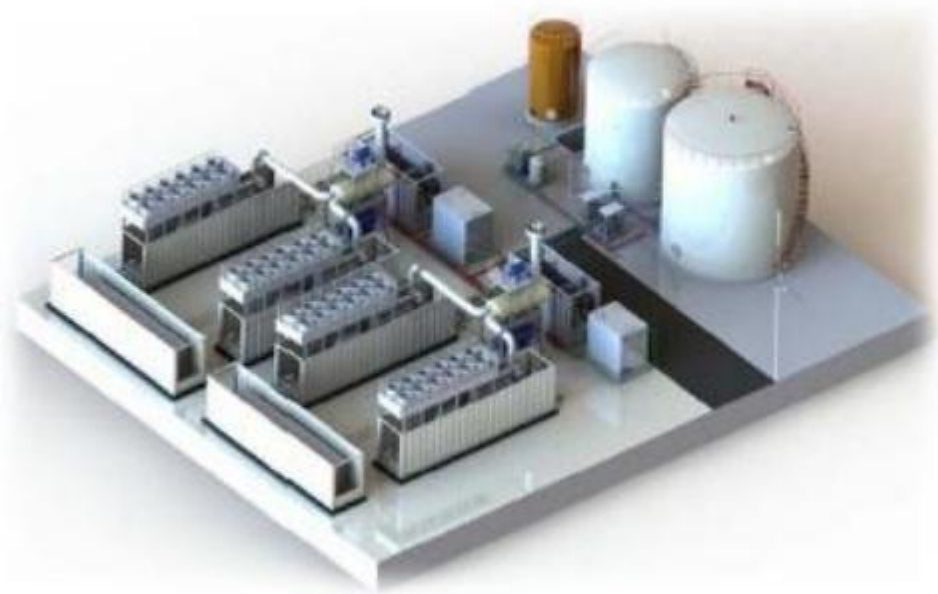


100MW Power Plant Proposal

100MW 电站方案

(HFO 11KV 50HZ)



20230310

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1. GENERAL DESCRIPTION 总则

1.1 GENERAL 综述

(1) Power plant

According to owner’s requirement, 100MW HFO run power plant, consists of :

7unit x MAN10L3244 5.4MW HFO gen-sets. 7*5.4mw=37.8MW.

6unit x MAN18V2832 5.4MW HFO gen-sets. 6*4mw=24MW.

5unit x MAN18V32/40 8.7MW HFO gen-sets. 5*8.7mw=43.5MW.

Total power: 37.8+24+43.5=105.3MW

85-90% run power:89-94.77MW

Voltage: 11kV

Frequency: 50Hz

PF: 0.8(Lagging)

电站选型

根据用户要求:需要100MW 11KV 50Hz重油发电机组，选择：

A.7台MAN 10L3244 5.4MW 重油发电机组,7*5.4mw=37.8MW

B.6台MAN 18V2832 4MW 重油发电机组， 6*4mw=24MW

C.5台MAN18V32/40 ,8.75MW发电机组， 5*8.7mw=43.5MW

总功率: 37.8+24+43.5=105.3MW

85-90%运行功率:89-94.77MW

电压: 11kV

频率: 50Hz

功率因数: 0.8(滞后)

1.2 DESIGN CONDITION AND PERFORMANCE DATA 设计条件和工作特性

工作特性

(1) DESIGN AMBIENT CONDITION

Refer to ISO 3046

The standard environmental condition:

Environmental temperature	25℃
Barometric pressure	1bar
RH (relative humidity)	30%
Gross Output AT Generator Terminal	105.3MW
Fuel consumption at Generator Terminal	194g/kW.h, tolerance +5%
Note: Tolerance + 5%, LCV= 42700 kJ/kg, Load 100%, 50 Hz, PF = 0.8	

(1)设计环境条件

参考 ISO 3046

标准环境条件:

环境温度	25℃
大气压力	1bar
相对湿度	30%
发电机端总输出功率	105.3MW
发电机端的燃油消耗率	194g/kW.h, 公差 +5%
注: 公差+ 5%, 低热值=42700 kJ/kg, 100%负荷, 50 Hz, PF = 0.8	

1.3 FUEL OIL FOR ENGINE 发动机用的燃油

(1) HFO and DO

The viscosity of Diesel oil shall be of $\geq 2 - 15$ cSt at Engine inlet under the power plant operating.

(2) 重油/柴油

发动机运行时的柴油机进口柴油的粘度应该在 $\geq 2 - 15$ cSt

1.4 LUBRICATING OIL FOR ENGINE 发动机用的润滑油

The Lubricating oil for engine shall be selected from the list of recommended lubricating oil for engine, which shall be of SAE 40.

发动机用润滑油应该从发动机的推荐润滑油列表中选择, SAE 40。

1.5 COOLING WATER FOR ENGINE 发动机冷却水

The cooling water system is designed for using normal fresh water with corrosion inhibitor, in order to prevent incrustation and corrosion attack.

The following water quality shall be valid:

For Engine (circulation water)

Property/ feature	Characteristics	Unit	Remark
Type of water	Distillate or freshwater, free from foreign matter. Not to be used: Sea	-	1) 1°dH (German hardness): 10mg CaO/litre 17.9mg CaCO ₃ /litre

	water, brackish water, river water, brines, industrial waste water and rain water		0.357mval/litre 0.179mmol/litre 2) 1 mg/l 1 ppm
Total hardness	max. 10	°dH 1)	
PH-value	6.5 - 8	-	
Chloride ion content	max.50	mg/l 2)	

为了防止水锈和腐蚀，冷却水系统采用带有防腐剂的淡水。

以下是水质要求:

发动机（循环水）

	要求	单位	备注
水的类型	蒸馏水或淡水，无杂质。 不能用：海水、淡盐水、 河水、卤水、工业废水和 雨水	-	1) 1°dH (德国硬度): 10mg CaO/litre 17.9mg CaCO3/litre 0.357mval/litre 0.179mmol/litre
总硬度	max. 10	° dH 1)	
PH 值	6.5 - 8	-	
氯离子含量	max. 50	mg/l 2)	2) 1 mg/l 1 ppm

1.6 STANDARDS 标准

Unless there are specified standards or codes, all design, manufacturing, quality control and tests shall be in accordance with the applicable portions of below listed prominent international and national Standards and Manufacturer's Standards :

- GB Chinese standards and ISO standards

除非有规定的标准和编码，所有的设计、制造、质量控制和测试应该与以下列出的国际、国家标准和制造商保准一致。

- GB 中国国家标准 和ISO 国际标准

1.7 UNIT AND LANGUAGE 单位和语言

(1) Units

In all correspondences of technical documents, schedules and drawings, metric units of all measurements shall be used.

(2) Language

The Chinese and english language shall be used in all documents, drawings, name plates and correspondences between contractor and owner.

(1)单位

所有来往的技术文档、计划表和图纸中的测量值均采用公制单位。

(2) 语言

承包人和业主之间，所有的文档、图纸、铭牌和函件均应采用中文和英文。

1.8 TEST AND INSPECTION 测试和检验

(1) Shop test

Diesel engine shall be tested at the shop in accordance with ISO 3046 and manufacturer's standard.

(2) Site test

Owner shall perform commissioning and start-up with Contractor's technical assistance.

Followings shall be checked before or during commissioning;

- Installation check
- Engine & generator coupling and alignment check
- Test to prove correct operation of interlocks, alarm and tripping circuits
- Safety device check

The performance test procedure will be submitted to the Owner.

