

For Sale : Used Cogeneration 51 MW, 50Hz Gas-Steam Combined Cycle Power Plant in Excellent Condition.

Combined Cycle Power Plant, 51 MW, 50 Hz, Heavy Oil- fired.

Owner's purchased one set each of PG6471B Gas Turbine Generator and N15-3.43 Steam Turbine Generator . **Total operation hours were 30268.1(LFO 29845.5 hours and HFO 422.6 hours)**
Due to various reasons, owner's is planning to sell the complete plant. All equipment is in perfect condition.

Appendix I

Technical Specification

for

PG6471B Gas Turbine Generating Set

Nanjing Turbine & Electric Machinery (Group) Co., Ltd.

Technical Specification

for

PG6471B Gas Turbine Generating Set

1. Manufacturing

The gas turbine generating set is produced under Manufacture Associate Agreement with GE Company of USA. The compressor- turbine rotor, stator vane of compressor, turbine nozzles, combustion system and Speedtronic Mark IV control panel as well as drawings are provided by GE.

2. Structure

PG6471B gas turbine generating set is a package unit and can be installed for outdoor operation. It is composed of four blocks i.e. the gas turbine and accessories compartment, control compartment, load gear box enclosure and generator compartment.

The control panel of gas turbine, control panel and protection panels of generator, motor control center (M.C.C.) are located in the control compartment. Neutral point and outgoing leads cabinet are situated at each sides of the generator compartment. The whole unit is furnished with necessary ventilation, lighting and fire-fighting system. There is air conditioners in the control compartment.

1. Technical Specification.

3.1 Base load (ISO condition) (guaranteed value)

		Distillate oil	HFO
Output	kW	36475	35200
Heat rate	kJ/kW.h	11786	12099
Inlet temp. of turbine	°	1104	1104
Exhaust temperature	°C	539	529
Exhaust gas flow	kg/h x10 ^{x3}	491	491

Note: above performance is measured at generator terminals and includes allowances for the effects on shaft driven auxiliaries, and 2.55 in H2O (6.48 mbar) inlet and 2.52 in H2O (6.4 mbar) exhaust pressure drops.

3.2 Performance correction on the non-ISO conditions.

3.2.1 Altitude correction on curve 416HA662 Rev A.

3.2.2 Ambient temperature correction on curve 544HA876-2 Rev 0 and 544HA875-2Rev 0.

3.2.3 Effect of modulating IGV's on exhaust temperature and flow on curve 544HA876-3Rev 0.and 544875-3 Rev.0

3.2.4 Humidity correction on curve 498HA697 Rev B.

3.2.5 Effect on pressure drop.

- Air inlet pressure loss increase every 996 Pa, results an output decrease of 1.50%, and a heat rate increase of 0.50%, exhaust temperature increase 1.2 °C.
- Exhaust pressure loss increase every 996 Pa, results an output decrease of 0.50%, and a heat rate increase of 0.50%, exhaust temperature increase of 1.2 °C.

3.2.6 Noise 93 dB (A) at 1m from each machine

3.4 Generator

Type:	QFR-36-2
Output:	36000 kW
Voltage:	10500 V
Current:	2474.4 A
Frequency:	50 Hz
Power factor:	0.8
Speed:	3000 rpm
Efficiency:	97.7%
Protection type:	IF 44

Synchronous reactance (saturated):	247%
Transient reactance (saturated):	22%
Sub-transient reactance (saturated):	14.8%
Negative sequence reactance (saturated):	19%
Short circuit ratio:	$\frac{1}{\omega}$ 0.46
Insulation class:	B
Connection:	Y
Cooling mode:	CACW
Cooling temperature	40

Note: The output of generator can be matched with the gas turbine output requirement.

Appendix II

Scope of Supply

for

PG6471B Gas Turbine Generating Set

(SMD start, simple cycle, axial air inlet, upward exhaust)

1. Gas Turbine Compartments

Single shaft gas turbine fitted on a common base with its accessories is built for weatherproof conditions, the enclosure is provided with thermal and acoustical insulation, heating and ventilation.

1.1 Gas turbine

- 1.1.1 Air inlet plenum and ducting of compressor
- 1.1.2 Inlet guide vane (IGV)
- 1.1.3 17 stages single shaft axial compressor
- 1.1.4 10 can-type combustors and ignitor, flame detector etc.
- 1.1.5 3 stages axial turbine

There are borescope inspection holes on the casings for maintenance. There is anti-corrosion coating on first stage bucket.

