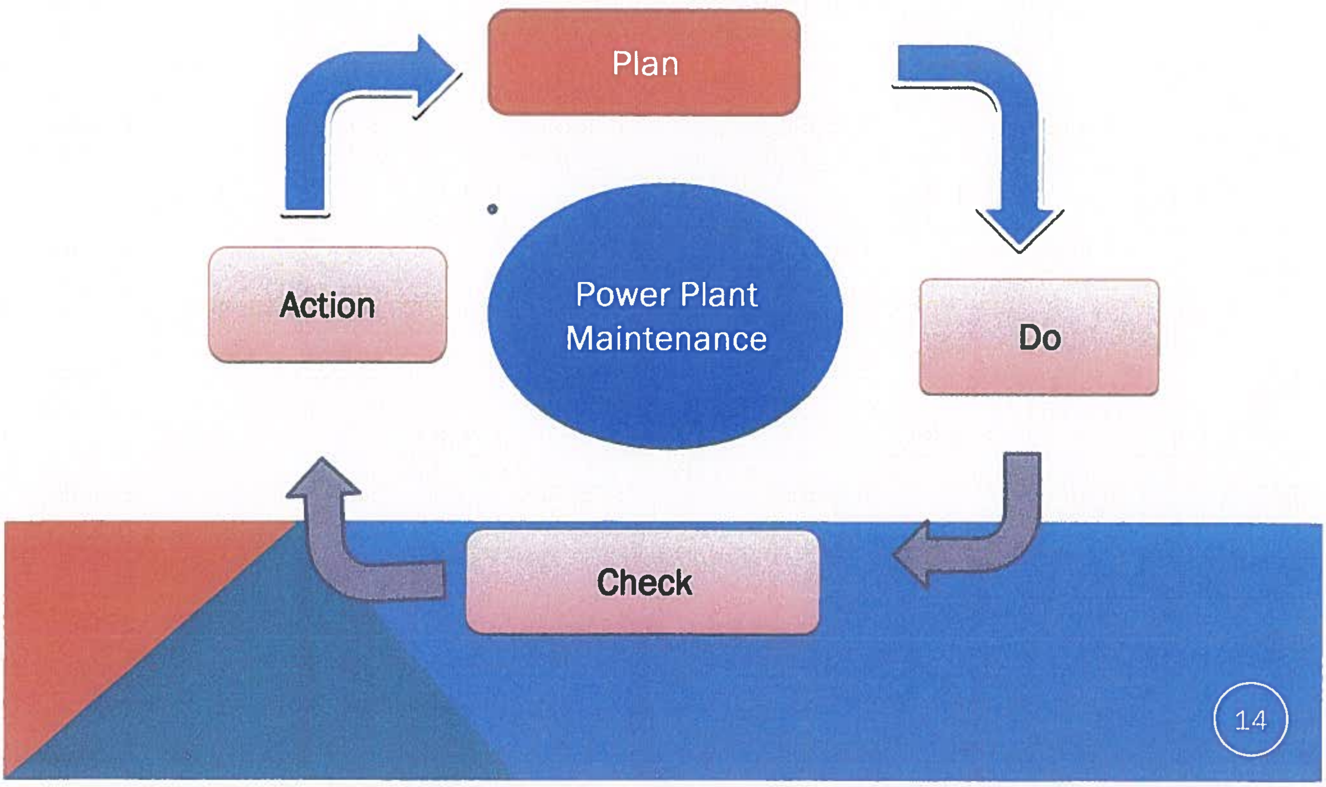


PERIODIC INSPECTION PROGRAM

- The electricity utilities industry standards
- Voluntary preservation of safety
- Safety rule
- Principles and manuals on periodic inspection
- Scope, interval for each equipment



WHAT IS P-D-C-A CYCLE



MAINTENANCE PDCA CYCLE (ACTION)

- **Plant Diagnosis Procedure**
  - Check engineering information / site condition
  - Carry out hazard identification and risk assessment
  - Discuss most appropriate action ;

    when, where, what, how, who, why and how much
  - Prepare plant diagnosis report
  - Authorization
  - To be followed by maintenance work plan

MAINTENANCE PLAN / ANNUAL BUDGET (PLAN)

- **Prioritize all the maintenance work plan to meet budget guideline on**
  - Thermal power plant
  - Thermal power office
  - Thermal power department
  -
- **Build up 5-year maintenance plan**
  - – Outage schedule
  - – Optimized maintenance works
- **Set up annual budget**
- **Design of inspection / repair/ modification work**