(1) 工厂测试

柴油机在工厂的测试依照ISO3046和制造商的标准。

(2) 现场测试

在承包商的技术支持下，业主完成调试和启动。在调试前和调试期间检查项目如下：

- 安装检查
- 发动机和发电机的连接和定位检查
- 测试为证明互锁、报警和脱扣的正确操作。
- 安全设备检查

性能测试程序提交业主。

1.9 PAINTING 涂装

All equipment will be painted in accordance with manufacturer's standard and painting color will be informed to the Owner.

所有设备的涂装依据制造商的标准，喷漆颜色通知业主。

2. CONFIGURE OF POWER PLANT SYSTEM 电站系统配置

Configure of power plant system contains as follows:

1	Generating sets
2	Mechanical auxiliary system
3	Electrical auxiliary system
电站系统配置包含以下内容:	
1	发电机组
2	机械辅助系统
3	电气辅助系统

2.1 GENERATING SETS 发电机组

2. 1.1 7sets MAN 10L3244

MAN 10L3244 Gen-set The generating sets mainly include engine, duplex bearing generator, high elasticity shaft coupling and public housing. Diesel and duplex bearing generator are connected by high elasticity shaft coupling, which are also supported and fixed by common bed.



Function of generating sets:

Rated power	-----5400kW
Rated speed	-----750rpm
Rated voltage	-----11kV
Rated frequency	-----50Hz
PF(Power factor)	-----0.8 (lagging)
Boundary dimension)	-----约 12750×3635×4840 (mm)
Dry weight	-----95 t
Steady-state voltage adjusting rate	-----≤2.5%
Transient voltage adjusting rate	-----+20%~-15%
Sudden load changing voltage steady time	-----1.5S
Voltage fluctuation rate	-----0.5%
Steady-state frequency adjusting rate	-----≤0.5%
Transient frequency adjusting rate	-----+10%~-7%
Sudden load changing frequency steady time	-----≤5S
Frequency fluctuation rate	-----≤0.5%
Waveform distortion	-----≤3%

发电机组主要包含发动机、双轴承发电机、高弹性联轴器和公共底盘。发动机和双轴承发电机通过高弹性联轴器连接，被安装固定在公共底盘上。

额定功率	-----5400kW
额定转速	-----750rpm
额定电压	-----11kV
额定频率	-----50Hz
功率因数	-----0.8 (lagging)
外形尺寸 (长 x 宽 x 高)	-----约 12750×3635×4840 (mm)
干量	-----95t
稳态电压调整率	-----≤2.5%
瞬态电压调整率	-----+20%~-15%
电压恢复时间	-----1.5S
电压波动率	-----0.5%
稳态频率调整率	-----≤0.5%
瞬态频率调整率	-----+10%~-7%
频率恢复时间	-----≤5S
频率波动率	-----≤0.5%
波形畸变率	-----≤3%

Engine

Brand and model of engine	MAN 10L3244
Pattern	L10, four stroke, direct injection, turbocharger, water cooled, compressed air starting
Cylinder bore	320mm
Stroke	440mm
Compressed ratio	15.2
MCR (Most Continuous Power)	5600kW
Speed	750r/min
Direction of rotation	Crankshaft clock-wise rotation (as viewed from output end)
Fuel consumption rate (When MCR happens)	189g/kW .h, tolerance +5%
Air intake flow	20.4kg/kW .h
Exhaust gas flow	50.5t/ h
Exhaust gas temperature after supercharger	350℃
Supercharger air pressure	3.04 bar
Supercharger air temperature before cylinder	45~55℃
Engine inlet lube pressure	0.42~0.5MPa
Engine inlet lube temperature	68~73℃
H. T. water into-machine pressure	0.2~0.5MPa
H. T. water out-machine temperature	68~73℃
L. T. water into-machine pressure	0.25~0.45MPa
L. T. water into-machine temperature	30~40℃
Fuel into- machine pressure	0.3~0.6MPa

发动机

发动机品牌	MAN 10L3244
模式	L10、四冲程、直接喷射、增压中冷、压缩空气启动
缸径	320mm
行程	440mm
压缩比	15.2
MCR (最大连续功率)	5600kW
转速	750r/min
旋转方向	顺时针（从功率输出端）

燃油消耗率（当 MCR 时）	189g/kW .h，公差 +5%
空气进气量	20.8kg/kW .h
排气量	50.5t/ h
增压器后排气温度	350℃
增压器空气压力	3.04 bar
进缸前增压器空气温度	45~55℃
润滑油进机压力	0.42~0.5MPa
润滑油进机温度	68~73℃
高温水进机压力	0.2~0.5MPa
高温水出机温度	75~85℃
低温水进机压力	0.25~0.45Mpa
低温水进机温度	30~40℃
燃油进机压力	0.3~0.6MPa

Alternator

Brand	KFS/ZFC（made in China）
Rated power	5400kW
Rated voltage	1 1kV
Rated frequency	50Hz
Rated speed	750 r/min
Direction of rotation	Counter clock-wise (as viewed from input end)
PF	0.8(Lagging)
Efficiency	96%
Grade of Protection	IP23
Winding temperature sensory	2 ×6Pt 100 (sensory) (1 set standby)
Anti- freezing heater	AC230V
Coolant method	Self- fan coolant
AVR (Automatic Voltage Regulator)	Installed on generator

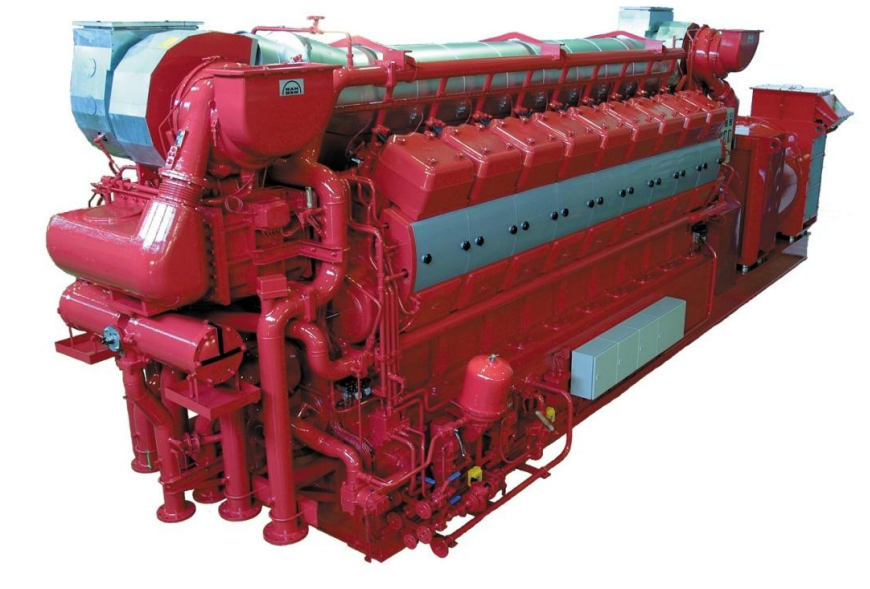
发电机

品牌	ZFC/KFS(中国)
额定功率	5400kW
额定电压	1 1kV
额定频率	50Hz
转速	750 r/min
旋转方向	顺指针（从输入端看）

功率因数	0.8（滞后）
效率	96%
防护等级	IP23
绕组温度传感器	2 ×6Pt 100（传感器）（1 套备用）
防冷凝加热器	AC230V
冷却方式	风冷
AVR（自动电压调节器）	安装在发电机上

2. 1.2 6sets MAN 18V2832 4MW

MAN 18V2832 4MW Gen-set The generating sets mainly include engine, duplex bearing generator, high elasticity shaft coupling and public housing. Diesel and duplex bearing generator are connected by high elasticity shaft coupling, which are also supported and fixed by common bed.