- 1.1.6 Exhaust plenum and ducting
- 1.1.7 Turbine supports
- 1.1.8 Load coupling

1.2 Accessory equipment

- 1.2.1 Multi-shaft accessory gear and over-speed bolts
- 1.2.2 Auxiliary coupling

1.2.3 Lube oil system

Main lube oil pump, accessory lube oil pump and emergency pump, duplex filters, duplex oil coolers, safety valves, pressure regulating valves, oil level indicators, oil heaters, temperature switches, pressure switches and piping.

1.2.4 Cooling and sealing system

Two cooler fans of turbine, two bleeding valves of compressor and solenoid valves, limit switches, pneumatic isolating valve, orifice and piping.

1.2.5 Hydraulic oil system

Main hydraulic oil pump, accessory hydraulic oil pump, safety valves, change-over duplex filter and valves, manifold, pressure switches and piping.

1.2.6 Trip oil system

Emergency trip oil device, pressure switches, fuel oil stop valve, orifice and piping.

1.2.7 Cooling water system

Temperature control valve of lube oil manifold, orifice and piping.

1.2.8 Starting means

SMD, hydraulic torque converter, starting clutch, control solenoid valves, safety valves, pressure switches.

1.2.9 Hydraulic turning gear system

Turning gear device, oil pump (DC), control unit, servo-operated cylinder of clutch, oil filter, safety valves, limit switches and piping.

1.2.10 Fuel oil system

Fuel oil pump, fuel oil stop valve, fuel oil filter, flow divider, by-pass control valve, by-pass servo-valve, starting-failure draining valve, check valve, pressure measuring transfer valve, pressure switch, limit switch and piping.

1.2.11 Atomizing air system

Main atomizing air compressor, starting atomizing air compressor, atomizing air pre-cooler, solenoid valve, check valve, safety valve, temperature switch, pressure switch and piping.

1.2.13 Ventilation in enclosure

Ventilation fans

1.2.14 IGV system

IGV actuating device, IGV servo-unit, hydraulic control modules, accumulator, transmitter for travel, solenoid valve and piping

1.2.15 Measuring system including protection system for over-speed, over-temperature, vibration, flame-off, lube oil pressure, lube oil temperature and measuring elements and local instrumentation such as speed sensor, various thermocouples, vibration sensor, flame detectors, pressure switches, temperature switches.

1.2.16 Lighting system (AC, DC) in gas turbine enclosure

1.2.17 Ductwork for internal wiring of system

1.2.18 Water washing system for compressor

1.2.19 CO₂ fire-fighting system and flame detection system

1.3 Gas turbine base

The gas turbine and accessories are mounted on the same base. The lube oil tank and 1#, 2# junction boxes are also mounted on it.

1.4 Enclosure

With ventilation, lighting and fire-fighting devices, the enclosure contain the GT compartment and accessory compartment.

1.5 Walk-way on the unit

Walk-way grid, railing, staircase etc.

2. Control Compartment

The main control panel of the gas turbine generating set are contained in the cabinet. It is air-conditioned and well illuminated.

The cabinet is set on its own base and enclosure.

2.1 GT control panel (SPEEDTRONIC MARK IV)

- 2.2 Generator control panel
- 2.3 Generator protection panel
- 2.4 M.C.C
- 2.5 Two sets of air conditioners located at wall
- 2.6 Cabling and tubing for air conditioning, lighting in the cabinet
- 2.7 Base of the cabinet
- 2.8 Enclosure of the cabinet

3. Load Gearbox Compartment

Load gearbox, gearbox base, enclosure with weatherproof, sound insulation, ventilation, lighting and fire-fighting devices.

4. Generator compartment

- 4.1 Generator (type: QFR-36-2)
- 4.2 AC brushless exciter
- 4.3 Permanent magnet pilot exciter
- 4.4 Generator outgoing lead booth
Including three phases arrester, discharge counter, protection capacitor and outgoing terminals
- 4.5 Generator neutral point booth
Including CT, arrester, etc.
- 4.6 Modular Automatic Voltage Regulator (MAVR)
- 4.7 Air cooler of generator
- 4.8 Enclosure of generator (with weatherproof, sound insulation, lighting and fire-fighting devices)

5. Air Inlet system

- 5.1 Self-cleaning air filter and control system
- 5.2 Air inlet ducting, silencer and support
- 5.3 Air process system (provide for purging of air filter after treatment of compressing air from compressor) and standby air purging source

6. Exhaust System

6.1 Exhaust ducting and exhaust silencer and expansion joint

6.2 Stack (level of outlet is 20m above base)

7. Fire-fighting Device

CO₂ cabinet, control and alarming device and piping

8. Water Washing Skid (One unit will be provided for one power plant)

9. Special Tools (One set will be provided for one power plant. If there are over three GT Gensets, additional one set will be provided.)