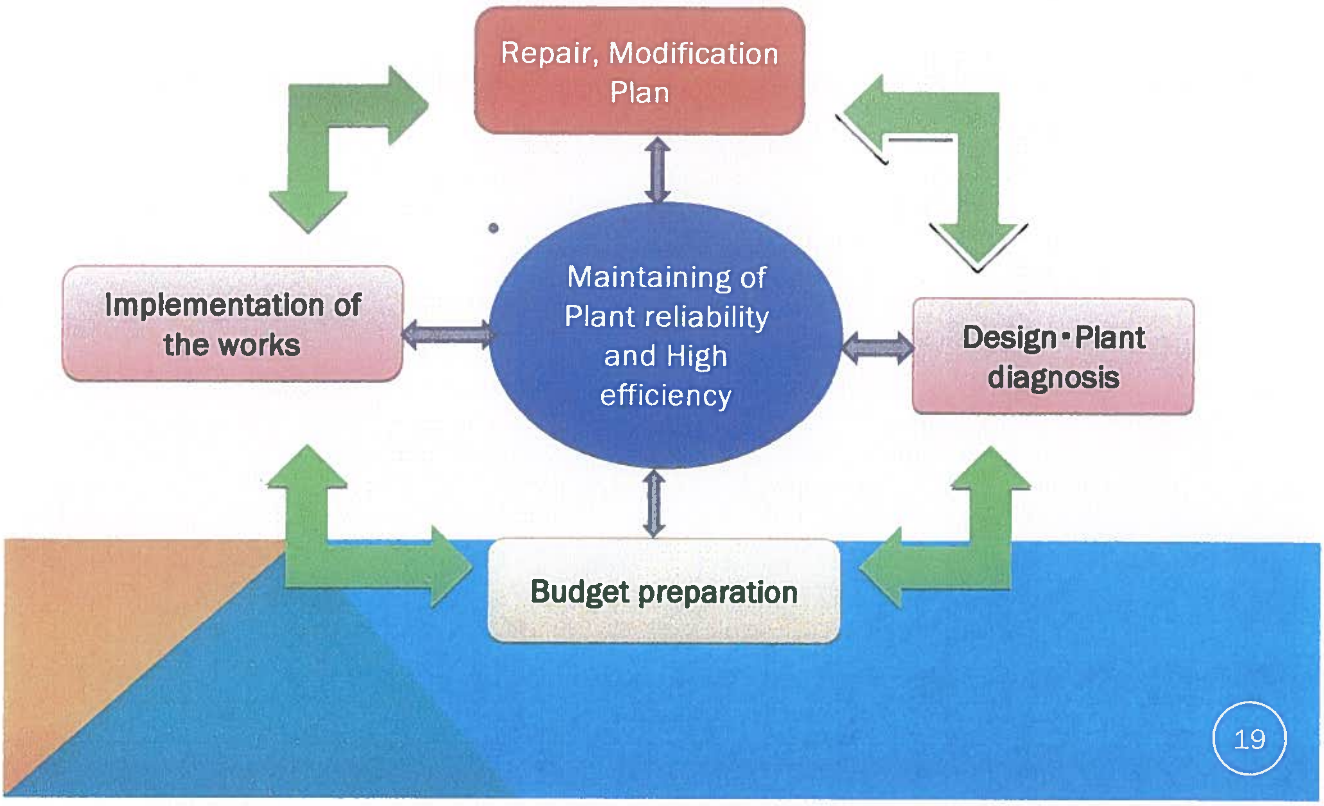
PREPARATION OF MAINTENANCE WORK (DO)

- To manage safety, schedule and quality of work
- Preparation by operation / maintenance team and contractors through close communication
- Hazard identification and risk assessment

IMPLEMENTATION OF MAINTENANCE WORK (DO)

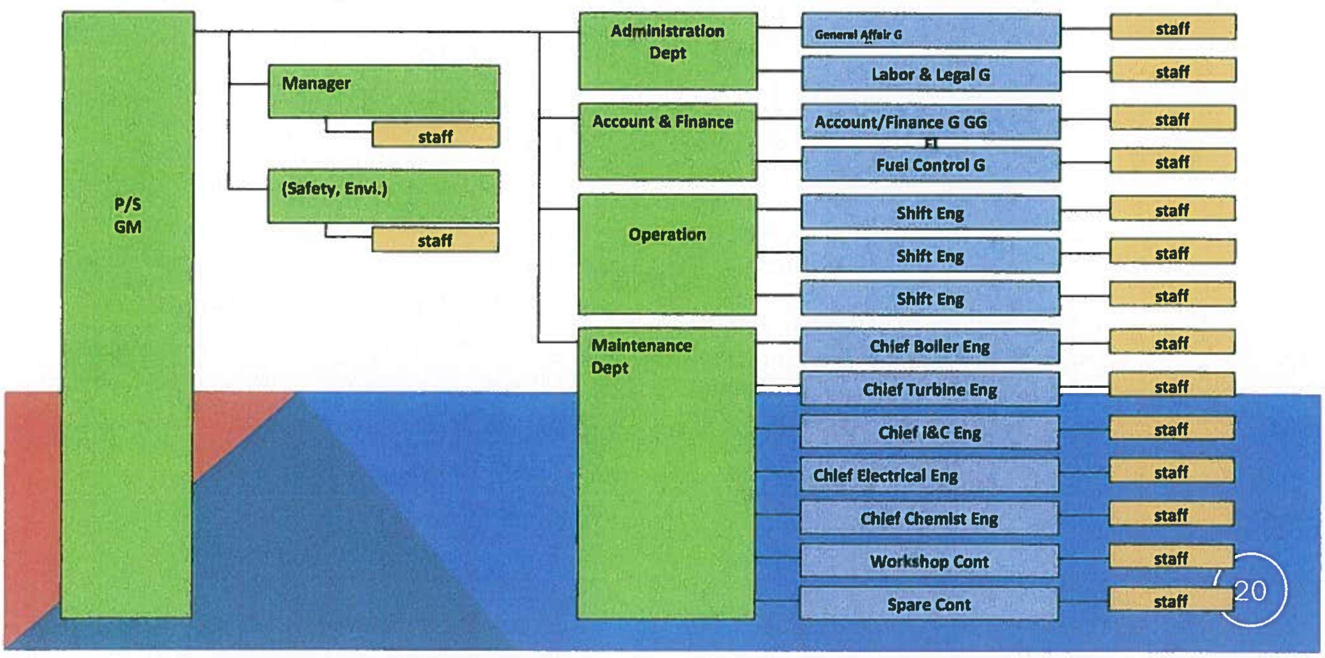
- Daily and weekly meeting
- Change of schedule
- Supervise
  - Isolation
  - Work and plant conditions
  - Inspection data
- Commissioning
  - Data to be checked carefully