Function of generating sets:

Rated power	-----4000kW
Rated speed	-----750rpm
Rated voltage	----- 11kV
Rated frequency	-----50Hz
PF(Power factor)	-----0.8 （lagging）
Boundary dimension）	-----约10707×3635×3449 （mm）
Dry weight	-----71 t
Steady-state voltage adjusting rate	-----≤2.5%
Transient voltage adjusting rate	-----+20%~-15%
Sudden load changing voltage steady time	-----1.5S
Voltage fluctuation rate	-----0.5%
Steady-state frequency adjusting rate	-----≤0.5%
Transient frequency adjusting rate	-----+10%~-7%
Sudden load changing frequency steady time	-----≤5S
Frequency fluctuation rate	-----≤0.5%
Waveform distortion	-----≤3%

发电机组主要包含发动机、双轴承发电机、高弹性联轴器和公共底盘。发动机和双轴承发电机通过高弹性联轴器连接，被安装固定在公共底盘上。

额定功率-----	4000kW
额定转速-----	750rpm
额定电压-----	11kV
额定频率-----	50Hz
功率因数-----	0.8 （lagging）
外形尺寸（长 x 宽 x 高）-----	约 10707×3635×2449 （mm）
干量-----	71t
稳态电压调整率-----	≤2.5%
瞬态电压调整率-----	+20%~-15%
电压恢复时间-----	1.5S
电压波动率-----	0.5%
稳态频率调整率-----	≤0.5%
瞬态频率调整率-----	+ 10%~-7%
频率恢复时间-----	≤5S
频率波动率-----	≤0.5%

波形畸变率-----≤3%

Engine

Brand and model of engine	MAN 18V28 / 30
Pattern	V18, four stroke, direct injection, turbocharger, water cooled, compressed air starting
Cylinder bore	280mm
Stroke	300mm
Compressed ratio	15.2
MCR (Most Continuous Power)	4600kW
Speed	750r/min
Direction of rotation	Crankshaft clock-wise rotation (as viewed from output end)
Fuel consumption rate (When MCR happens)	189g/kW .h, tolerance +5%
Air intake flow	16.4kg/kW .h
Exhaust gas flow	40.75t/ h
Exhaust gas temperature after supercharger	350℃
Supercharger air pressure	3.04 bar
Supercharger air temperature before cylinder	45~55℃
Engine inlet lube pressure	0.42~0.5MPa
Engine inlet lube temperature	68~73℃
H.T. water into-machine pressure	0.2~0.5MPa
H.T. water out-machine temperature	68~73℃
L.T. water into-machine pressure	0.25~0.45MPa
L.T. water into-machine temperature	30~40℃
Fuel into-machine pressure	0.3~0.6MPa

发动机

发动机品牌	MAN 18V28 / 30
模式	V18、四冲程 直接喷射、增压中冷、压、缩空气启动
缸径	320mm
行程	380mm
压缩比	15.2
MCR (最大连续功率)	4600kW
转速	750r/min
旋转方向	顺时针（从功率输出端）

燃油消耗率（当 MCR 时）	189g/kW .h, 公差 +5%
空气进气量	16.4kg/kW .h
排气量	40.75t/ h
增压器后排气温度	350℃
增压器空气压力	3.04 bar
进缸前增压器空气温度	45~55℃
润滑油进机压力	0.42~0.5MPa
润滑油进机温度	68~73℃
高温水进机压力	0.2~0.5MPa
高温水出机温度	75~85℃
低温水进机压力	0.25~0.45Mpa
低温水进机温度	30~40℃
燃油进机压力	0.3~0.6MPa

Alternator

Brand	ZFC/KFS (中国)
Rated power	4000kW
Rated voltage	11 kV
Rated frequency	50Hz
Rated speed	750 r/min
Direction of rotation	Counter clock-wise (as viewed from input end)
PF	0.8(Lagging)
Efficiency	96%
Grade of Protection	IP23
Winding temperature sensory	2 ×6Pt 100 (sensory) (1 set standby)
Anti-freezing heater	AC230V
Coolant method	Self-fan coolant
AVR (Automatic Voltage Regulator)	Installed on generator

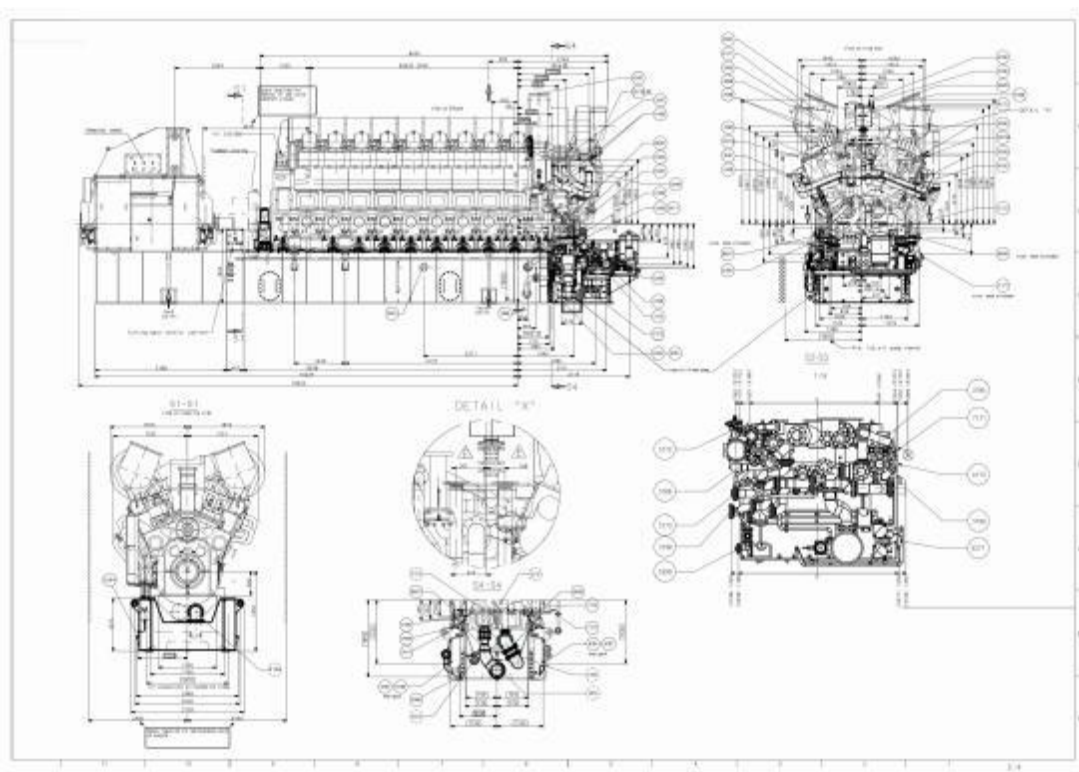
发电机

品牌	ZFC/KFS(CHINA)
额定功率	4000kW
额定电压	11kV
额定频率	50Hz
转速	750 r/min
旋转方向	顺指针（从输入端看）

功率因数	0.8 （滞后）
效率	96%
防护等级	IP23
绕组温度传感器	2 ×6Pt 100 （传感器）（1 套备用）
防冷凝加热器	AC230V
冷却方式	风冷
AVR （自动电压调节器）	安装在发电机上

2. 1.3 5sets *MAN 18V3240

MAN 18v3240 Gen-set The generating sets mainly include engine, duplex bearing generator, high elasticity shaft coupling and public housing. Diesel and duplex bearing generator are connected by high elasticity shaft coupling, which are also supported and fixed by common bed.