9.1 Tool for liner

9.2 Fixture for fuel nozzles

9.3 2 guide stems (for dismantling and assembling of bearing cover, compressor and turbine casing)

9.4 Alignment tools

9.5 Dismantling and assembling tools for No.2 bearing and load Coupling

9.6 GT Rotor lifting tool

9.7 Generator rotor withdrawing tool

9.8 Disassembling and assembling tools for retaining ring

9.9 Diode fixture tool (belong to exciter)

10. Wedge Plates and Anchor Bolts

All special packing plates for the unit erection, regulating shims and anchor bolts (including ordinary leveling plates and the embedded parts)

11. Spare Parts Provided with GT Genset

Shall be provided according to " Scope of Supply of PG6471B Gas Turbine Generating Set "

12. Five copies of drawings provided with the GT Genset

12.1 Installation drawings

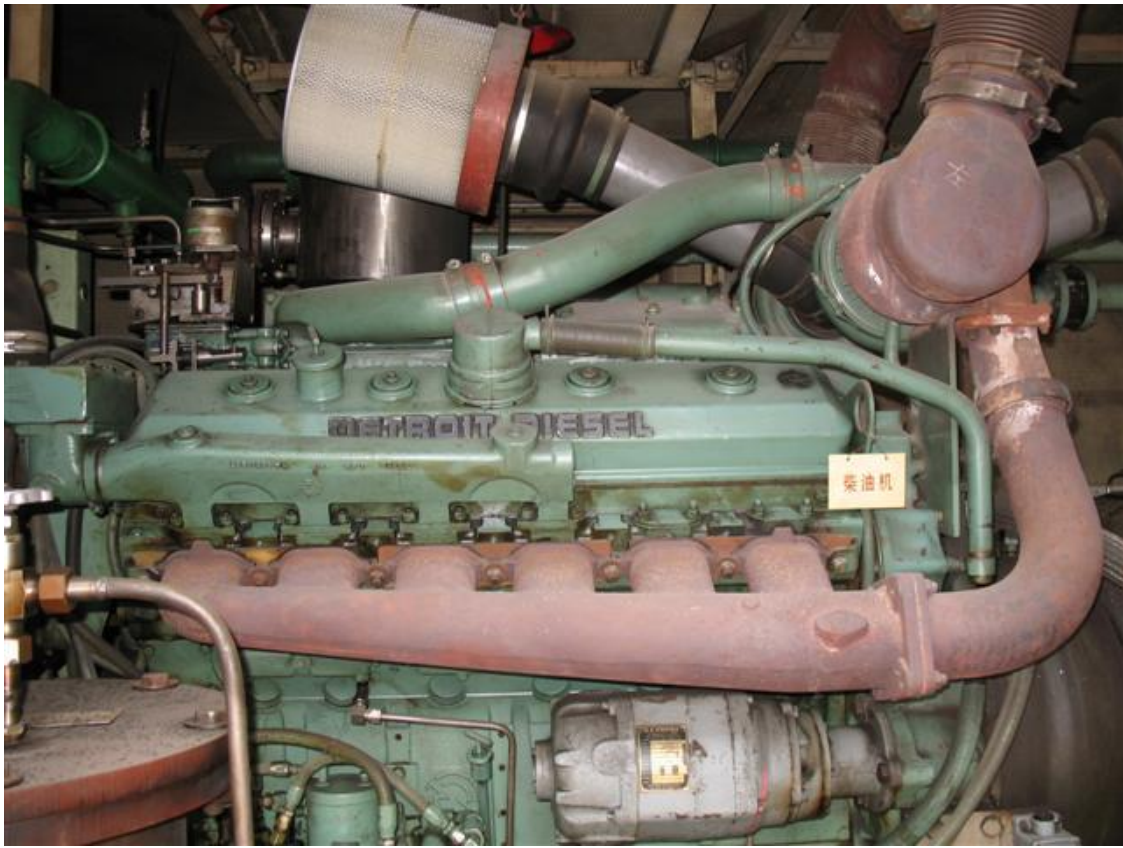
- 12.2 Outline of foundation; Arrangement of anchor bolts;
- 12.3 Interface diagram of enduser's piping;
- 12.4 Wiring of gas turbine;
- 12.5 Clearance of gas turbine;
- 12.6 Arrangement of gas turbine generating set;
- 12.7 Center of weight for gas turbine; Center of weight for gas turbine generating set;
- 12.8 Alignment;
- 12.9 Schematic piping system;
- 12.10 One-line diagram of generator;
- 12.11 Drawings of spare parts