WHAT WE UNDERSTAND ABOUT MAINTENANCE
PDCA



RECOMMENDED POWER PLANT MANAGEMENT ORGANIZATION

Assuming that the following current organization will be employed for the time being for power plant maintenance management subsequent to completion of this Project and the constituent number of each group for management will be adequately determined, we recommend a total of about 250 persons for the management of power plant organization.



Fixed cost and variable O&M cost

In order to maintain the plant efficiency and availability after construction, O &M cost covering the pervious description in the operation & maintenance consideration is estimated as follows.

O&M item	Total	Fixed cost	Variable cost
O & M Personnel	4,200	4,200	-
Material and equipment for repair and periodic inspection	11,840	1,000	10,840
Consumables cost	535	-	535
General management cost	1,340	1,340	-
Total	17,915	11,460	6,455
Fixed cost (repair cost) $/kW/year (1)		7.27	-
Variable (repair cost) $/MWh (2)		-	1.80

PERIODIC INSPECTION (SPECIAL METHOD)

"Explanation": Roll-in/roll-out repair method

- **The roll-in/roll-out repair method was first adopted in the Futtsu Thermal Power Plant of the Tokyo Electric Power Co., Ltd. (TEPCO) in 1984. After that, this method has been employed by the Japanese power utilities over an extensive range as a combined thermal power plant repair method. This conforms to the TEPCO maintenance policy.**
- **This method, a set of parts constituting the gas turbine are owned as spare parts. To minimize the inspection intervals in the periodic inspection (8,000,16000, 24,000, 46,000 EOT time), the fuel nozzle (inspection time will be reduced if operated hydraulically). The transition portion, peripheral parts, combustion liner, turbine first stage, nozzle/bucket and turbine second nozzle/bucket are prepared in advance. The parts whose operation time has reached the EOT level at the time of inspection are entirely replaced by the parts on hand.**
- **The parts taken out will be carefully inspected. If repair is required, the relevant parts will be sent to the manufacturer for repair. These parts will be managed as spare parts to be used in the next inspection.**

Spare parts list for gas turbine (roll-in/roll-out maintenance)

(EXAMPLE)

Description	Q'ty recommended in Spare Parts "B"		'CATEGORY-1'		'CATEGORY-2'		'CATEGORY-3'	
Fuel Nozzle	2 sets	40 pcs	2 sets	40 pcs	-	-	-	-
Transition piece assembly (Combustor baskets)	2 sets	40 pcs	2 sets	40 pcs	-	-	-	-
Combustion Liners (Transition piece)	2 sets	40 pcs	2 sets	40 pcs	-	-	-	-
Turbine first stage nozzles (Row 1 vanes)	2 sets	80 pcs	1 sets	40 pcs	1 set	40 pcs	-	-
Turbine first stage buckets (Row 1 blade)	2 sets	192 pcs	1 sets	96 pcs	1 set	96 pcs	-	-
Turbine second stage nozzles (Row 2 vanes)	1 set	32 pcs	1 set	32 pcs	-	-	1 set	32 pcs
Turbine second stage buckets (Row 2 blade)	1 set	87 pcs	1 set	87 pcs	-	-	1 set	87 pcs
Turbine third stage nozzles (Row 3 vanes)	1 set	18 seg	0.5 set	9 seg	0.5 set	9 seg	-	-
Turbine third stage buckets (Row 3 blade)	1 set	112 pcs	0.5 set	56 pcs	0.5 set	56 pcs	-	-
Row 1 ring segment	-	-	-	-	-	-	2 set	120 pcs
Row 2 ring segment	-	-	-	-	-	-	2 set	128 pcs
Spark plug assembly	2 sets	4 pcs	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ultraviolet flame [illegible] assembly	2 sets	8 pcs	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Thermoco[illegible] exhaust [illegible]	2 sets	52 pcs	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Eac[illegible]	1 sets	2 pcs	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1 sets	1 pcs	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

WHY LONG TERM SERVICE AGREEMENT IS REQUIRED

- The major facilities of the combined cycle power generation facility include a gas turbine, HRSG and steam turbine. Generally, of these major facilities, the gas turbine is characterized by the greatest failure rate.

- The maintenance of the gas turbine has a serious impact on the overall availability factor of the plant. The combustor and turbine blade as high-temperature parts of the gas turbine are exposed to a high-temperature gas of 1,000°C or more during the operation. This means more serious deterioration and damage as compared to the blade of the steam turbine. Inspection, repair and replacement are required in a shorter period of time.

- Thus, these high-temperature parts have their expected service life set for each type by the manufacturer, the user is required to conduct inspection, repair and replacement at prescribed maintenance intervals until the service life expires.

