CEYLON ELECTRICITY BOARD
SRI LANKA

INTERNATIONAL COMPETITIVE BIDDING (ICB)

BID DOCUMENT

FOR

KELANITISSA GAS TURBINE PROJECT

BID NO.: **CEB/KGTP/PROC/01/Re**

VOLUME 4 of 5

April 2021

BID DOCUMENT
FOR
KELANITISSA GAS TURBINE PROJECT

CEYLON ELECTRICITY BOARD

Volume 4

Technical Schedules

FOR

KELANITISSA GAS TURBINE PROJECT

BID NO: CEB/KGTP/PROC/01/Re

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SCHEDULE 1 – DEVIATIONS, RESERVATION, OMISSION FROM THE BIDDING DOCUMENT

The Bidder shall indicate below if the offer contains any departures / deviations from the bidding document corresponding to the requirements of Clause 27.3 - Section 1.2 of Volume 1. The Employer reserves the right to accept or reject deviations given in this Schedule at his discretion. If required bidder may attach additional table conforming to the below format for departures and deviations.

Please refer Form 16 of Section 3. 2 of Volume - 01

KELANITISSA GAS TURBINE PROJECT

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SCHEDULE 2 – DELIVERIES AND COMPLETION PERIODS

1. Deliveries and completion Schedules shall be completed by the Contractor with relevant periods in weeks for below listed activities separately. The overall period of each deliverables to complete from date of Commencement shall be binding on the Contractor.

2. All deliverables declared under Schedule 2 shall be indicated in GAANT CHARTS and submitted with the Bid. Milestones declared under Form 13- Project Milestones Schedule shall be tallied with the Deliveries and completion Schedules declared herein.

3. Bids with Time for Completion more than 15 months will be rejected.

KELANITISSA GAS TURBINE PROJECT

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SCHEDULE 2A - DELIVERIES AND COMPLETION PERIODS FOR GAS TURBINE GENERATOR

SCHEDULE 2A.1 - DELIVERIES AND COMPLETION PERIODS FOR GAS TURBINE 01

Activity	Date of Commencement to Date of Order (Weeks)	Date of Order to Date of Shipment (Weeks)	Shipping and Local Transport (Weeks)	Delivery at Site from the date of commencement (Weeks)	Erection, commissioning and Power to Grid (Weeks)	Total time from Date of Order to Power to Grid (Weeks)
Gas Turbine Complete 01 A.C Generator 01						
11~15kV Switchgear with GCB 01 6 kV Switchgear (if Applicable) 01 400V Switchgear 01 Neutral Earthing Switchgear 01 D.C. Equipment 01						
Unit Auxiliary Transformers 01 Excitation Transformer 01 Generator Step up transformer 01						
11-15kV cables/IPB 01 Control Panels and Local Desks 01						
Other Equipment (Pls. specify)						

Signed……

On behalf of ……

Address ……

Date ……

SCHEDULE 2A.2 - DELIVERIES AND COMPLETION PERIODS FOR GAS TURBINE 02

Activity	Date of Commencement to Date of Order (Weeks)	Date of Order to Date of Shipment (Weeks)	Shipping and Local Transport (Weeks)	Delivery at Site from the date of commencement (Weeks)	Erection, commissioning and Power to Grid (Weeks)	Total time from Date of Order to Power to Grid (Weeks)
Gas Turbine Complete 02 A.C Generator 02						
11~15kV Switchgear with GCB 02 6 kV Switchgear (if Applicable) 02 400V Switchgear 02 Neutral Earthing Switchgear 02 D.C. Equipment 02						
Unit Auxiliary Transformers 02 Excitation Transformer 02 Generator Step up transformer 02						
11-15kV cables/IPB 02 Control Panels and Local Desks 02						
Other Equipment (Pls. specify)						

Signed……

On behalf of ……

Address ……

Date ……

SCHEDULE 2A.3 - DELIVERIES AND COMPLETION PERIODS FOR GAS TURBINE 03

Activity	Date of Commencement to Date of Order (Weeks)	Date of Order to Date of Shipment (Weeks)	Shipping and Local Transport (Weeks)	Delivery at Site from the date of commencement (Weeks)	Erection, commissioning and Power to Grid (Weeks)	Total time from Date of Order to Power to Grid (Weeks)
Gas Turbine Complete 03 A.C Generator 03						
11~15kV Switchgear with GCB 03 6 kV Switchgear (if Applicable) 03 400V Switchgear 03 Neutral Earthing Switchgear 03 D.C. Equipment 03						
Unit Auxiliary Transformers 03 Excitation Transformer 03 Generator Step up transformer 03						
11-15kV cables/IPB 03 Control Panels and Local Desks 03						
Other Equipment (Pls. specify)						

Signed……

On behalf of ……

Address ……

Date ……

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 2B - DELIVERIES AND COMPLETION PERIODS OF COMMON PLANT EQUIPMENT

Item of Common Plant Equipment	Date of Commencement to Date of Order (Weeks)	Date of Order to Date of Shipment (Weeks)	Shipping and Local Transport (Weeks)	Erection, commissioning & Setting to Work (Weeks)	Total time from Date of Order to Completion (Weeks)
Fuel Oil Treatment Plant Water Treatment Plant 6kV switchgear (if applicable) LV switchgear Service Air Compressor Distributed Control System Protection Panels Metering Panels Control Panels Lighting and Small Power					
Black Start Diesel Generator/s Emergency Diesel Generator/s					

132kV Cables with terminations MV cables (if applicable) LV cables Control Cables					
Ventilation and Air Conditioning Fire Protection Equipment Fire Protection System Equipment					

Signed……...……

On behalf of ……

Address ……..……

Date ……

KELANITISSA GAS TURBINE PROJECT

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SCHEDULE 2C - COMPLETION PERIODS OF **POWER STATION CIVIL ENGINEERING WORKS**

Work Description/Activity	Time required in weeks After Date of Commencement	Time required in weeks After Commencement for Completion
Survey of Proposed Power Station Site		
Existing Structure/foundations Removing and Site Clearing		
Site layout plan		
Foundation Design		
Gas Turbines Complete		
Gas Turbine Exhaust Stack		
Transformers		
Water Treatment Plant		
Fuel Oil Treatment Plant		
Fuel Storage Tanks		
Buildings		
Any other (Pls. specify)		
Foundation Construction		
Gas Turbines Complete		
Gas Turbine Exhaust Stack		
Transformers		
Water Treatment Plant		
Fuel Oil Treatment Plant		
Fuel Storage Tanks		
Buildings		
Any other (Pls. specify)		

Signed……...……

On behalf of ……

Address ……..……

Date ……

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 3 – PERFORMANCE GUARANTEES

The figures entered in the performance guarantees of gas turbines of the Schedule shall be based upon the following conditions and operation on Lanka Auto Diesel (LAD) and RLNG.