- 13. Five copies of documents provided with the GT Genset
 - 13.1 Operation and maintenance manual including curves of output and heat rate at different environmental condition
 - 13.2 Installation and alignment instruction
 - 13.3 Control specification and manual of turbine control panel
 - 13.4 Report of test-run in the factory; Product certificate
 - 13.5 Other documents which the enduser's needs











PLEASE NOTE the following Scope of Supply WILL COMPLEMENT THE COMBINED CYCLE POWER PLANT:

- 1x15 MW condensing steam turbine generator
- Exhaust gas boiler (HRSG) including exhaust gas stack
- Exhaust gas duct work leading to exhaust gas stack, including baffles
- Plus all BOP.
- 1x55 t/h HRSG include all auxiliaries

Nanjing Turbine & Electric Machinery (Group) Co., Ltd.

Main technical parameters of steam turbine

1. Main technical parameters of 15MW steam turbine

1.1 Model: **N15-3.43**

1.2 Type: Condensing turbine

1.3 Rated power: 15MW

1.4 Rated rotate speed: 3000r/min

1.5 Rotate direction of rotor: Clockwise (face to generator from the position of steam turbine)

1.6 Steam pressure at main stop valve: 3.43 Mpa (a)

1.7 Steam temperature at main stop valve: 435°C

1.8 Temperature of cooling water 20°C (winter), 33°C (summer)

1.9 Max. ability of steam admission for steam turbine: 74/h

1.10 Weight of biggest part in steam turbine: 21t

Weight of steam turbine rotor: 6.45t

Body dimension of steam turbine: 6628×4890×3685

1.11 Power of examining operating condition: 15MW

Condition: Rated pressure of main steam: 3.43 Mpa (a)

Rated temperature of main steam: 435°C

Flow of main steam: 70.2t

Steam consumption 4.184kg/kwh

Feed-water ratio: 0

Temperature of cooling water: 20°C

2. Technical requirements of steam turbine

2.1 Equipment performance requirements of steam turbine

2.1.1 Straight condensing operating conditions

The steam turbine generator should be able to continuously operate without accident under following conditions, the net power from generator is 15 MW, and here, it is under the straight condensing operating conditions:

- 1 _ The parameter of main steam is rated value
 - 2 _ Temperature of cooling water: 25°C 3000t/h
 - 3 _ Feed-water ratio: 0
- 4 _ Efficiency of generator: 97.4%

3 . Main parameters of condenser

(1) Type:	single shell, two-pass bisection, and surface model
(2) Model:	N-1000-2
(3) Total effective area of condenser tube:	1000m ²
(4) Circulating water flow:	3000t/h
(5) Average flow speed of circulating water in tube:	1.9 m /s
(6) Design cleanliness factor:	0.80
(7) Design of circulating water and thermometer (allowed for feed water of max. temperature)	20℃
(8) Total water resistance in tube (when water flow is 1.56m ³ /s):	42 kpa. g
(9) External dimension of condenser:	8270(mm) ×3400(mm) ×4810(mm)
(10) Connection type of condenser casing and turbine exhaust outlet:	rigid
Condenser (without water)	37500kg
Condenser (when operating)	58000kg
Condenser (full with water)	68700kg

Technical specification of fixed-type steam turbine for power generation use
(GB5578-198)

5 Scope of supply

For the scope of supply, see appendix I (Scope of supply for 15MW steam turbine generator set) for details.

Part Two: Generator

1. Brief introduction

- 1.1 This part is applied to the technical specifications for structures of steam turbine generator, excitation system and excitation regulator, design performance, function, installation, test, etc.
- 1.2 Under the conditions of rated frequency, rated voltage, rated power factor and rated cooling medium, the consecutive output power of generator is 15 MW.
- 1.3 Maximal output capacity of generator should be matched with the output power of steam turbine under the operating condition of maximal steam admission (VWO). In addition, the power factor should be same as the rated value, and for long operating, the each part of temperature rise should not exceed the value stipulated in GB- T7064-1996.