WHY LONG TERM SERVICE AGREEMENT IS REQUIRED (CURRENT TREND OF EOT)

- **The gas turbine inspection intervals may differ to some extend in conformity to each manufacturer. Generally, inspection is carried out for each of the following three types in recent years. Due to the technological development and improvement of the material used for the gas turbine, the combustor inspection interval of 8,000h has come to be extended. For example, GE has changed the EOT concept to allow the extension of the inspection intervals. Similarly, MHI (Mitsubishi Heavy Industries, Ltd.) and Siemens allow the combustor inspection intervals to be extended to 12,000h.**

Features of the Long-term maintenance management service

Item	Long-term maintenance management agreement	Separate ordering
Inspection, repair and replacement management for high-temperature parts	Package management by provider	Management by user
Monitoring of gas turbine operation status	Contribution to improvement of remote monitoring availability factor also on the part of the provider	Monitoring by user alone
Engineer	Stationed	Not stationed
Availability factor	Assured (optional)	Not assured
Costs of inspection, repair and replacement management for high-temperature parts, and payment	Monthly payment of a fixed amount at a package price. The price is equal to or less than the total cost at the time of separate ordering. The cost of unexpected repairs or replacements is paid by the provider (except when the user is responsible).	For each inspection, the amount corresponding to the repair and replacement is paid. The cost of unexpected repairs or replacements is paid by the user.

SPECIAL CONSIDERATION TO IRAQ POWER SECTOR IN FUTURE

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GOAL TO BE ACHIEVED BY MOE

Why MOE dose require structural reform of the power sector

➤It is necessary to illustrate the ideal image of the power sector as they ought to be in future when this Project is implemented. Especially during the period from 2015 through 2018, a great number of gas turbines will be laid out in parallel on the system. The gas turbines to be placed in parallel will be converted into a combined cycle. When the MOE as a national agency is to work out a plan of installing new facilities and to take charge of the management in the maintenance of the existing power generation facilities, the MOE will be required to take correct steps in various aspects in the distribution of the national budget and efficient management. The MOE as an agent responsible for power supply is required to reconsider the reason for the need of implementing the structural reform in terms of "characteristics of the electricity as an asset" and "mission of electric industry".

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Characteristics of the electricity as an asset

➢Electricity has inherent characteristics that cannot be found in other assets. Electricity requires the supply-demand balance to be kept at all times. For example, the electric industry and telecommunications industry belong to the same network industry. However, when the demand has been increased close to the limit of the supply capacity, "The line is busy" will occur and communications will be disabled in the telecommunications industry. When the supply-demand balance has been recovered, communications are resumed. However, electricity cannot be stored. This requires the supply-demand balance to be kept at every moment. If the demand/supply balance cannot be maintained, blackout may occur over an extensive range.

➢If the required supply cannot be ensured and supply-demand balance cannot be maintained due to a failure in the design of the business model, the people's living and economic activities will be exposed to a serious impact.

➢Electricity cannot be easily replaced by other alternative, and the demand is less elastic, although electricity is essential to people's lives and economic activities.

➢Much time is required to construct the facilities and shortage of electricity cannot be covered immediately. To put it another way, the supply of electricity is less elastic.

•Mission of electric industry

The mission of the electric industry is to supply electricity at a stable and reduced price.

➢To achieve this mission, compatibility between the public requirements (ensuring the energy security and environment for maintaining the supply reliability) and efficiency is indispensable.

➢Efforts should be made to promote efficiency in business administration and to form the facilities for power source distribution as an integral unit from the long-term viewpoint, thereby meeting the public requirements through the operation.

➢Because of the characteristics of electricity as an asset, the national agency as an electricity supplier is faced with difficult management problems in meeting the public requirements, when consideration is given to such a basic item as mission of the electric industry.

History of Power Sector Reform in Japan

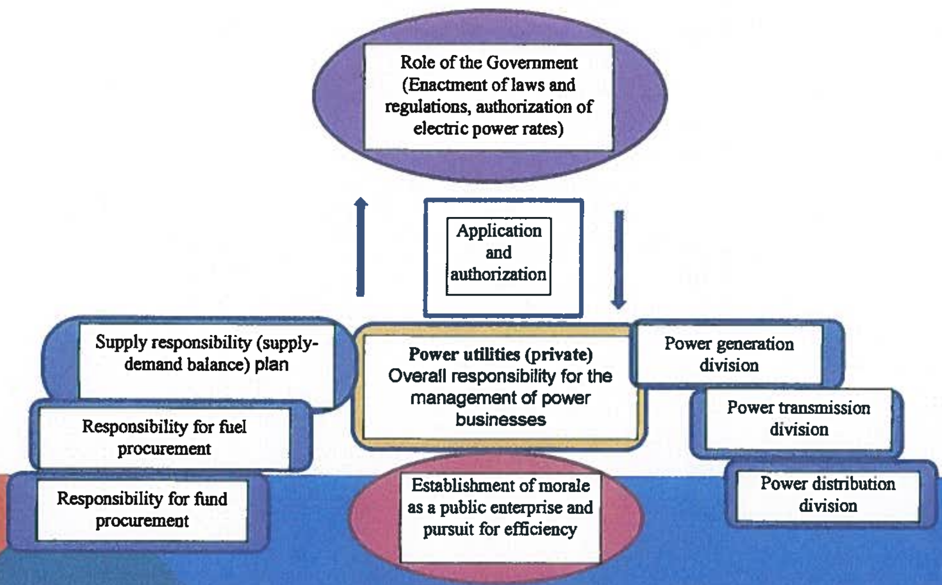
Looking back on the transition of electric industrial regime in Japan

➢State control management was enforced in the 1940s.
overall policy of reduced and uniform low-electric power rate was adopted throughout Japan, the result that the Government subsidy had to be granted.
Further, the location and scope of responsibility for power supply and distribution became less clear for the Government.
This resulted in frequent blackout and deterioration in services.