SCHEDULE 3A - PERFORMANCE GUARANTEES OF GAS TURBINE

Description	Required	Offered
ISO Rating		
Inlet air temperature	15 ^{0}C	
Relative humidity	60%	
Barometric pressure (absolute)	1.01 bar	
Site Rating		
Inlet air temperature	30 ^{0}C	
Mean humidity	80%	
Height above sea level	2m to 3m	
Percentage De-rating of the Gas Turbine reference to ISO ratings – for LAD at Site Conditions		
For ambient air temperature	%	
For humidity	%	
For altitude	%	
TOTAL	%	
Percentage De-rating of the Gas Turbine reference to ISO ratings for RLNG at Site Conditions		
For ambient air temperature	%	
For humidity	%	
For altitude	%	
TOTAL	%	

SCHEDULE 3A - PERFORMANCE GUARANTEES OF GAS TURBINE (Cont.)

Description	Unit	Percentage of Maximum Continuous Rating (MCR) for LAD*			
		100	75	50	25
ISO RATING – COMBINED TEST Power output at a.c generator terminals at unity power factor Heat Rate (LHV)**	 kW(e) kJ/kWh				
SITE RATING AT GENERATOR TERMINAL At average ambient Temp. of 28.2^0C Power output at a.c. generator terminals at 0.8 power factor Heat Rate (LHV)** At average ambient Temp. of 30^0C Power output at a.c. generator terminals at 0.8 power factor Heat Rate (LHV)**	 kW(e) kJ/kWh kW(e) kJ/kWh				
AC GENERATOR					
Efficiency at unity power Factor – ISO rating	%				
Efficiency at 0.8 power Factor – Site rating	%				
Efficiency at unity power Factor – Site rating	%				

*MCR of Gas Turbine shall be given considering any Inlet Air Cooling system, if provided
**Assume Net Calorific Value of Diesel fuel (LAD) – 42915 kJ/kg and Density s 0.84 kg/lit

SCHEDULE 3A - PERFORMANCE GUARANTEES OF GAS TURBINE (Cont.)

Description	Unit	Percentage of Maximum Continuous Rating (MCR) for RLNG*			
		100	75	50	25
ISO RATING – COMBINED TEST Power output at a.c generator terminals at unity power factor Heat Rate (LHV)	 kW(e) kJ/kWh				
SITE RATING AT GENERATOR TERMINAL At average ambient Temp. of 28.2^{0}C Power output at a.c. generator terminals at 0.8 power factor Heat Rate (LHV) At average ambient Temp. of 30^{0}C Power output at a.c. generator terminals at 0.8 power factor Heat Rate (LHV)	 kW(e) kJ/kWh kW(e) kJ/kWh				
AC GENERATOR					
Efficiency at unity power Factor – ISO rating	%				
Efficiency at 0.8 power Factor – Site rating	%				
Efficiency at unity power Factor – Site rating	%				

*MCR of Gas Turbine shall be given considering any Inlet Air Cooling system, if provided

SCHEDULE 3A - PERFORMANCE GUARANTEES OF GAS TURBINE (Cont.)
Liquid Fuel (LAD) and RLNG

Gas Turbine Set Load **Liquid Fuel (LAD)**	% of MCR	100%	75%	50%	25%
SOx	ppm				
NOx (without water injection)	ppm				
NOx (with water injection)	ppm				
Particulate Matters	ppm				

Gas Turbine Set Load **RLNG**	% of MCR	100%	75%	50%	25%
SOx	ppm				
NOx (without water injection)	ppm				
NOx (with water injection)	ppm				
Particulate Matters	ppm				

The guaranteed Heat Rate shall be subject to a tolerance of +1.0 % and shall be **based upon Lanka Auto Diesel (LAD) and RLNG**.

The power outputs stated in kW shall be the power delivered to the 132kV GIS and should not include the power required for excitation and auxiliary power requirement.

Signed……...……

On behalf of ……

Address ……..……

Date ……

SCHEDULE 3B - PERFORMANCE GUARANTEES OF POWER AUXILIARIES

The Power required to drive the continuously operating auxiliaries, when the engine is operating at its site MCR.

Please refer Form 16 of Section 3. 2 of Volume - 01

SCHEDULE 3C - PERFORMANCE GUARANTEES OF AC GENERATOR TEMPERATURE RISE

The AC Generator temperature rise above the generator compartment temperature of 40°C will not exceed the following;

Temperature Rise in ^{0}C		Percentage of Site MCR	
		100%	110% (1 Hour)
Stator Windings (Thermocouples)	^{0}C		
Rotor Windings (Resistance)	^{0}C		
Stator Core (Thermometers)	^{0}C		

The one-hour load at 110% of MCR shall be deemed to be applied when the a.c generator has reached a steady temperature at MCR.

Signed……...……

On behalf of ……

Address ……..……

Date ……

SCHEDULE 3D - PERFORMANCE GUARANTEES OF AC GENERATOR LOSSES

The alternator losses at rated voltage will not exceed the following figures, corrected to 75°C.