1.4 The rated power factor of generator is 0.80 (lag), the rated rotate speed is 3000rpm/min, and the frequency is 50Hz.

1.5 The cooling mode of generator is air cooling mode.

1.6 The excitation mode of generator is coaxial alternating-current excitor excitation.

1.7 The unit used is State legal metrological unit.

1.8 The warranty service life of generator is not less than 30 years.

2. Technical requirement

2.1 Fundamental parameters and size

Model:	QF-15-2
Rated power:	15MW
Rated power factor:	0.80 (lag)
Rated voltage:	10.5KV
Rated rotate speed:	3000r/min
Rated frequency:	50Hz
Phase number:	3
Connection mode of stator coil:	Y
Rated efficiency: 额定效率	≥97.4%
Insulation class of generator stator and rotor:	F
Noise (1 m from shell, rated power):	___92 dB (A grade)

2.2 Number of wire outlet of generator: 6

2.3 Rotating direction of generator:

Clockwise (face to generator from the position of steam turbine)

2.4 Max. hoisting weight: 32.7t

2.5 Party B should provide complete data to meet the requirements of thermal detection and control, including alarm value, protection actuation value for each parameter.

2.6 The temperature measurement elements and other thermal detection and control devices provided together with equipments should meet State current relevant standards.

2.7 The limit values of temperature and temperature rise for each part of stator and rotor of generator should meet the stipulations of "Technical specification of turbo-type synchronous motor (GB-T7064-1996)".

2.8 The temperature of generator bearing gathering should not exceed 65℃, and the temperature of metallic part of bearing should not exceed 80℃.

2.9 Permissible value of vibration for each part of generator

When running combined with steam turbine generator and exciter under rated rotate speed:

The vibration limit value (double-amplitude) of bearing housing should not be greater than 0.03 in horizontal direction as well as vertical direction. If over the critical speed, it should be less than 0.15 mm.

2.10 For the design of air cooler, if one group of cooler stops operation due to some causation, the generator can be able to bear 75% of power to continuously operate, and not exceed the permissible value of temperature rise. Party B should ensure that the effective measures are adopted in the design of air cooler to prevent water leakage of air cooler tubes.

2.11 The stator winding should bear the following over-current in a short time without harmful deformation.

Over current time (s)	10	30	60	120
Rated stator current (%)	226	154	130	116

2.12 The rotor winding should have the ability to bear following over-voltage in a short time.

Over voltage time (s)	10	30	60	120
Rated excitation voltage (%)	208	146	125	112

2.13 The generator should have the ability of asynchronous operation under the condition of field loss. When the trouble of excitation system is occurred, if the electric network is normal, the generator should stably asynchronously operate with 50% of rated active power for 15-30 minutes.

2.14 Ability of leading phase operation: Under the condition that the power factor of leading phase is 0.95 (advance), the generator can continuously operate steadily with rated apparent power and the equipment is not damaged.

3. Excitation system

3.1 Excitation mode: The mode of generator excitation system is coaxial alternating-current brushless excitation.

The brushless excitation system is composed of AC exciter with rotary rectifier, permanent-magnet type sub exciter, and automatic voltage regulator.

3.2 If the excitation voltage and current of generator are not over the 1.1 times of the rated excitation voltage and current, the excitation system can be able to operate continuously.

3.3 The excitation system should have the edge load ability, the multiple of compelled excitation should not be less than 1.8, and permissible time of compelled excitation should not be less than 10 seconds.

3.4 Response ratio of excitation system (V) (namely rate of voltage rise) should not be lower than twofold/s.

3.5 Step response

Under the conditions of no-load and rated voltage, when the stage response set by voltage is 10%, the voltage overshoot of generator should not be greater than 50% step amount, the oscillation number is not over 3, and the regulation time for stator voltage of generator is not over 10 seconds.

3.6 For voltage regulation range of automatic excitation regulator, the generator can smoothly and stably adjust the voltage in 20-110% of rated voltage under the condition of no-load.

3.7 The excitation regulator (AVR) should be the equipment with remarkable achievement, and its performance should be credible. The additive units, such as over-excitation limit, over-excitation protection, low-excitation limit, etc should be equipped for excitation regulator.