Based on the experience learnt from these problems,

➢ Japan was divided into nine areas in the 1950s
private companies voluntarily took responsibility for power supply in a system covering both power transmission and distribution in an integrated manner, thereby ensuring stable power supply to all parts of the country.
As a result, the supply of electricity as a major segment of the social infrastructure was successfully separated from the management by the national agency.
These private companies were responsible for voluntary business administration and operation in the supply of electricity, so that demand/supply balance for each region could be achieved at an earlier date.
This has successfully encouraged development and improvement of power supply in each region, and made a significant contribution to the development of the Japanese economy thereafter.

Demarcation Image of Governmental Authorities and Power Utilities Responsibility



As shown the above, when the power supply structure has grown in size, it is essential for Iraq to minimize the impact of the Government and to design a system capable of improving the electricity infrastructure through quick decision-making step.

Road map for implementing the structural reform of power sector (2015-2020)

Reform of the existing power plant

➢**All the existing power plants in the public sector should be converted into profit centers, which should be integrated into several corporations in the final phase.**

➢ **The business management and financial planning should be worked out.**

➢**The Government (MOE) should be responsible for the structural reform of power sector, and new businesses should be managed on a commercial basis.**

➢**Technological level should be upgraded and management efficiency should be enhanced. A management plan should be worked out in an effort to establish the optimum governance.**

Road map for implementing the structural reform of power sector (2015-2020)

- **Particular care should be taken in working out a human resource development program.**
- **Quality management activities should be introduced to upgrade technological level and management capacity, and to establish an accountability framework.**

A new power plant

- **The optimum governance, effective O&M and commercial environment should be established in the power plant of the public sector.**

Attachment 4.2

GENERATION COST SENSIVITY ANALYSIS

No.	Description	Unit	Iraq Units 1 & 2				
1	Installed Capacity	MW	1654	1654	1654	1654	1654
2	Const. Cost (Base Cost)	$/KW	1,158.00	1,158.00	1,158.00	1,158.00	1,158.00
3	Construction Period	Year	4.5	4.5	4.5	4.5	4.5
4	I.D.C.	$/KW	35.43	35.43	35.43	35.43	35.43
5	Capital Cost + I.D.C.	$/KW	1,193.43	1,193.43	1,193.43	1,193.43	1,193.43
6	Life Time	Years	5	10	15	20	25
7	Discount Rate	%	10.00%	10.00%	10.00%	10.00%	10.00%
8	C.R.F		26.38%	16.27%	13.15%	11.75%	11.02%
9	Annual Capital Cost	$/Kw-y	314.83	194.23	156.91	140.18	131.48
10	Annual Operation Cost	$/Kw-y	31.48	19.42	15.69	14.02	13.15
11	Utilization Factor	%	80%	80%	80%	80%	80%
12	Fuel Cost	$/ton	115	115	115	115	115
13	Fuel Heat Content	Kcal/Kg	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00
14	Heat Rate (G.E.)	Kcal/KWh	1,508.77	1,508.77	1,508.77	1,508.77	1,508.77
15	Fuel Cost	Mil/KWh	17.35	17.35	17.35	17.35	17.35
16	Capital Cost	Mil/KWh	44.92	27.71	22.39	20.00	18.76
17	O/M Cost	Mil/KWh	4.49	2.77	2.24	2.00	1.88
18	Aux. Power Loss	%	3.50%	3.50%	3.50%	3.50%	3.50%
20	Generation Cost	Mil/KWh	66.77	47.84	41.98	39.35	37.99
21	Net Generation Cost	Mil/KWh	69.19	49.57	43.50	40.78	39.37

Attachment 5

4th Mission

6.Economic and Financial Analysis

February 2012

Contents

1. Result of Financial/Economic Analysis

Financial Analysis

Financial Internal Rate of Return (FIRR): **5.8 %**

⬇

Financially Not Viable (Not profitable)

Economic Analysis :

Economic Internal Rate of Return (EIRR): **24.4 %**

⬇

Economically Viable

2. Methodologies

(1) FIRR

Although FIRR cannot be practically calculated as an independent project in this case, imaginary FIRR (Project IRR) is calculated as if it is an independent project for reference.

FIRR is the indicator to measure the financial return on investment of project and is calculated based on CAPEX, OPEX, revenues and etc.