Generator Losses	Units	Percentage of Site MCR		
		100%	75%	50%
Stator Iron Loss	kW			
Stator Copper Loss	kW			
Rotor Copper Loss	kW			
Friction and Windage	kW			
Exciter Loss	kW			
Other Losses (specify)	kW			
Total Loss	kW			

Signed……...……

On behalf of ……

Address ……..……

Date ……

SCHEDULE 3E - PERFORMANCE GUARANTEES FOR STEP-UP TRANSFORMER LOSSES

Please refer Form 16 of Section 3. 2 of Volume -01

KELANITISSA GAS TURBINE PROJECT

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SCHEDULE 4 - MAINTENANCE INTERVALS RECOMMENDED BY MANUFACTURER

Maintenance	Units	LAD	RLNG	Remarks
Estimated Maintenance intervals for Base load operation (LAD and RLNG)				
a. Combustion Inspection	Actual running hrs			
b. Hot Gas Path Inspection	Actual running hrs			
c. Major inspection	Actual running hrs			
Estimated Maintenance intervals for System Peak demand operation* (LAD and RLNG)				
a. Combustion Inspection	Actual running hrs			
b. Hot Gas Path Inspection	Actual running hrs			
c. Major inspection	Actual running hrs			
Staff Requirement - Estimated inspection outage period based on 8-working hours shifts				
Combustion Inspection	hrs.			
	Man hrs.			

SCHEDULE 4 - MAINTENANCE INTERVALS RECOMMENDED BY MANUFACTURER Cont..

Maintenance	Units	LAD	RLNG	Remarks
Staff Requirement - Estimated inspection outage period based on 8-working hours shifts (Cont..)				
Hot Gas Path Inspection	hrs.			
	Man hrs.			
Major Inspection	hrs.			
	Man hrs.			

* Consider multiple startup scenario

Please provide the equivalent running hours calculation formula based on actual running hours, fuel type, number of starts, stops, trips and any other governing parameters.

Signed……...……

On behalf of ……

Address ……

Date ……

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE For liquid Fuel (LAD) and RLNG

The bidder shall specify the chapter, title, page and the paragraph in the product manual/ documentation or literature which points to each terms or requirements of the specification given below (They shall also be highlighted in the documentation of the manufacturer supplied with the bid).

The particulars to be given in this Schedule will be binding on the Contractor and shall not be departed from without the written permission of the Employer.

In case there is a discrepancy between this document and the technical specification then the conditions and clauses in the technical specification shall prevail.

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE For liquid Fuel (LAD) and RLNG (Cont.)

The particulars in this Schedule shall be given by considering the inlet air cooling system and NOx suppression system, if available**Gas Turbine** (The bidder may use separate attachments in case space provided in the cages below are not enough)		**Units**	**Specified**	**Offered**		**Remarks**
				LAD	**RLNG**	
General Information						
Type of Gas turbine			Industrial/ Aero derivative			
Make						
Model						
Year of Manufacture						
Name of Manufacturer						
Country of manufacture						
Performance of Gas Turbine						
Net Power Output @ ISO Conditions at generator terminal		kW @ 0.8 pf				
Efficiency (Net efficiency simple cycle mode) @ ISO Conditions		%	Min 36%			
Net Heat Rate(LHV) @ ISO Conditions		kJ/kWh				
Net Heat Rate @ 36 °C @ RH 85%	100% load	kJ/kWh				
	75% load					
	50% load					
	25% load					

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE - For liquid Fuel (LAD) and RLNG (Cont.)

Gas Turbine Cont…		Units	Specified	Offered		Remarks
				LAD	RLNG	
Performance without inlet cooling						
Net Heat Rate @ 34 °C @ RH 85%	100% load	kJ/kWh				
	75% load					
	50% load					
	25% load					
Net Heat Rate @ 32 °C @ RH 85%	100% load	kJ/kWh				
	75% load					
	50% load					
	25% load					
Net Heat Rate @ 30 °C @ RH 85%	100% load	kJ/kWh				
	75% load					
	50% load					
	25% load					
Net Heat Rate @ 28 °C @ RH 85%	100% load	kJ/kWh				
	75% load					
	50% load					
	25% load					
Net Heat Rate @ 26 °C @ RH 85%	100% load	kJ/kWh				
	75% load					
	50% load					
	25% load					
Net Heat Rate @ 24 °C @ RH 85%	100% load	kJ/kWh				
	75% load					
	50% load					
	25% load					
Net Heat Rate @ 22 °C @ RH 85%	100% load	kJ/kWh				
	75% load					
	50% load					
	25% load					
De-rating Factors for Temperature (*Manufacturer's Literature shall be attached)						
De-rating Factors for Relative Humidity (*Manufacturer's Literature shall be attached)						
De-rating Factors for Altitude (*Manufacturer's Literature shall be attached)						
Maximum Noise level at 1m						

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE - For liquid Fuel (LAD) and RLNG (Cont.)

Gas Turbine Cont…		Units	Specified	Offered		Remarks
				LAD	RLNG	
	Performance with inlet cooling					
Net Heat Rate (LHV) @ 36 °C @ 100% load	RH: 80%	kJ/kWh				
	RH: 70%					
	RH: 60%					
	RH: 50%					
Net Heat Rate @ 34 °C @ 100% load	RH: 80%	kJ/kWh				
	RH: 70%					
	RH: 60%					
	RH: 50%					
Net Heat Rate @ 32 °C @ 100% load	RH: 80%	kJ/kWh				
	RH: 70%					
	RH: 60%					
	RH: 50%					
Net Heat Rate @ 30 °C @ 100% load	RH: 80%	kJ/kWh				
	RH: 70%					
	RH: 60%					
	RH: 50%					
Net Heat Rate @ 28 °C @ 100% load	RH: 80%	kJ/kWh				
	RH: 70%					
	RH: 60%					
	RH: 50%					
Net Heat Rate @ 26 °C @ 100% load	RH: 80%	kJ/kWh				
	RH: 70%					
	RH: 60%					
	RH: 50%					
Net Heat Rate @ 24 °C @ 100% load	RH: 80%	kJ/kWh				
	RH: 70%					
	RH: 60%					
	RH: 50%					
Net Heat Rate @ 22 °C @ 100% load	RH: 80%	kJ/kWh				
	RH: 70%					
	RH: 60%					
	RH: 50%					

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE - For liquid Fuel (LAD) and RLNG (Cont.)