Function of generating sets:

Rated power -----8700kW
Rated speed -----750rpm
Rated voltage ----- 11kV
Rated frequency -----50Hz
PF(Power factor) -----0.8 （lagging）
Boundary dimension) -----约 13185×3730×5245 （mm）
Dry weight -----139 t
Steady-state voltage adjusting rate -----≤2.5%
Transient voltage adjusting rate -----+20%~-15%
Sudden load changing voltage steady time -----1.5S

Voltage fluctuation rate -----0.5%
Steady-state frequency adjusting rate -----≤0.5%
Transient frequency adjusting rate -----+10%~-7%
Sudden load changing frequency steady time -----≤5S
Frequency fluctuation rate -----≤0.5%
Waveform distortion -----≤3%

发电机组主要包含发动机、双轴承发电机、高弹性联轴器和公共底盘。发动机和双轴承发电机通过高弹性联轴器连接，被安装固定在公共底盘上。

额定功率-----8700kW
额定转速-----750rpm
额定电压-----11kV
额定频率-----50Hz
功率因数-----0.8 (lagging)
外形尺寸（长 x 宽 x 高） -----约 12750×3870×5240（mm）
干量-----139t
稳态电压调整率-----≤2.5%
瞬态电压调整率-----+20%~-15%
电压恢复时间-----1.5S
电压波动率-----0.5%
稳态频率调整率-----≤0.5%
瞬态频率调整率-----+ 10%~-7%
频率恢复时间-----≤5S
频率波动率-----≤0.5%
波形畸变率-----≤3%

Engine

Brand and model of engine	MAN 18V32/40
Pattern	V18, four stroke, direct injection, turbocharger, water cooled, compressed air starting
Cylinder bore	320mm
Stroke	400mm
Compressed ratio	15.2
MCR (Most Continuous Power)	9000kW
Speed	750r/min
Direction of rotation	Crankshaft clock-wise rotation (as viewed from output end)

Fuel consumption rate (When MCR happens)	188g/kW .h, tolerance +5%
Air intake flow	23.84kg/kW .h
Exhaust gas flow	64.75t/ h
Exhaust gas temperature after supercharger	350℃
Supercharger air pressure	4.04 bar
Supercharger air temperature before cylinder	45~55℃
Engine inlet lube pressure	0.42~0.5MPa
Engine inlet lube temperature	68~73℃
H.T. water into-machine pressure	0.2~0.5MPa
H.T. water out-machine temperature	68~73℃
L.T. water into-machine pressure	0.25~0.45MPa
L.T. water into-machine temperature	30~40℃
Fuel into-machine pressure	0.3~0.6MPa

发动机

发动机品牌	MAN 18V32/40
模式	V18、四冲程、直接喷射、增压中冷、压缩空气启动
缸径	320mm
行程	400mm
压缩比	15.2
MCR (最大连续功率)	9000kW
转速	750r/min
旋转方向	顺时针（从功率输出端）
燃油消耗率（当 MCR 时）	188g/kW .h, 公差 +5%
空气进气量	23.84kg/kW .h
排气量	64.75t/ h
增压器后排气温度	350℃
增压器空气压力	4.04 bar
进缸前增压器空气温度	45~55℃
润滑油进机压力	0.42~0.5MPa
润滑油进机温度	68~73℃
高温水进机压力	0.2~0.5MPa
高温水出机温度	75~85℃
低温水进机压力	0.25~0.45Mpa
低温水进机温度	30~40℃
燃油进机压力	0.3~0.6MPa

Alternator

Brand	ZFC/KFS (made in China)
Rated power	8700kW
Rated voltage	1 1kV
Rated frequency	50Hz
Rated speed	750 r/min
Direction of rotation	Counter clock-wise (as viewed from input end)
PF	0.8(Lagging)
Efficiency	96%
Grade of Protection	IP23
Winding temperature sensory	2 ×6Pt 100 (sensory) (1 set standby)
Anti-freezing heater	AC230V
Coolant method	Self-fan coolant
AVR (Automatic Voltage Regulator)	Installed on generator

发电机

品牌	ZFC/KFS(中国)
额定功率	8700kW
额定电压	1 1kV
额定频率	50Hz
转速	750 r/min
旋转方向	顺指针（从输入端看）
功率因数	0.8（滞后）
效率	96%
防护等级	IP23
绕组温度传感器	2 ×6Pt 100（传感器）（1套备用）
防冷凝加热器	AC230V
冷却方式	风冷
AVR（自动电压调节器）	安装在发电机上

2.2MECHANICAL AUXILIARY SYSTEM 机械辅助系统

2.2.1 LUBRICATING OIL SYSTEM

The engine has it's own internal lubricating oil system. Lube oil service tank is mounted on common-bed.

Lube oil filter	Duplex type
Lube oil pump	Engine driven, mounted on engine
Lube oil cooler	Plate type, mounted on engine
Pre-lubricating pump	Electric Motor driven
Thermostatic valve	Mounted on engine

滑油系统

发动机有自己的内部润滑油系统，润滑油工作油箱安装在机组的公共地盘上。

滑油滤清器	双联滤清器
滑油泵	机带
滑油冷却器	板式冷却器
滑油预供泵	电马达驱动
恒温阀	装机

2.2.2 COOLING WATER SYSTEM

The engine cooling water system consists of two cooling water circuits, which are Low temperature(LT) and High temperature(HT) water circuits. The heat transfer to engine cooling water is discharged to atmosphere by Radiator Cooling.

Low temperature water circuit comprises:

LTCW pump	Mounted on engine
Charge air cooler	Mounted on engine
Lubricating oil cooler	Plate type
LTCW radiator	Air cooling
LTCW expansion water tank	

High temperature water circuit comprises:

HTCW pump	Engine driven, mounted on engine
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Engine water jackets/ cylinder head	Mounted on engine
Thermostatic valve	Mounted on engine
HTCW expansion water tank	

冷却水系统

发动机冷却水系统由两路冷却水组成，低温冷却水和高温冷却水。传递发动机冷却水中的热量通过散热器释放到大气中。

低温水路的组成	
低温水泵	机带
中冷器	装机
滑油冷却器	板式
低温水散热器	水冷却塔
低温膨胀水箱	客户自制
高温水路的组成	
高温水泵	机带
发动机缸套/缸头	装机
恒温阀	装机
高温膨胀水箱	

2.2.4 COMPRESSED AIR SYSTEM

The compressed air supply system consists of starting air receiver and air compressor as follows. The compressed air supply system provides also the control air to the related auxiliaries through pressure- reducing valve.

Engine starting	Compressed air, 7 bar
Air compressor	Electric Motor driven, 30 bar
Air receiver	Cylindrical, 30 bar

压缩空气系统

压缩空气供应系统由启动空气瓶和空气压缩机组成。

压缩空气系统还通过减压阀提供相关辅助设备控制空气。

发动机启动	压缩空气，0.7MPa
空气压缩机	电马达驱动 3MPa
空气瓶	圆柱型，3MPa

2.2.5 INTAKE AIR SYSTEM

Intake air filter is dry and washable type filter to be mounted on turbocharger.

进气系统

进气滤清器为干式、可洗型滤清器，安装在增压器上。

2.2.6 EXHAUST GAS SYSTEM

Exhaust gas of the engine flows out from turbocharger to atmosphere via expansion joint and silencer.