(2) EIRR

EIRR calculation based on benefits made by the project such as Willingness to pay (WTP)

Tariff rate is assumed based on

① Purchasing cost of power from the foreign country

② Electric bill to be paid by power users

Calculation of WTP: WTP=(Min. Rate)+{(Max. Rate)-(Min. Rate)}x 1/3

3. Assumptions

Output (1 Train)	Total	827	MW
	- Gas Turbine	565	MW
	- Steam Turbine	290	MW
	—Aux. & Losses	29	MW
Operation Hours		7,008	Hrs/Y
	Plant Capacity Factor	80%	
CAPEX	Total Capex	1,940	MMUS$
	EPC Cost	1,792	MMUS$
	Other Owners Cost	118	MMUS$
	PMC Cost	30	MMUS$
OPEX	Tariff	4.0	US$/mmbtu
	Efficiency	57%	
	Gas Cost	277	MMUS$/Year @1,653MW
	O&M Cost (Fixed)	7.27	US$/Kw/Year
	O&M Cost (Variable)	1.80	US$/MWh
Benefit		0.53	MMUS$/YkW
	Unit Price	7.5	Usc/KWH
Revenue	Base Case	0.292234	MMUS$/YKW
	(Unit Price)	4.17	Usc/KWH
	Low Case	0.257894	MMUS$/YKW
	(Unit Price)	3.68	Usc/KWH
Funding	Yen Loan Amount	0	MMUS$
	Iraqi Own Budget Amount	1940	MMUS$

4. FIRR Calculations

(Unit in MMUS$)

Project Year	Fiscal Year	Capex	Opex: Fuel	Opex: O&M Cost (Fixed)	Opex: O&M Cost (Variable)	Opex: Total (A)	Revenue (B)	Net Cash Flow	Output (KW): 1st Train Output	Output (KW): 2nd Train Output	Output (KW): Total Output
-3	2015	582	0	0	0	0	0	-582	0	0	0
-2	2016	970	0	0	0	0	0	-970	0	0	0
-1	2017	388	137	13	10	161	239	-310	546	273	819
1	2018	0	257	13	19	290	448	158	827	705	1,532
2	2019	0	277	13	21	311	483	172	827	827	1,653
3	2020	0	277	13	21	311	483	172	827	827	1,653
4	2021	0	277	13	21	311	483	172	827	827	1,653
5	2022	0	277	13	21	311	483	172	827	827	1,653
6	2023	0	277	13	21	311	483	172	827	827	1,653
7	2024	0	277	13	21	311	483	172	827	827	1,653
8	2025	0	277	13	21	311	483	172	827	827	1,653
9	2026	0	277	13	21	311	483	172	827	827	1,653
10	2027	0	277	13	21	311	483	172	827	827	1,653
11	2028	0	277	13	21	311	483	172	827	827	1,653
12	2029	0	277	13	21	311	483	172	827	827	1,653
13	2030	0	277	13	21	311	483	172	827	827	1,653
14	2031	0	277	13	21	311	483	172	827	827	1,653
15	2032	0	277	13	21	311	483	172	827	827	1,653
16	2033	0	277	13	21	311	483	172	827	827	1,653
17	2034	0	277	13	21	311	483	172	827	827	1,653
18	2035	0	277	13	21	311	483	172	827	827	1,653
19	2036	0	277	13	21	311	483	172	827	827	1,653
20	2037	0	277	13	21	311	483	172	827	827	1,653
	Total	1,940	5,667	275	426	6,367	9,867	3,112			
							FIRR	5.8%			

Note: * Project Schedule is set out for 20 years commencing at the point of commencement of 2nd train at full load. Meanwhile, a part of the facility starts operation in 2017 and it is counted in the cash flow analysis above.

5. EIRR Calculations

(Unit in MMUS$)

Project Year	Fiscal Year	Economic Cost: Capital	Economic Cost: Fuel	Economic Cost: O&M Cost (Fixed)	Economic Cost: O&M Cost (Variable)	Economic Cost: Total (A)	Economic Benefit (B)	(B) - (A)
-3	2015	582	0	0	0	582	0	-582
-2	2016	970	0	0	0	970	0	-970
-1	2017	388	137	13	10	549	430	-118
1	2018	0	257	13	19	290	805	516
2	2019	0	277	13	21	311	869	558
3	2020	0	277	13	21	311	869	558
4	2021	0	277	13	21	311	869	558
5	2022	0	277	13	21	311	869	558
6	2023	0	277	13	21	311	869	558
7	2024	0	277	13	21	311	869	558
8	2025	0	277	13	21	311	869	558
9	2026	0	277	13	21	311	869	558
10	2027	0	277	13	21	311	869	558
11	2028	0	277	13	21	311	869	558
12	2029	0	277	13	21	311	869	558
13	2030	0	277	13	21	311	869	558
14	2031	0	277	13	21	311	869	558
15	2032	0	277	13	21	311	869	558
16	2033	0	277	13	21	311	869	558
17	2034	0	277	13	21	311	869	558
18	2035	0	277	13	21	311	869	558
19	2036	0	277	13	21	311	869	558
20	2037	0	277	13	21	311	869	558
	Total	1,940	5,667	275	426	8,307	17,746	9,439
							EIRR	24.4%