3.8 In order to ensure the reliable operation of voltage regulator (AVR), it should have two working modes of auto and manual, so as to ensure normal operation.

3.9 The AVR with air cooling should be able to continuously operate under the ambient temperature /10℃ ~ 45℃, max. monthly relative humidity 90% as well as average min. temperature 25 ℃ (in certain month every year).

3.10 When shutdown due to malfunction, the field circuit breaker and resistor can be actuated for field suppression.

3.11 The excitation system can correctly operate when symmetrical or dissymmetrical short-circuit is occurred near the generator.

3.12 In AVR, the automatic regulation units for regulating voltage, reactive power and power factor should be equipped.

3.13 150Hz alternating current generator is adopted for main exciter, so as to adapt the requirement of the load with rectification, it should bear the three- phase symmetrical

or dissymmetrical short-circuit at outlet, and not produce harmful deformation which will not be restored.

3.14 The permanent magnet constant voltage generator is adopted for sub exciter, it has good external characteristic. From no-load to compelled excitation of generator, the terminal voltage should not exceed 10~25% of rated value.

3.15 In brushless excitation system, the rotary rectification elements can bear powerful centrifugal force and not cause any change and damage of performances in electric and mechanical aspects. The structure of rotary fuse should have high mechanical intensity, and can bear the powerful centrifugal force. The rectification elements should be tested strictly. The performance of consistency should be ensured for each element in parallel. If the rectification circuit fails, there should be indicated signal.

4. Others

4.1 The generator should have the ability to output rated power under following conditions:

When the temperature of cooling water in air cooler is 33°C , the generator can output rated power.

4.2 When rotor is over-speed (120% of rated rotate speed), the rotor of generator can bear it for 2 minute.

4.3 The user provide one path of 220 V DC power supply only.

4.4 Air cooling system

4.4.1 After shutdown of air cooler, the machine group can operate with rated load for more than 30 seconds.

4.4.2 The working pressure of cooling water for air cooler of generator is 0.2 Mpa, and the working temperature is not higher than 33°C .The design pressure of air cooler is 0.4 Mpa, and Party B should provide side pressure of air cooler.

Brief Introduction of the Heat Recovery Steam Generator.

1.1 Technical Conditions

This HRSG Island system is specially designed for Shaoxing Cogeneration Phase 51MW Gas- Steam Combined Cycle Power Project. Light oil is used for the gas turbine fuel. The whole HRSG boiler unit includes Exhaust gas system, HRSG boiler, boiler thermodynamic control system and accessorial facilities concerned.

1.1.1 Exhaust Gas System

1.1.1.1 General Description

The exhaust gas system consists of boiler flue gas inlet and boiler flue gas outlet. The exhaust gas system is mainly used for the delivery and release of exhaust gas during the period of boiler single cycle and combined cycle operation as well as the control of exhaust gas flow direction during the period of HRSG startup and breakdown.

- Technical conditions

Design temp.	548
Design pressure	2800Pa
Nominal operating course	10 m ²
Operating duration of valve plate	90s
Working medium	GT exhaust gas
Leakage rate	0.5%

1.1.2 HRSG Boiler

1.1.2.1 General Description

HRSG boiler is mainly used to recover waste heat from G.T. exhaust gas as much as possible and produce MT-MP steam which is carried to the steam turbine to do the work and drive the generator to generate.

1.1.2.2 Boiler Type and Main Technical Conditions

The heat recovery boiler is a natural circulation, one-pressure, non-afterburning, water-tube boiler with horizontal flue. The boiler is laid out in the open air. Located in the horizontal flue of boiler are vertical helical finned pipes of the heat-transmitting components.

The boiler model is .

1.4.2.2.1 Boiler Main Technical Conditions

Sr. No.	Item	Unit	Value
1	Ambient temperature	°C	15 (ISO conditions)
2	G.T. model	/	PG6471B
3	Unit operating condition	/	basic load combined cycle
4	G.T. fuel	/	0# light oil
5	G.T. exhaust temperature	°C	548
6	G.T. exhaust flow rate	t/h	
7	MP steam pressure	MPa	3.82
8	MP steam temp.	°C	445 ⁺⁵ ₋₁₀
9	MP steam output	t/h	

1.4.2.2.2 The operating life-span of Other Performance Data

- Maximum weight of overhaul parts: 14t
- Steam quality:

If Feedwater quality reaches

Total hardness	≤1.5umol/l
Iron	≤50 g/l
Copper	≤10g/l
PH	8.8-9.2
Oiliness quantity	≤1.0ug/l

The superheated steam quality would ensure: 过热蒸汽品质

Na	_>15	_0 g/kg
SiO ₂	_>20	_0 g/kg
Cu	_>5	_0 g/kg
Fe	_>20	_0 g/kg

- main boiler pressure parts would be more than 30 years and the overhaul period be more than 4 years.
- At the place of 1m far away from outer surface of equipment the noise would be less than 85dB.
- The HRSG flue gas temperature would be considered to avoid low-temperature sulfur corrosion as far as possible.