Performance for LAD Firing @ Site Conditions Specified (Section 3.4)				
Gas Turbine Cont…	**Units**	**Specified**	**Offered**	**Remarks**
Base Load operation				
Net Power Output @ generator terminals	kW @ 0.8 pf			
Net Heat rate (LHV)	kJ/kWh			
Fuel Flow rate	l/h			
Fuel Consumption	g/kWh			
NO_x Level (at 3% O_2)	ppm			
NO_x Level (at 15% O_2)	ppm			
Particulate Matter (PM)	ppm			
SO_x Level	ppm			
Max. Turbine Inlet Temperature	°C			
Max. Turbine Outlet Temperature	°C			
Maximum Auxiliary Power Consumption	kW			

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE - For liquid Fuel (LAD) and RLNG (Cont.)

Performance RLNG Firing @ Site Conditions Specified (Section 3.4)				
Gas Turbine Cont…	**Units**	**Specified**	**Offered**	**Remarks**
Base Load operation				
Net Power Output @ generator terminals	kW @ 0.8 pf			
Net Heat rate	kJ/kWh			
Fuel Flow rate	kg/h			
Fuel Consumption	kg/kWh			
NO_x Level (at 3% O_2)	ppm			
NO_x Level (at 15% O_2)	ppm			
Particulate Matter (PM)	ppm			
SO_x Level	ppm			
Max. Turbine Inlet Temperature	°C			
Max. Turbine Outlet Temperature	°C			
Maximum Auxiliary Power Consumption	kW			

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE - For liquid Fuel (LAD) and RLNG (Cont.)

Gas Turbine Cont…	Units	Specified	Offered	Remarks
Technical Information				
Dual fuel capability for LAD and RLNG		Shall be complied		
Combustion Chamber arrangement type				
Type of Combustor				
Number of Compressor stages				
Compressor pressure ratio				
Number of turbine stages				
Instruments for measuring fouling in the compressor		Shall be fixed		
Type & arrangement of Bearings				
Number of Bearings				
Starting means				
Guaranteed maximum safe load ramp rate	MW/min			

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE - For liquid Fuel (LAD) and RLNG (Cont.)

	Units	Specified	Offered	Remarks
Gas Turbine Cont…				
Turbine/ Compressor Rated speed	rpm			
Critical Speed above and below rated speed	rpm			
Maximum vibration Limit	mm/s	ISO 10816/ ISO 20816/ ISO 21940		
Moment of Inertia of Rotor complete	kgm^2			
Weight of single heaviest component	kg			
Operation parameters				
Air Flow	kg/s			
Turbine Cooling Air flow (% of total air mass flow of the turbine)	%			
Exhaust Gas Flow	kg/s			
Max. Exhaust temperature limit of RLNG burning	°C			
Max. Exhaust temperature limit of LAD burning	°C			
Max. Starting time required from standstill to full speed without any impact to cyclic life of GT	min	10		
Min. time required for the Gas turbine to reach full load a. From Cold standby b. From warm shutdown c. From tripping (with no fault)	 min min min			
Maximum time for normal shut down from FSNL	min			
Restrictions due to Hot lockout activation for restarting		Not allowed any hot lockout conditions		

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE - For liquid Fuel (LAD) and RLNG (Cont.)

Time required for a restart just after machine shut down when following a, a. normal restart b. a cooling cycle (if any) c. turbine warmup (if any) d. hot lockout is activated (if any)	 min min min min	Submit restart sequence graphs which indicates each sequence		

SCHEDULE 5 – GUARANTEES & TECHNICAL PARTICULARS OF GAS TURBINE - For liquid Fuel (LAD) and RLNG (Cont.)

	Units	Specified	Offered	Remarks
Gas Turbine Cont…..				
Inlet and Exhaust Losses				
<u>Correction Curves for Offered Gas Turbines</u> **Correction without water injection** 1. Correction to ISO Performance vs Compressor Inlet Temperature (Ambient Temperature) for Turbine Power, Heat rate, Fuel flow, Exhaust flow and Exhaust temperature. 2. Performance Correction Curves for Excess Inlet Loss. 3. Performance Correction Curves for Excess Exhaust Loss **Correction with water injection** 1. **Curves for** a. Water/Fuel ratio VS NOx for Liquid fuel and **Correction curves for** water injection with liquid fuel for Turbine Power, Heat Rate, Exhaust flow and Exhaust temperature b. Water/ Fuel ratio VS NOx for RLNG and **Correction curves** for water injection with RLNG for Turbine Power, Heat Rate, Exhaust flow and Exhaust temperature				

Signed……...……

On behalf of ……

Address ……..……

Date ……

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 6: GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION MEANS

SCHEDULE 6A – GUARANTEES & TECHNICAL PARTICULARS FOR GAS TURBINE POTECTION DEVICES

	Units	Specified	Offered	Remarks
Type of Turbine Protections				
Low lube oil pressure protection		Yes		
Over speed protection		Yes		
High exhaust gas temperature		Yes		
Flame failure		Yes		
Low fuel pressure		Yes		
High Vibration level		Yes		
Sensor failure alarm		Yes		
Emergency trip button located on Turbine control panel		Yes		
Bearing metal temperature		Yes		
Lube oil temperature		Yes		
Fire protection		Yes		
Emergency trip		Yes		