Output (MW): 1st Train Output	2nd Train Output	Total Output
0	0	0
0	0	0
546	273	819
827	705	1,532
827	827	1,653
827	827	1,653
827	827	1,653
827	827	1,653
827	827	1,653
827	827	1,653
827	827	1,653
827	827	1,653
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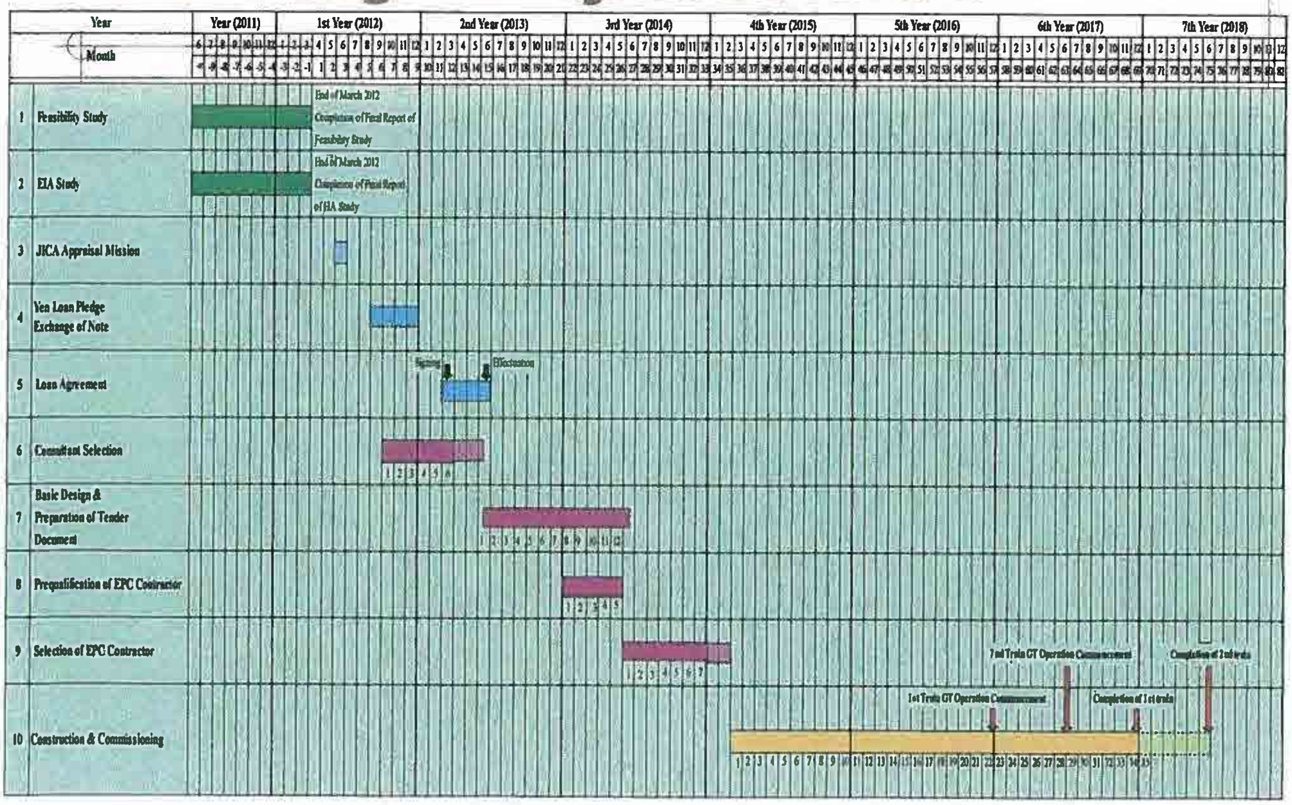
827	827	1,653
827	827	1,653

6. Envisaged Project Schedule



Attachment 6

4th Mission
Environmental and social considerations

February 2012

1. Progress of the EIA Report
2. Major expected impacts and mitigation measures
3. Conclusion (to be discussed)
4. Recommendations (to be discussed)
5. Submission of the EIA Report to MOEN (to be discussed)

1. Progress of the EIA Report

(1) It is in a process of finalization. The contents of Chapter 7 "Environmental impacts" and Chapter 8 "Environmental management plan" are to be finalized.

(2) At the 4th mission, the EIA Team will check the contents of the entire report.

2. Major expected impacts and mitigation measures (1)

(1) Resettlement

It is one of the major impacts to the social environment.

<u>Mitigation measures</u>

It has been avoided by the comprehensive site selection.

2. Major expected impacts and mitigation measures (2)

(2) Impacts on natural environment

Precious natural environment such as a national park, and critical habitats for endangered species are to be protected.

<u>Mitigation measures</u>

Although these areas are excluded in the process of the site selections, the water issue needs to be considered.

2. Major expected impacts and mitigation measures (3)

(3) Impacts by environmental pollution

Without appropriate mitigation measures, air pollution, water pollution, solid waste, noise/vibration pollution are expected.

The next slide shows examples of mitigation measures.

2. Major impacts and mitigation measures (4)

Air pollution is mitigated by:

1) Selection of fuel (natural gas)

2) Selection of generation type (combined cycle)

3) Selection of height of stack

Water pollution is mitigated by:

1) Appropriate selection and design of the facility

2) Adequate waste water management at the plant

3. Conclusion (1)

(The contents need to be discussed)

The Project is designed to fulfill both Iraqi laws and the JICA Guidelines for environmental considerations.

(1) Comprehensive and logical evaluation of candidate sites have been successfully conducted to have resulted in the best site, Nasiryah, for Mega-Power project (Nasiryah II Project) in economic, technical and environmental aspects.

3. Conclusion (2)

(2) Nasiryah II is designed to follow the Iraqi and international environmental standards.

(3) Every mitigation measure will be taken under MOE's supervision during both the construction and operation stages.

(4) Stakeholders and relevant authorities have been involved in the process of authorization of the EIA activities of the Project, and their comments are reflected in the Project.

4. Recommendations (1)

(The contents need to be discussed)

Pending issues: they are related to the overall budget

(1) The detailed design of the facility

To follow the guidelines, a further survey is needed to measure backgound ambient air quality around the site to determine the stack height.