- Total pressure loss in the exhaust gas system : max. 2.5kPa
- Exhaust gas silencer : absorption & resonance Type
- Exhaust gas boiler unit : Smoke tube type, 7 bar.

排气系统

发动机排气系统通过膨胀节和消音器从增压器流出到大气中去。

排气系统排气背压：最大2.5kPa

排气消音器：吸收共振型

排气锅炉：烟道型，0.7MPa

2.3 ELECTRICAL AUXILIARY SYSTEM 电气系统

Electrical system mainly includes medium voltage system, low voltage system, control system, etc.

电气系统主要包括了中压系统、低压系统和控制系统等。

2.3.1 PLANT SYSTEM VOLTAGE

Generator	AC 1 1kV, 3PH,
Secondary distribution	AC 400V, 3PH,
Motors	AC 400V, 3PH,
AC control	AC 230V, 1PH,
DC control	DC 1 10V, 2W or 24V,
Grid	AC 1 1kV, 3PH,

电站系统电压

发电机	AC 1 1kV, 3PH,
二次分配	AC 400V, 3PH,
马达	AC 400V, 3PH,
交流控制	AC 230V, 1PH,
直流控制	DC 1 10V, 2W or 24V,
电网	AC 1 1kV, 3PH,

2.3.2 11kV SWITCHGEARS

General description

1) 11kV switchgear shall be indoor, metal-enclosed, floor mounted, draw out type.

Meters, relays, switches and lamps will be flush mounted on the respective cubicle door or on control cabinet. The degree of protection enclosure will be of IP 41x.

2) The breakers shall be triple pole, single throw and vacuum circuit breaker

3) All the external cables will enter the switchgear through adequate openings at the bottom.

- 4) Current transformers(CT) will be epoxy-resin type. All current transformer secondary will be connected to short circuiting terminal blocks.
- 5) Potential transformers(PT) will be epoxy-resin type with primary and secondary fuses.
- 6) The accuracy class for CT & PT will be of 1.0 cl. for metering 5P20 for protection.
- 7) The vacuum circuit breaker operating and control circuit will be for 110V DC supplied from 1 10V DC station which is normally floated with battery and battery charger.
- 8) The switchgear cubicle will be provided with space heaters to prevent condensation of moisture within the switchgear.
- 9) For generator feeders, the necessary electrical parameters are to be measured or displayed in each generator control panel.

Particulars

Type	KYN28-24
Rated voltage	24kV 3PH, 50Hz
Service voltage	1 1kV 3PH, 50Hz
Ground system	Solidly grounded
Control power	DC110V
Switch gear main bus current	630A/ 1250A
Material of busbar	Copper
Circuit breaker	Type: Draw out type, VCB Rated voltage: 24kV, 3PH Rated current: 630A Rated interrupting current: 25kA

开关柜

综述

- 1) 11kV 开关柜是户内、金属密封、地板安装、抽出性型
仪表、继电器、转换开关和指示灯安装在各自的柜体面板和控制柜内。柜体的防护等级为 IP4x。
- 2) 断路器是三极、单掷的真空断路器。
- 3) 所有的外部电缆通过底部足够的开孔进入开关柜。
- 4) 电流互感器（CT）为环氧树脂型。所有电流互感器的二次侧连接到短路的接线端子上。
- 5) 电压互感器（PT）带有一次和二次熔断器的环氧树脂型。
- 6) CT 和 PT 的精度等级是为保护测量 5P20 用的 1.0 级。
- 7) 真空断路器的运行和控制线圈是来自于 110V 直流站供应的 DC110V。
- 8) 开关柜内安装有空间加热器，以防止柜内的水汽凝结。
- 9) 对于发电机馈线，在每个发电机控制屏上测量和显示必要的电气参数。

详情

型号	KYN28-24
额定电压	24kV 3PH, 50Hz
供电电压	1 1kV 3PH, 50Hz
接地系统	直接接地
控制电源	DC110V
开关主母线电流	630A/ 1250A
母线材料	铜
断路器	型号：抽出型，真空断路器 额定电压：24kV, 3PH

	额定电流：630A/1250A 额定分断电流：25kA
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2.3.3 400V SWITCHGEARS/MCC/DISTRIBUTION BOARDS

General description

- 1) L.V switchgear will be metal-enclosed, free-standing, dead front structure with electrically operated draw out type air circuit breaker suitable for indoor installation.
- 2) The air circuit breaker will be 3-pole, 600V class air circuit breaker (ACB) with suitable rating of continuous current rating and interrupting rating respectively.

Specification

Type	Metal enclosed type for indoor service
Rated voltage	600VAC,3PH,50Hz
Service voltage	400VAC,3PH,50Hz
Ground system	Solidly grounded
Control power	1 10VDC for ACB and 230VAC, 1Ph
Bus	Copper bus with current rating as required
Circuit breaker	Air circuit breaker
	(1) Type : Draw out type
	(2) Rate voltage: 600V, 3PH, 50Hz
	(3) Rated current: 630A
	(4) Rated interrupting current : 65kA SYMM.
	(5) Operating type : Motor spring type
	(6) Over current trip : Direct acting trip device
	(7) No of poles: 3p

400V 开关柜/MCC/配电板

综述

- 1) 低压开关柜是带有可操作的抽出式空气断路器，适合户内安装的，金属密封的、独立的、框架式结构。
- 2) 空气断路器是 3 极，600V 空气断路器(ACB)，带有连续和分断电流额定值合适的等级。

规格

型号	为屋内检修的金属密封型
额定电压	600VAC,3PH,50Hz
供电电压	400VAC,3PH,50Hz
接地系统	直接接地
控制电源	1 10VDC for ACB and 230VAC, 1Ph
母线	按照规定额定电流的铜母线
断路器	空气断路器

	(1) 型号: 抽出型 (2) 额定电压: 600V, 3PH, 50Hz (3) 额定电流: 630A (4) 分断电流 : 65kA SYMM. (5) 操作形式: 电马达弹簧型 (6) 过流跳闸: 直接动作脱扣装置 (7) 极数: 3p
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2.3.5 POWER TRANSFORMER

<u>Particulars</u>	
Aux. Transformer	
a) Rated voltage	
H.V	11kV
L.V	0.4kV
b) Winding	
H.V	Delta
L.V	Wye
c) Vector group	Dyn1 1
d) Capacity	600kVA
e) Cooling	oil- immersed
f) Tap changer	NLTC 2 × ±2.5% TAPS

电力变压器

详情	
辅助变压器	
a) 额定电压	
高压侧	11kV
低压侧	0.4kV
b)绕组	
高压侧	三角形
低压侧	星形
c)矢量组	Dyn1 1
d) 容量	600kVA
e)冷却	油浸式
f)分接头	NLTC 2 × ±2.5% TAPS

2.3.6 DC SYSTEM

<u>Batteries</u>	
Rated voltage	1 10V DC & 24V DC
Type	Lead-Acid
No. of cell	As required
Capacity	As required
No minal voltage	12V/cell

Back-up time	60 Minutes
* Capacity shall be adjusted during the detail design	

Battery Charger

TYPE	Metal-enclosed, indoor, floor mounted Float charger combined booster charger
Quantity	One set for 110V DC system
Rated output	24V DC, 50A & 1 10V DC, 50A
Feeder	Molded case circuit breaker
No. of pole	2P

直流系统

蓄电池

额定电压	1 10V DC & 24V DC
类型	铅酸
电池组数目	按照需要
容量	按照需要
单元蓄电池电压	12V/块
备用时间	60 分钟

* 容量根据详细设计调整

电池充电器

类型	金属密封、户内、地板安装 浮充电结合大电流充电
数量	为 110V 直流系统的一套
额定输出	24V DC, 50A & 1 10V DC, 50A
馈线	模式断路器
极数	2P

2.3.7 MOTOR

General Description

- 1) AC motors will be suitable for operation on 3-phase, 400V, 50Hz.
- 2) Unless otherwise specified, all the AC motors will be squirrel cage induction motors suitable for full voltage direct starting.