Signed……...……

On behalf of ……

Address ……..……

Date ……

SCHEDULE 6B – GUARANTEES & TECHNICAL PARTICULARS FOR LUBRICATION OIL SYSTEM

2.0 Lubrication Oil System	**Units**	**Specified**	**Offered**	**Remarks**
Shaft driven Lube oil pump capacity	m^3/h			
AC Lube oil pump capacity (Duty and Stand by pumps shall be same)	m^3/h			
AC pump power rating	kW			
DC Lube oil pump Capacity	m^3/h			
DC pump power rating	kW			
Shaft driven pump Manufacturer, Country of Origin				
AC pump Manufacturer, Country of Origin				
DC pump Manufacturer, Country of Origin				
Type of Lube Oil (Provide the specification and recommended list of products)				
Total Quantity of lube oil in system	liters			
Type of lube oil filters				
Degree of filtration	microns			
Manufacturer of lube oil filter				
Country of lube oil filter manufacture				

Signed……...……

On behalf of……

Address ……..……

Date……

SCHEDULE 6C – GUARANTEES & TECHNICAL PARTICULARS FOR FUEL AND ATOMIZING SYSTEMS

3.0 Liquid fuel system	Units	Specified	Offered	Remarks
Fuel Oil Treatment Plants (FOTP)				
Manufacturer of FOTPs				
Country				
Model & Type of FOTP		Centrifuge		
No. of centrifuge				
Capacity of each Plant (Filtering rate)				
Daily Fuel Storage Tanks				
Manufacturer				
Country				
Model & Type		Cylindrical, Steel		
No of Tanks				
Capacity of Each Tank				
Fuel forwarding pump skid				
Type of Pumps				
No. of Pumps				
Pump Capacity	m^3/h			
Pump Motor Rating	kW			
Manufacturer of pumps				
Country manufactured				

SCHEDULE 6C – GUARANTEES & TECHNICAL PARTICULARS FOR FUEL AND ATOMIZING SYSTEMS (Cont.)

Fuel Filtering Skid (Duplex Filter)				
Type of Filter		Duplex		
Type of filter element		Paper/strainer		
Degree of Filtration				
Capability of online interchanging of filters		Yes		
Manufacturer of filtering skid				
Manufacturer of filter element				
Country manufacture of filtering skid				
Atomizing air skid				
Type of Compressor				
Rated pressure	Bar			
Maximum pressure	bar			
Capacity	m^3/h			
Manufacturer of compressor				
Country manufactured				
Motor Rating	kW			

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SCHEDULE 6D – GUARANTEES & TECHNICAL PARTICULARS FOR AIR INTAKE AND EXHAUST SYSTEM

4.0 Air Intake and exhaust system		Units	Specified	Offered	Remarks
Air Intake System					
Materials of weather Louvers					
Material of intake duct					
Intake duct surface treatment					
Type of Air Filter element	Primary		Static/Pulse		
	Secondary				
Make/Country of Manufacturer of Filter house/element					
Material of Filter medium					
Size of Filter element Length Width/diameter Height		 mm mm mm			
Reusability of filter element after washing					
Ability for Disposing					
Max. Intake velocity		m/s			
Max. Pressure loss		mm Aq			
Type of Silencer					
Material of Sound absorber					
Manufacturer of Silencer					
Amount of Intake Air Required		m^3/hr			
Exhaust System					
Stack Height		m	Minimum 38m		
Material of Stack					
Surface Treatment of Stack plate					
Material of expansion joint					
Material and thickness of expansion Joint liner					
Manufacturer of expansion Joints					

SCHEDULE 6D – GUARANTEES & TECHNICAL PARTICULARS FOR AIR INTAKE AND EXHAUST SYSTEM (Cont.)

Exhaust System Cont….	**Units**	**Specified**	**Offered**	**Remarks**
Type of silencer				
Material of sound absorber/ insulation material				
Manufacturer of silencer				
Country of manufacture				
Maximum Pressure Loss	mmAq			
Maximum leaving temperature at exhaust stack	^{0}C			

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SCHEDULE 6E – GUARANTEES & TECHNICAL PARTICULARS FOR ANCILLARY SYSTEMS

5.0 Ancillary systems	Units	Specified	Offered	Remarks
Boost Air Compressor (if applicable)				
Type of Compressor				
Rated Pressure	kPa			
Capacity	m^3/h			
Manufacturer				
Country of manufacture				
Motor Rating	kW			
Load Gear (if applicable)				
Manufacturer				
Country of manufacture				
Type				
Size / Capacity	kW			
Weight	kg			
Service factor as per ISO/DIN or AGMA				
High speed shaft	rpm			
Low speed Shaft	rpm			
Barring Gear (if applicable)				
Intermittent or Continuous rolling				
Speed	rpm			
Manual Turning Capability		Shall be provided		
Normal Turning period after Base Load operation	Hrs.			
Normal Turning period after Peak Load operation	Hrs.			
Normal Turning period before start up from stand still				

SCHEDULE 6E – GUARANTEES & TECHNICAL PARTICULARS FOR ANCILLARY SYSTEMS (Cont.)

Auxiliary Gear (if applicable)				
Manufacturer				
Country of manufacture				
Type				
Weight	kg			
Size / Capacity	kW			
High speed shaft	rpm			
Low speed Shaft	rpm			
Service Air Compressor				
Type of Compressor				
Rated pressure	kPa			
Capacity	m^3/h			
Manufacturer and Country				
Lube Oil Heat Exchangers / Coolers				
Manufacturer				
Country of manufacture				
Type		Air/Water		
Max. flow rate	m^3/min			
Oil inlet temperature	^0C			
Oil outlet temperature	^0C			

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KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATON

Description	Units	Required	Offered
A.C Generator - General			
Name of Manufacturer			
Country of manufacture			
Year of Manufacture			
Model			
Type reference			
Frequency	Hz	50	
Number of phases		3	
Number of poles			
Connection			
Speed	rpm		
Maximum continuous rating at			
Rated 0.8pf lagging and engine hall	MVA		
Ambient temperatures of	^{0}C		
Power factor			
Rated stator line current	A		
Terminal voltage	kV		
Altitude	m		
Class of Insulation		F	
Temperature rise above 40ºC of ambient			
At full load conditions: -			
(a) Stator windings	k		
(b) Stator core	k		
(c) Rotor windings	k		

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATON (Cont.)