- Materials of Boiler pressure parts

Sr. No.	Name of Component	Material	Standard
1	MP Superheater		
1.1	Header	12Cr1MoVG	GB5310
1.2	Heating surface pipe	15Cr1MoVG	GB5310
1.3	Fin	1Cr13	GB3280
2	MP Evaporating pipe bank		
2.1	Drum	20g	GB713
2.2	Header	20G	GB5310
2.3	Heating surface pipe	20G	GB5310
2.4	Fin	08Al	GB710
2.5	Steam-water communicating pipe	20G	GB5310
2.6	Saturated steam communicating pipe	20G	GB5310
2.7	Downcomer	20G	GB5310
3	MP Economizer		
3.1	Header	20G	GB5310
3.2	Heating surface pipe	20G	GB5310
3.3	Fin	08Al	GB710
3.4	communicating pipe	20G	GB5310
4	LP boiler		

Sr. No.	Name of Component	Material	Standard
3.1	Header	20G	GB5310
3.2	Heating surface pipe	20G	GB5310
3.3	Fin	08Al	GB710
3.4	communicating pipe	20G	GB5310
3.5	Downcomer	20G	GB5310

2 Scope of Supply

The whole HRSG system would be composed of exhaust gas system, HRSG proper and HRSG thermodynamic control system and lighting.

2.1 Scope of Supply for Exhaust gas system

The scope of supply for exhaust gas system includes boiler flue gas inlet, boiler flue gas outlet and flue accessories.

2.1.1 Scope of Supply for Flue Gas Inlet

Three-way diverter damper

Boiler inlet expansion joint

Boiler inlet flue

2.1.2 Scope of Supply for Flue Gas outlet

Boiler outlet expansion joint

Main stack

2.2 Scope of supply for HRSG proper

The scope of supply for HRSG proper would mainly include the following parts:

MP superheater

Mp evaporating pipe bank

Mp economizer

pipings, valve, instrumentation within the scope of boiler

desuperheating device

LP boiler (including deaerating system)

Boiler frame and casing

Platform, staircase, ladder

Rain-proof shed

Insulation of HRSG proper (The insulation for drum above the boiler top casing as well as that for the piping, valves within the scope of boiler would not be included.)

MP feedwater pump (the pump made by Changsha water pump factory matched with motor made by Xiangtan Motor Factory or the pump with the same level would be recommended.)

Impulse soot blowing system (including 24 soot blowing points)

2.3 Scope of Supply for HRSG Thermodynamic Supervision and Control System

The scope of supply for HRSG thermodynamic supervision and control system would mainly include the following parts:

- primary measuring components for flow rate, temperature, pressure liquid level, impulse pipe, instrument valve (valve group), transmitter and so on.
- Motor-operated stop valve (gate valve)
- Motor-operated regulating valve
- Local control cabinet (IP54), control box of motor-operated valve, power distribution box, terminal box of transmitter sensor (not including thermocouple)
- Cable bridge frame within the HRSG island
- Secondary display instrument control box of electric contactor water level meter

The electricity demand points would be taken as scope of supply of 380V power cable. For others the control cabinet and terminal box be selected.

2.4 Lighting of HRSG Island

The lighting within the HRSG island includes normal lighting and emergency lighting.

The lighting power distribution box would be selected as scope of supply of lighting.

2.5 Requirements for Equipment Type Selection

Regulating valve body	Tianjin No.4 Factory FISHER (joint-venture)
Actuator of regulating valve	German BOSCH (imported) or Tianjin No.7 Bernard (joint-venture)
Other valve body with same level	Qingdao Power Station Valve or other valve factory
Instrument valve (welding connection for steam-water pipe)	Ningbo Torch Factory
Transmitter	Henghe EJA (joint-venture)
Pressure switch	SOR