Technical Specifications for LV Motors.	
Rated voltage	400V, 3PH, 50Hz
Enclosure	Indoor area Outdoor area
Insulation class	F
Space heaters	Outdoor motors, 37.5KW & larger
Starting type	Direct on line starting
Others	Tropical design

2.3.7 马达

总则

- 1) 交流电动机适合 3 相 400V/50Hz
- 2) 除非另有说明，所有的交流电动机采用鼠笼式感应电动机，适合于全压直接启动。

低压电动机的技术规格	
额定电压	400V, 3PH, 50Hz
外壳	户内: IP54 户外: IP55
绝缘等级	F
空间加热器	户外电动机, 37.5kW 或更大
启动类型	直接启动
其他	热带设计

2.3.8 Cables

2.3.8.1 HV Power Cables

Type	24 kV, XLPE, PVC sheathed
Core	3C
Minimum size	As per calculation
Conductor	Copper

2.3.8.2 L.V Power Cables

Type	0.6/ 1.0kV XLPE, PVC sheathed
Core	Multiple (3C or 4C)
Conductor	Copper

2.3.8.3 Control Cables

Type	600V CVV (PVC/PVC)
Shielding	As needed
Multiple Core	Multiple (2C through 30C)
Conductor	Copper

2.3.8.4 Instrumentation cables

Type	600V CVVS
Shielding	Shielded
Core	1 pair and multi-pair
Conductor	Copper

电缆

2.3.8.1 高压电源电缆

类型	24 kV, XLPE, PVC 护套
芯数	3C 或 1C
最小尺寸	根据计算
导体	铜

2.3.8.2 低压电源电缆

类型	0.6/ 1.0KV XLPE, PVC 护套
芯数	多芯 (2C、3C 或 4C) 或单芯 (1C)
导体	铜

2.3.8.3 控制电缆

类型	600V CVV (PVC/PVC)
屏蔽	
芯数	多芯 (2C-30C)

导体	铜
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2.3.8.4 仪表电缆

类型	600V CVVS
屏蔽	带屏蔽层
芯数	一对及多对
导体	铜

2.3.10 Conduits and trays

- 1) Cables will be installed in above ground conduits, cable trays, underground conduits or cable trenches or direct buried.
- 2) Conduits will be rigid steel conduits.
- 3) Separate trays for instrumentation cables will be provided to separate them from power cable.
- 4) Trays for cables for different voltage levels will be stacked in descending order with the higher voltage above. Instrumentation trays will always be at the bottom.
- 5) Trays will be made of hot-dip galvanized steel for outdoor and indoor.

管道和电缆桥架

- 1) 电缆可安装于地面管道、 电缆桥架、地下管道或电缆槽上方，或直接埋入地面。
- 2) 管道应为硬钢管。
- 3) 应提供单独的仪表电缆桥架，将仪表电缆和电源电缆分开。
- 4) 不同电压的电缆桥架按降序叠放，电压高的置于上方。仪表电缆架桥始终置于底部。
- 5) 室内外的架桥均应采用热浸锌钢。

2.3.11 INSTRUMENT & CONTROL SYSTEM

2.3.11.1 ENGINE/ GENERATOR CONTROL PANEL

Engine/ Generator control panel will be metal-enclosed, free-standing, IP40, indoor installation.

- a) Control and Monitoring
 - Engine RPM display
 - T/C RPM display
 - Engine pressure display
 - Starting air pressure
 - FO engine inlet pressure
 - LO engine inlet pressure
 - Engine temperature display
 - FO engine inlet temperature
 - HT water outlet temperature
 - Exh. Gas T/C inlet temperature
 - D/G set emergency stop
 - Engine start and stop
 - Engine speed control
 - Generator voltage control
- b) Annunciator
- c) Synchronizing

d) Protection relay (Multi or single protective type)

- Under/ over voltage protection
- Reverse power protection
- Loss of excitation
- Over current protection
- Over current ground protection
- Under and over frequency protection
- Lock out relay(separate type)
- Differential Protective Relay(87G)

However, the above shall be adjusted subject to detail design

2.3.11.1 发动机/发电机控制屏

发动机/发电机控制屏金属密封型、独立的、IP40、户内安装。

a)控制和监控

- 发动机转速显示
- 增压器转速显示
- 发动机压力显示
 - 启动空气压力
 - 发动机燃油进机压力
 - 润滑油进口压力
- 发动机温度显示
 - 发动机进口温度
 - 高温水出机温度
 - 增压器口的排气温度
- 机组紧急停机按钮
- 发动机启动和停机
- 发动机转速控制
- 发电机电压控制

b)报警器

c)同步

d)保护继电器（多个或单个保护型）

- 欠/过压保护
- 逆功保护
- 失磁
- 过流保护
- 过流接地保护
- 欠/过频保护
- 闭锁继电器（分离型）
- 差动保护(87G)

然而，以上要求根据详细设计调整。

2.3.11.2 Field instrumentation

Necessary local instrumentation for field tanks and pipe lines will be provided properly for efficient and reliable plant operation, subject to our standard. Instrumentation will be tropicalized to suitable the conditions of the plant environment.

But, the instruments for tanks will be supplied by tanks supplier when tanks are out of contractor`s scope. Wherever possible, instruments which perform similar functions in similar applications will be of uniform type and manufacturer. However package mounted instruments will be subject to manufacture standard and practice.

Each instrument will be identified and tagged with a tag number, according to job standards. Local indicators will be graduated to in engineering units of the measures variable. Instrument scale ranges will be expressed in S.I. Engineering units.

All the instruments will be the industrial type and field proven design.

2.3.11.2 现场仪表

应按照我们的标准，为油罐和管道提供必要的本地仪表，以确保电站的高效、可靠运行。仪表应适合热带气候以适应电站环境条件。

但当油罐不在承包商供货范围内时，油罐的仪表应由油罐供应商提供。如有可能，应用于类似领域、功能相近的仪表应为统一类型、由统一的生产商提供。但是，打包安装的仪表应受服从生产商的标准和惯例。每台仪表都应通过鉴定并根据工作标准贴上标签号。本地指示器应使用工程单位，仪表刻度范围应采用国际单位表示。

所有仪表均应为工业型，并经现场验证。

3. SCOPE OF SUPPLY 供货范围

3.1 7sets 10L3244 5.4MW

ITEM No. 序号	DESCRIPTION 名称	SPECIFICATION 技术规格	REQUIRED 必需的		SCOPE 责任方	
			Qty 数量	Unit 单位	Supply 供应商	OWNER 业主
1	GENERATOR SET 发电机组	10L3244 5.4Mw	7			
1.1	Diesel engine 柴油机		7	Unit(s)	▪	
1.2	Alternator with AVR 发电机带 AVR	5400kW, 0.8PF, 11kV, 50Hz	7	Unit(s)	▪	
1.3	Common bed 公共底盘	For engine and alternator, with lube oil sump tank	7	Unit(s)	▪	
1.4	Flexible coupling assembly 高弹性联轴器		7	Set(s)	▪	
2	MECHANICAL AUXILIARY SYSTEM 机械辅助设备					
2.2	fuel SYSTEM 燃油系统					
2.2.1	重油供应单元 HFO supply unit	2500m3/hr 1.0mpa	4	Unit(s)	▪	