Open circuit transient time constant	S		
Short circuit transient time constant	S		
Formula for three-phase short time			
Generator air inlet temperature	^{0}C		
Generator air outlet temperature	^{0}C		

Description	Units	Required	Offered
A.C Generator - General			
Regulation:			
(a) Unity pf	%		
(b) 0.8 lagging pf	%		
Weight of complete generator	kg		
Negative phase sequence rating as			
(a) Maximum continuous			
(b) I2t			
Applicable international standard	IEC		
Generator air flow rate	m^3/sec		
Moment of inertia, WR^2	$kg.m^2$		
Inertia Constant, H	kW secs /kVA		

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Generator Losses at:		Unity pf		0.8 pf	
		Require	Offered	Required	Offered
(a)	MW Output		%		%
(b)	Friction and windage loss (kW)				
(c)	Stator core iron loss (kW)		%		%
(d)	Stator copper loss at 95^0C (kW)		%		%
(e)	Stray load loss at 95^0C (kW)		%		%
(f)	Rotor copper loss at 95^0C (kW)				
(g)	Exciter loss (kW)				
(h)	Total loss (kW)				
	Anti-condensation space heater power rating				

Generator Efficiency at:			Unity pf		0.8 pf	
			Require	Offered	Required	Offered
(a)	Gas turbine Overload condition	capacity		%		%
(b)	Nominal rating			%		%
(c)	75%			%		%
(d)	50%			%		%
(e)	25%			%		%

Reactance:	Unity pf at Rated Current		0.8 pf at Rated Volts saturated		At 50% Volts	
	Reqd	Offered	Reqd	Offered	Reqd	Offered
Sub-transient		%		%		%
Transient		%		%		%
Negative sequence		%		%		%
Zero sequence		%		%		%
Synchronous		%		%		%
Short circuit ratio		%		%		%
Inertia Constant						
Type of Cooling (IC Category)						
Degree of Protection of Enclosure (IP Category)						

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Description		Required	Offered
Generator Stator			
Weight	kg		
Length of core	mm		
Internal diameter of core	mm		
Air Gap	mm		
Core material			
Type of slot			
Number of slots			
Stator coil slot pitch			
Conductors per slot			
Type of winding			
Arc Conductors laminated construction			
Dimension of copper forming conductor	mm		
Cross section of one conductor	mm^2		
D.C. resistance per phase at 75°C	ohms		
Insulation:			
(a) Class		F	
(b) Material in slot			
(c) Material on overhang			
(d) Minimum thickness to earth			
(e) Between turns in slot			
(f) Between phases in slot to			
(g) Stator end shield material			

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Description		Required	Offered
Insulation (continued) :			
(h) Designed maximum continuous Power frequency dielectric stress			
(i) Provisions for stress grading			
D.C. site test voltage			
Stator	kV		
Field	kV		
HV type tests – Inter-turn:			
(a) Power frequency withstand (1 minute)	kV		
(b) Power frequency breakdown (minimum)	kV		
(c) Surge withstand	kV		
(d) Surge impedance per phase at 75°C	Ohms		
HV type tests – Earth:			
(a) Power frequency withstand (1 minute)	kV		
(b) Power frequency breakdown (minimum)	kV		
(c) Surge withstand	kV		
(d) Surge impedance per phase at 75°C	Ohms		
Generator Rotor			
Weight	kg		
Rotor windings direct or indirect cooled			
Length of rotor body	mm		
Length over windings	mm		
Length over end rings	mm		

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Description		Required	Offered
Generator Rotor Cont.			
Material:			
Rotor body			
Hub and spider			
End rings			
Slip rings			
Packing material under end rings			
Length between centre lines of bearing	mm		
Diameter of rotor body	mm		
Operating speed	rpm		
Critical speed	rpm		
Lowest factor of safety of any part of rotor when running at 20% above normal running speed, calculated yield point of material			
Part with lowest factor of safety			
Number of wound slots			
Spacing of wound slots	mm		
Conductors per slot			
Section of conductor	mm^2		
Slot wedge material			
Total winding resistance hot (75^oC)	ohms		
Insulation on windings			

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR(Cont.)

Description		Required	Offered
Generator Rotor Cont…			
Insulation in slot			
Class of insulation		**F**	
Minimum insulation thickness:			
(a) To earth			
(b) Between turns in slot			
Temperature Measurement			
Type of Measuring Device			
Number and position of measuring device			
(a) in air circuit			
(b) in slots			
(c) in core			

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Description	Required	Offered
Static Rectification Equipment		
Technology	State of art	
Type	Static type	
Excitation Transformer	a. Three Phase	
	b. Shall capable to provide field voltage for 1.05 p.u continues field current	
	c. Shall capable to provide 2 p.u field current for 10s	
Thyristor Converter	a. full control three phase with protection for high dv/dt and over current (Snubber + HRC fuse)	
	b. shall able to provide continuous over voltage sufficient to drive the continues 1.05 p.u field current	
	c. Converter forced cooling	
	d. Repetitive peak reverses voltage and the peak off state voltage of the thyristor shall satisfy a voltage security factor of at least 3 times the maximum peak of secondary voltage of the excitation transformer	
Rated continues Field current	Excitation system shall capable to provide at least 105% of field current continuously	

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Description	Required	Offered
Static Rectification Equipment		
Rated continuous field voltage	Shall allow operation of the synchronous machine at rated MVA and within ±5% of rated terminal voltage	
Voltage Ceiling Limit	positive ceiling voltage of 2 times of rated field voltage for the duration of 10s	
Negative ceiling voltage limit	Negative ceiling voltage shall not be less than 1.6 (70% of positive ceiling) times of the rated voltage	
Field Current Ceiling Limit	2 p.u for 10 seconds	
Regulator functions	a. Relevant PID and feedback loops and relevant PID arrangement (PID block position)	
	b. Ability to onsite reconfiguring and tuning of PID parameters.	
Control modes	Local and Remote	
Limiter functions	a. Maximum field current limit	
	b. Under excitation limiter (PQ Limiter)	
	c. Minimum field current limit	
	d. Stator Capacitive current limit	
	e. Volts per hertz or over flux limit (V/Hz)	
	f. Stator Inductive current limit	
Monitors	a. PQ Monitoring.	
	b. Rotor earth fault monitoring.	
	c. V/Hz monitoring.	
	d. Rotor temperature monitoring.	
	e. Excitation Transformer Temperature.	
	f. Stator overcurrent monitoring.	
	g. Stator overvoltage Monitoring.	
	h. Measurements Monitoring.	