(2) Solid waste management within the project site

A further survey is needed to determine the capacity and structure of the solid waste management site (dumping site) within the project site.

4. Recommendations (3)

(The contents need to be discussed)

(1) For the planned transmission line for Nasiryah I, MOE should be responsible for conduct the environmental and social considerations for its construction.

(2) For the planned gas pipeline for Nasiryah I, MOE should be responsible for communicating with MOO to conduct the environmental and social considerations for its construction.

5. Submission of the EIA Report to MOEN

(The schedule needs to be discussed)

(1) The Study Team plans to submit the version for the 2nd stakeholders meeting to MOE by the middle of March 2012.

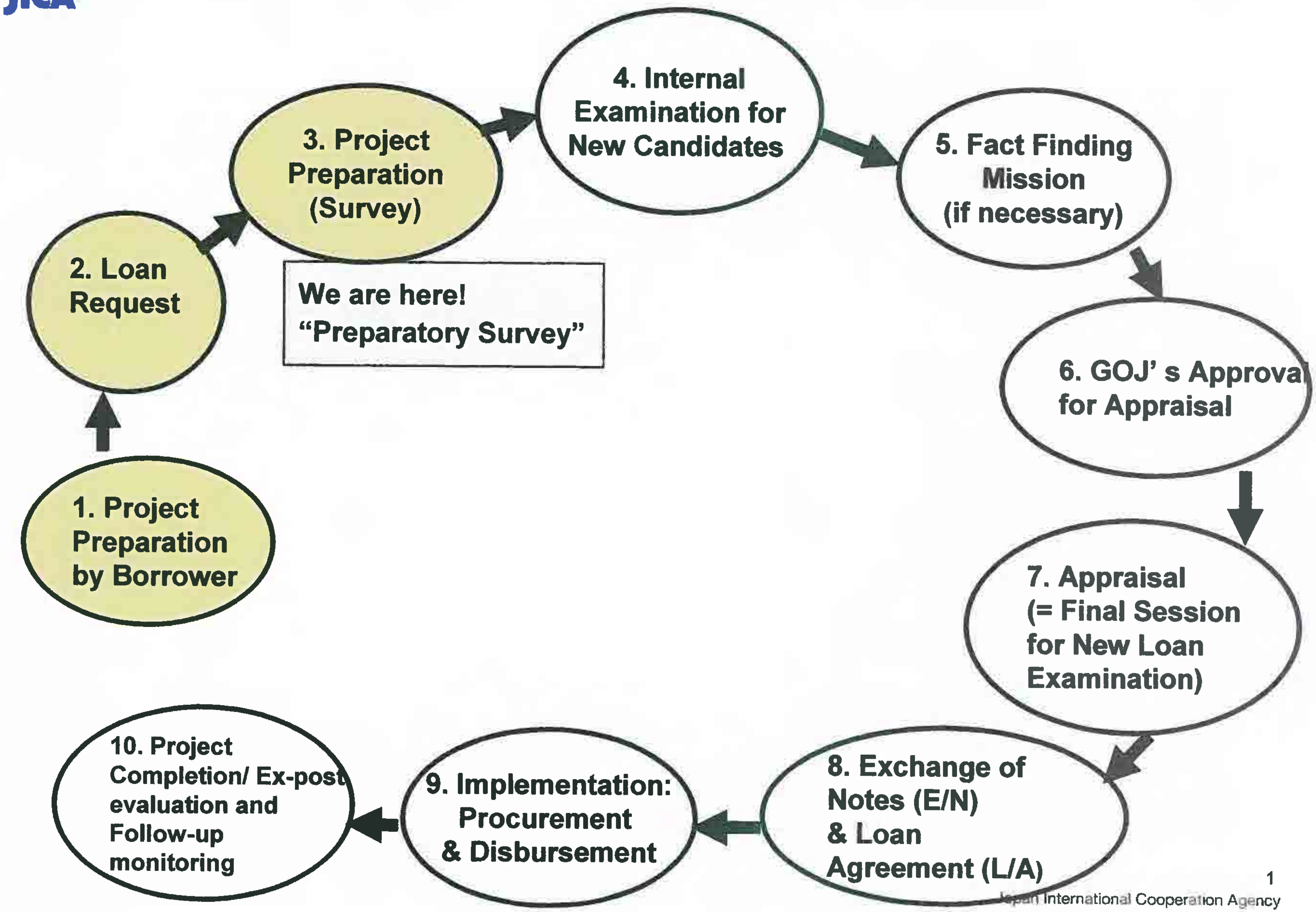
(2) MOE is responsible for submitting the EIA Report to MOEN by the end of March 2012.

Attachment 7

Schedule for completion of JICA preparatory study

Date	JICA report	EIA report (Reference)
6 to 15 - Feb	4th Mission (ISTANBUL)	
20 - Feb		EIA Df/R
21 - Feb		2nd Stake holder meeting
23 - Feb		Anbar Uni. to JICA Team
2 - March	Df/R (Submission to JICA & MOE)	
11 - March	Df/R (Comment from JICA & MOE)	Finalization by MOE
17 to 22 -March	F/R (Printing and Booking)	
23 - March	F/R (Submission to MOE & JICA)	
29 - March		F/R(Submission to MOEn)
30 - March	Completion JICA Study	

Basic Cycle of New Candidates



Attachment 8