2.2.2	重油分离单元 HFO separation unit	2500m ³ /hr	4	Unit(s)	▪	
2.3.3	废气锅炉 exhaust gas boiler	500t/hr 1.0mpa	7	Unit(s)	▪	
2.4	LUBRICATING OIL(LO)SYSTEM 润滑油系统					
2.4.1	Lube Oil (Centrifuge) Separator unit 润滑油分离单元	Effective capacity 0.8m ³ /h per separator.	7	Unit(s)	▪	
2.5	COMPRESSED AIR SYSTEM 压缩空气系统					
2.5.1	Starting Air Compressor Unit 启动空气压缩机单元	37m ³ /h,30bar	2	Unit(s)	▪	
2.5.2	Starting Air Receiver Unit 启动空气瓶	1000L, 30kg/cm ² , with 40kg/cm ² relief valve.	2	Set(s)	▪	
2.6	WATER COOLING SYSTEM 水冷却系统					
2.6.1	Radiator 散热器		7	Unit(s)		▪
2.6.2	HT Expansion Tank 高温水膨胀水箱	300L	7	Unit(s)		▪
2.6.3	LT Expansion Tank 低温水膨胀水箱	300L	7	Unit(s)		▪
2.7	EXHAUST GAS SYSTEM 排气系统					
2.7.1	Silencer 消音器		7	Pc(s)	▪	
2.7.2	Expansion Bellows 膨胀节		7	Pc(s)	▪	
2.8	INTAKE AIR SYSTEM 进气系统					
2.8.1	Air intake filter unit 空气进气滤清器单元	Dry and washable type filter to be mounted on turbocharger.	7	Unit(s)	▪	
2.9	OTHER EQUIPMENT AND MATERIALS 其他设备和材料					

2.9.1	System Piping & Fitting & Auxiliary material 系统管路、管件和辅助材料	System Gauges\control & Fitting	7	Pc(s)		▪
2.9.2	System Valves & Fitting 系统阀门和管件		7	Pc(s)		▪
2.9.3	System Gauges\control & Fitting 系统仪表、控制和管件		7	Pc(s)		▪
3	ELECTRICAL AUXILIARY SYSTEM 电气辅助系统					
3.1	MV ELECTRICAL SYSTEM 中压电气系统					
3.1.1	Generator Circuit Breaker Panel (GB) 发电机出线屏	KYN28-24, 630A, 25KA	7	sets	▪	
3.1.2	Station service transformer 13.8KV Side CB Panel 厂用电变压器 11kV 进线屏	KYN28-24, 630A, 25KA	1	sets		▪
3.1.3	Station Service Transformer 厂用电变压器	500KVA, 11/0.4KV, Dyn11	1	sets		▪
3.2	LV ELECTRICAL SYSTEM 低压电气系统					
3.2.1	LV Input CB Panel 低压进线屏	ACB,0.4kV, 1000A, 60Hz	1	Unit		▪
3.2.3	Auxiliary Equipment Control Panel 辅助设备控制屏		3	Units		▪
3.3	CONTROL & PROTECTION SYSTEM 控制和保护系统					

3.3.1	Diesel Engine local control panel 柴油机就地控制屏		7	Units	▪	
3.3.2	Central Operating System 集中操作系统	Including parallel machine device 包括并机装置	7	Unit	▪	
3.4	DC SYSTEM 直流系统					
3.4.1	DC System Control Panel (DCC) 直流控制屏		1	Unit		▪
3.4.2	Accumulator Battery Panel 蓄电池屏		1	Unit		▪
3.5	INSTALLATION MATERIALS 安装材料					
3.5.1	Power Cable 动力电缆		1	lot		▪
3.5.2	Control Cable 控制电缆		1	lot		▪
3.5.3	Cable Bridge & Stand & Install auxiliary materials 电缆桥架、支架和安装材料		1	lot		▪
4	Spare Part 备件					
4.1	Standard Spare Parts for Engine 发动机标准备件		7	Set(s)	■	
4.2	Standard Spare Parts for Generator 发电机标准备件		7	Set(s)	■	
5	Tool 工具					
5.1	Standard Tools for Engine 标准工具		1	Set(s)	■	

3.2 6sets 18V2832 4MW

ITEM No. 序号	DESCRIPTION 名称	SPECIFICATION 技术规格	REQUIRED 必需的		SCOPE 责任方	
			Qty 数量	Unit 单位	Supply 供应商	OWNER 业主

1	GENERATOR SET 发电机组	18V2832 4MW	6			
1.1	Diesel engine 柴油机	4300kW 750r	6	Unit(s)	▪	
1.2	Alternator with AVR 发电机带 AVR	4000kW, 0.8PF, 11kV, 50Hz	6	Unit(s)	▪	
1.3	Common bed 公共底盘	For engine and alternator, with lube oil sump tank	6	Unit(s)	▪	
1.4	Flexible coupling assembly 高弹性联轴器		6	Set(s)	▪	
2	MECHANICAL AUXILIARY SYSTEM 机械辅助设备					
2.2	fuel SYSTEM 燃油系统					
2.2.1	重油供应单元 HFO supply unit	2500m3/hr 1.0mpa	4	Unit(s)	▪	

2.2.2	重油分离单元 HFO separation unit	2500m ³ /hr	4	Unit(s)	▪	
2.3.3	废气锅炉 exhaust gas boiler	500t/hr 1.0mpa	6	Unit(s)	▪	
2.4	LUBRICATING OIL(LO)SYSTEM 润滑油系统					
2.4.1	Lube Oil (Centrifuge) Separator unit 润滑油分离单元	Effective capacity 0.8m ³ /h per separator.	6	Unit(s)	▪	
2.5	COMPRESSED AIR SYSTEM 压缩空气系统					
2.5.1	Starting Air Compressor Unit 启动空气压缩机单元	37m ³ /h,30bar	2	Unit(s)	▪	
2.5.2	Starting Air Receiver Unit 启动空气瓶	1000L, 30kg/cm ² , with 40kg/cm ² relief valve.	2	Set(s)	▪	
2.6	WATER COOLING SYSTEM 水冷却系统					
2.6.1	Radiator 散热器		6	Unit(s)		▪
2.6.2	HT Expansion Tank 高温水膨胀水箱	300L	6	Unit(s)		▪
2.6.3	LT Expansion Tank 低温水膨胀水箱	300L	6	Unit(s)		▪
2.7	EXHAUST GAS SYSTEM 排气系统					
2.7.1	Silencer 消音器		6	Pc(s)	▪	
2.7.2	Expansion Bellows 膨胀节		6	Pc(s)	▪	
2.8	INTAKE AIR SYSTEM 进气系统					
2.8.1	Air intake filter unit 空气进气滤清器单元	Dry and washable type filter to be mounted on turbocharger.	6	Unit(s)	▪	
2.9	OTHER EQUIPMENT AND MATERIALS 其他设备和材料					