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Description	Required	Offered
Static Rectification Equipment		
Monitors	i. Monitoring of the monitored Components.	
	j. Ripple Monitoring.	
	k. Converter Fault Monitoring.	
	l. Auxiliaries Ready Monitoring.	
	m. Power Supply Monitoring.	
	n. Converter Temperature Monitoring.	
AVR Mode	Regulate generator terminal voltage	
PF Mode	Regulate generator terminal power factor	
MVAR Mode	Regulate generator reactive power generation	
Joint Voltage Control Mode	Control strategy responding together in a coordinated response to two or more machines causing a proportional change in multiple generator outputs. The adjusted machine quantity can be voltage (or reactive power if appropriate). When the control strategy signal is raised or lowered, all machines will increase or decrease their output accordingly.	
I_f Mode or Manual mode	Regulate generator field current (manual channel)	
PSS	a. Mitigate inter-plant, inter-area, local area power oscillations (0.2Hz -3Hz). Shall get dual inputs (active power and rotor angular frequency.	
	b. Shall be based on IEEE 421 5. 2005-type 2B standard	
Voltage droop compensation	Control and sharing of reactive power in parallel generators operation.	
Voltage drop compensation	Compensate transformer inductive drop in voltage regulation	

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Description		Required	Offered
Static Rectification Equipment			
Soft start		Starting excitation in ramp to avoid overshoot.	
Reverse polarity voltage injection		To minimize stored energy during field breaker opening.	
Small signal control system performance (Refer IEEE Std 421.2-1990 table 01)		a. Gain Margin ≥ 6 dB	
		b. Phase Margin ≥ 40º	
		c. Overshoot - 0 to 15%	
		d. Damping ratio ≥ 0.6	
High initial response		Quick response to transient state variations. (An excitation system capable of attaining 95% of the difference between Ceiling voltage and rated field voltage in 0.1 s or less under specified conditions.)	
Redundancy concept (n-1 concept)	Control channel	Two no of complete AVR module with all hardware (one operation and one backup)	
	Power supply	Three separate sources (PT from generator terminal, Auxiliary AC, from DC bus)	
	Converter	Two Complete converter modules with all protection cooling, sensing equipment.	
Operating mode change-over		Smooth transfer without any over or under shoot.	
Auto – follower		Manual channel shall follow auto channel set point to smooth transfer when auto channel fails.	

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Description	Required	Offered
Static Rectification Equipment		
Protection coordination with generator protection relays	Mainly following functions of AVR shall coordinate with generator protection. 1. Voltage per Hertz 2. Under voltage 3. Over voltage 4. Loss of field	
Rotor earth fault	Frequency injection scheme shall cover 100% of field winding.	
Online real time monitoring	To check operating condition parameters (analog/digital) , Setting Parameters and AVR control logic	
Historical data recoding	Ability to plot selected parameters with respect to time with high sampling rate. (ability to plot sub transient conditions)	
Control and communication	a. Shall have several programmable levels of password protection, in order to view data records, retrieve data records and to change parameters.	
	b. Shall communicate with Unit Controller.	
	c. Shall able to connect through local PC with the software with uploading, calibration, tuning, editing and commissioning.	

SCHEDULE 6F – GUARANTEES & TECHNICAL PARTICULARS FOR A.C GENERATOR (Cont.)

Description	Required	Offered
Control and communication	d. Facility shall be available for remote communications through 100 Mbps Ethernet with OPC server and SCADA facility to interface with DCS	
	e. Shall supply the drivers/license for the OPC server, which is based on Windows	
Annual forced outage rate (FOR)	Shall be not more than 0.1%	

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On behalf of ……

Address ……..……

Date ……

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS

Description Oil filled transformers		Unit (Step up) Transformers		Station Auxiliary	
		Required	Offered	Required	Offered
Name of manufacturer					
Brand/Model offered					
Country of manufacture					
Year of manufacture					
Continuous maximum rating at site ambient	MVA				
Type of Cooling		ONAF		ONAN	
Rated Frequency	Hz	50		50	
Number of Phases		3		3	
Highest System Voltages (HV/LV)	kV	145/*		36/0.415	
Designed Impulse Withstand Voltage for HV/LV side	kV	650/*		95/95	
Vector group		YNd1/YNd11			
Transformation ratio at no-load					
Voltage control equipment (Tap changer)					
(a) Make and type		MR/Vacutap			
(b) whether on-load or off-load		On-load		Off-load	
(c) HV or LV winding		HV		HV	
(d) Range		-10% to+10%		-5% to +5%	
(e) Power frequency withstand Test voltage to latest IEC standards					
i) first and last contacts of the selector switch	kV				
ii) any two adjacent contacts of the selector	kV				
iii) open diverter switch contacts	kV				
(f) Type test certificate reference					
(g) Size of Tapping	%	1.25%		2.5 %	

* to be specified to suit Generating Voltage as per IEC 60076-3.