2.9.1	System Piping & Fitting & Auxiliary material 系统管路、管件和辅助材料	System Gauges\control & Fitting	6	Pc(s)		▪
2.9.2	System Valves & Fitting 系统阀门和管件		6	Pc(s)		▪
2.9.3	System Gauges\control & Fitting 系统仪表、控制和管件		6	Pc(s)		▪
3	ELECTRICAL AUXILIARY SYSTEM 电气辅助系统					
3.1	MV ELECTRICAL SYSTEM 中压电气系统					
3.1.1	Generator Circuit Breaker Panel (GB) 发电机出线屏	KYN28-24, 630A, 25KA	6	sets	▪	
3.1.2	Station service transformer 13.8KV Side CB Panel 厂用电变压器 11kV 进线屏	KYN28-24, 630A, 25KA	1	sets		▪
3.1.3	Station Service Transformer 厂用电变压器	500KVA, 11/0.4KV, Dyn11	1	sets		▪
3.2	LV ELECTRICAL SYSTEM 低压电气系统					
3.2.1	LV Input CB Panel 低压进线屏	ACB,0.4kV, 1000A, 60Hz	1	Unit		▪
3.2.3	Auxiliary Equipment Control Panel 辅助设备控制屏		3	Units		▪
3.3	CONTROL & PROTECTION SYSTEM 控制和保护系统					

3.3.1	Diesel Engine local control panel 柴油机就地控制屏		6	Units	▪	
3.3.2	Central Operating System 集中操作系统	Including parallel machine device 包括并机装置	6	Unit	▪	
3.4	DC SYSTEM 直流系统					
3.4.1	DC System Control Panel (DCC) 直流控制屏		1	Unit		▪
3.4.2	Accumulator Battery Panel 蓄电池屏		1	Unit		▪
3.5	INSTALLATION MATERIALS 安装材料					
3.5.1	Power Cable 动力电缆		1	lot		▪
3.5.2	Control Cable 控制电缆		1	lot		▪
3.5.3	Cable Bridge & Stand & Install auxiliary materials 电缆桥架、支架和安装材料		1	lot		▪
4	Spare Part 备件					
4.1	Standard Spare Parts for Engine 发动机标准备件		6	Set(s)	■	
4.2	Standard Spare Parts for Generator 发电机标准备件		6	Set(s)	■	
5	Tool 工具					
5.1	Standard Tools for Engine 标准工具		1	Set(s)	■	

3.3 MAN 18V3240 8.7MW

ITEM No. 序号	DESCRIPTION 名称	SPECIFICATION 技术规格	REQUIRED 必需的		SCOPE 责任方	
			Qty 数量	Unit 单位	Supply 供应商	OWNER 业主
1	GENERATOR SET 发电机组	MAN18V3240	5			
1.1	Diesel engine 柴油机	9000kW, 750r	5	Unit(s)	.	

1.2	Alternator with AVR 发电机带 AVR	8700kW, 0.8PF, 11kV, 50Hz	5	Unit(s)	▪	
1.3	Common bed 公共底盘	For engine and alternator, with lube oil sump tank	5	Unit(s)	▪	
1.4	Flexible coupling assembly 高弹性联轴器		5	Set(s)	▪	
2	MECHANICAL AUXILIARY SYSTEM 机械辅助设备					
2.2	fuel SYSTEM 燃油系统					
2.2.1	重油供应单元 HFO supply unit	2500m ³ /hr 1.0mpa	5	Unit(s)	▪	
2.2.2	重油分离单元 HFO separation unit	2500m ³ /hr	5	Unit(s)	▪	
2.3.3	废气锅炉 exhaust gas boiler	800t/hr 1.0mpa	5	Unit(s)	▪	
2.4	LUBRICATING OIL(LO)SYSTEM 润滑油系统					
2.4.1	Lube Oil (Centrifuge) Separator unit 润滑油分离单元	Effective capacity 0.8m ³ /h per separator.	5	Unit(s)	▪	
2.5	COMPRESSED AIR SYSTEM 压缩空气系统					
2.5.1	Starting Air Compressor Unit 启动空气压缩机单 元	37m ³ /h,30bar	3	Unit(s)	▪	
2.5.2	Starting Air Receiver Unit 启动空气瓶	1000L, 30kg/cm ² , with 40kg/cm ² relief valve.	3	Set(s)	▪	
2.5.3	Air Reducing Valve Unit 空气减压阀	30 to 8kg/cm ² pressure.	3	Set(s)	▪	
2.6	WATER COOLING SYSTEM 水冷却系统					
2.6.1	Radiator 散热器		5	Unit(s)		▪

2.6.2	HT Expansion Tank 高温水膨胀水箱	300L	5	Unit(s)		▪
2.6.3	LT Expansion Tank 低温水膨胀水箱	300L	5	Unit(s)		▪
2.7	EXHAUST GAS SYSTEM 排气系统					
2.7.1	Silencer 消音器		5	Pc(s)	▪	
2.7.2	Expansion Bellows 膨胀节		5	Pc(s)	▪	
2.8	INTAKE AIR SYSTEM 进气系统					
2.8.1	Air intake filter unit 空气进气滤清器单元	Dry and washable type filter to be mounted on turbocharger.	5	Unit(s)	▪	
2.9	OTHER EQUIPMENT AND MATERIALS 其他设备和材料					
2.9.1	System Piping & Fitting & Auxiliary material 系统管路、管件和辅 助材料	System Gauges\control & Fitting	5	Pc(s)		▪
2.9.2	System Valves & Fitting 系统阀门和管件		5	Pc(s)		▪
2.9.3	System Gauges\control & Fitting 系统仪表、控制和管 件		5	Pc(s)		▪
3	ELECTRICAL AUXILIARY SYSTEM 电气辅助系统					
3.1	MV ELECTRICAL SYSTEM 中压电气系统					
3.1.1	Generator Circuit Breaker Panel (GB) 发电机出线屏	KYN28-24, 630A, 25KA	5	sets	▪	
3.1.2	Station service transformer 11KV Side CB Panel	KYN28-24, 630A, 25KA	1	sets	▪	

	厂用电变压器 11kV 进线屏					
3.1.3	Station Service Transformer 厂用电变压器	600KVA, 11/0.4KV, Dyn11	1	sets	▪	
3.2	LV ELECTRICAL SYSTEM 低压电气系统					
3.2.1	LV Input CB Panel 低压进线屏	ACB,0.4kV, 1000A, 60Hz	1	Unit	▪	
3.2.3	Auxiliary Equipment Control Panel 辅助设备控制屏		3	Units	▪	
3.3	CONTROL & PROTECTION SYSTEM 控制和保护系统					
3.3.1	Diesel Engine local control panel 柴油机就地控制屏		5	Units	▪	
3.3.2	Central Operating System 集中操作系统	Including parallel machine device 包括并 机装置	5	Unit	▪	
3.4	DC SYSTEM 直流系统					
3.4.1	DC System Control Panel (DCC) 直流控制屏		2	Unit	▪	
3.4.2	Accumulator Battery Panel 蓄电池屏		2	Unit	▪	
3.5	INSTALLATION MATERIALS 安装材料					
3.5.1	Power Cable 动力电缆		5	lot		▪
3.5.2	Control Cable 控制电缆		5	lot		▪
3.5.3	Cable Bridge & Stand & Install auxiliary materials 电缆桥架、支架和安 装材料		5	lot		▪

4	Spare Part 备件					
4.1	Standard Spare Parts for Engine 发动机标准备件		5	Set(s)	■	
4.2	Standard Spare Parts for Generator 发电机标准备件		5	Set(s)	■	
4.3	Standard Spare Parts for AUX. Equipment 辅助设备标准备件		5	Set(s)	■	
5	Tool 工具					
5.1	Standard Tools for Engine 标准工具		1	Set(s)	■	