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Unit (Step up) Transformers		Station Auxiliary Transformers	
		Required	Offered	Requ	Offered
Hot temperature at CMR to IEC 60076 or latest	^{0}C	55			
Maximum temperature rise by resistance	^{0}C				
Assumed simultaneous conditions under which maximum fluxdensity is attained					
(a) Tap position	Tap				
(b) Frequency	Hz				
(c) Voltage H.V	kV				
Voltage L.V	kV				
(d) Load – MVA at 0.85PF	MVA				
Maximum top oil temperature					
(a) CMR					
(b) ONAN rating	^{0}C				
(c) At site ambient of	^{0}C				
Maximum flux density in iron at					
(a) Cores	Tesla	**1.6**			
(b) Yokes	Tesla	**1.6**			
Magnetizing Current	%				
Maximum current density in windings					
(a) HV winding	A/m				
(b) LV winding	A/m				
Losses					
No-load losses at rated voltage, ratio and frequency	kW				
Auxiliary losses at CMR	kW				
Load losses at 75^{o}C and nominal ratio					
(a) CMR	kW				
(b) ONAN rating	kW				
Total losses at 75^{o}C and nominal ratio					
(a) CMR including input to	kW				
(b) ONAN rating	kW				

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Unit (Step up) Transformers		Station Auxiliary Transformer	
		Required	Offered	Required	Offered
Efficiency					
Efficiencies at:					
(a) Full load, unity power factor	%				
(b) Full load, 0.8 power factor	%				
(c) 80% load unity power factor	%				
(d) 80% load 0.8 power factor	%				
(e) 60% load unity power factor	%				
(f) 60% load 0.8 power factor	%				
MVA at 0.95PF leading					
(e)Maximum flux density in iron under these conditions	Tesla				
Impedance voltage at 75°C and CMR					
(a) Between HV and LV windings	%	10**%**			
Zero phase sequence impedances					
(a) HV to LV	%				
(b) LV to HV	%				
DETAILS OF CONSTRUCTION					
Types of winding:					
(a) HV					
(b) LV					
Insulation of:					
(a) HV windings					
(b) LV windings					
Insulation of tapping connections					
Insulation of:					
(a) Core bolts					
(b) Side plates					
(c) Core laminations					
Winding connections (brazed or crimped)					
Availability of facility provided for adjustment of axial pressure on windings					

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Unit (Step up) Transformers		Station Auxiliary Transformers	
		Require	Offered	Required	Offered
Dimensions of Transformer Tank					
(a) Thickness of sides	mm				
(b) Thickness of base	mm				
(c) Length of base	mm				
(d) Skid base	mm				
Material used for Gaskets for all tight joints					
RADIATORS AND FANS					
Thickness of radiator plates and/or cooling	mm				
Equipment for ON cooling					
(a) Radiators on main tank or					
(b) Separate cooler banks					
Auxiliary equipment for ONAF					
(a)Forced air cooling of Radiators on tank					
(b) Separate forced air Cooler bank					
Number of Coolers/Radiators/Tubes or Cooler banks per Transformer					
Thermal rating of each cooler Radiator Bank	kW				
Number of air blowers per Transformer					
Speed of air blowers	rpm				
Rating of each Air Blower Motor	kW				
Starting current of each Blower Motor	A				

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Unit (Step up) Transformers		Station Auxiliary Transformers	
		Required	Offered	Required	Offered
OIL VOLUMES AND WEIGHTS					
Total oil required including cooler system	litres				
Volume of oil above level of the top	litres				
Total volume of conservator	litres				
Volume of oil in conservator between highest and lowest visible graduations	litres				
Weight of core and winding assembly	kg				
Total weights of complete transformer, including attached coolers, voltage regulating equipment, all fittings and oil	kg				
Transport weight and dimensions of largest part of transformer (approx.)					
(a) Weight	kgs				
(b) Length	mm				
(c) Width	mm				
(d) Height	mm				
Whether the type of offered transformer					
TRANSFORMER BUSHING					
Manufacturer	HV				
	LV				
Insulator material (solid/srbp/oil/paper)	HV				
	LV				
Manufacturer's type reference and rated	HV				
	LV				
Length of insulator (overall)	HV				
	LV				
Weight of insulator	HV				
	LV				
Electrostatic capacity of complete	HV				
	LV				

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Unit (Step up) Transformers		Station Auxiliary Transformers	
		Require	Offered	Requir	Offered
50Hz dry voltage withstand	HV				
	LV				
Lightning impulse flashover voltage (1.2/50 wave)	HV				
	LV				
Full wave lightning impulse voltage	HV				
	LV				
50HZ wet withstand voltage without arcing horns	HV				
	LV				
Total creepage distance of shedding	HV				
	LV				
Protected creepage distance of shedding					
Whether Additional information to be provided with the Bid:					
Brief description of transformer or parts thereof subjected to short circuit test or for which short circuit calculations are available					
Buchholz Protection Device					
Manufacturer					
Type					
Number of contacts/elements					
Winding Temperature Device					
Manufacture					
Type					
Number of Contacts/Elements					
Air Drying Device					
Manufacture					
Type					

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description Oil filled transformers		Step down Auxiliary Transformers	
		Required	Offered
Name of manufacturer			
Country of manufacture			
Year of manufacture			
continuous maximum rating at site ambient	MVA		
Type of Cooling		ONAN	
Rated Frequency	Hz	50	
Number of Phases		3	
Highest System Voltages (HV/LV)	kV	*/6.6	
Designed Impulse Withstand Voltage for HV/LV side	kV	*/95	
Vector group		YNd1/YNd11	
Transformation ratio at no-load			
Voltage control equipment (Tap changer)			
(a) Make and type		MR	
(b) whether on-load or off-load		Off-load	
(c) HV or LV winding		HV	
(d) Range		+5% to -5% at 2.5% steps	
(e) Power frequency withstand Test voltage to latest IEC standards			
i) first and last contacts of	kV		
ii) any two adjacent contacts of the selector	kV		
iii) open diverter switch contacts	kV		
(f) Type test certificate reference			
(f) Size of Tapping	%	1.25%	

* to be specified to suit Generating Voltage as per IEC 60076-3.

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Step down Auxiliary Transformers	
		Required	Offered
Hot temperature at CMR to IEC 60076 or latest	^{0}C	55	
Maximum temperature rises by resistance	^{0}C		
Assumed simultaneous conditions under which maximum fluxdensity is attained			
(a) Tap position	Tap		
(b) Frequency	Hz		
(c) Voltage H.V	kV		
Voltage L.V	kV		
(d) Load – MVA at 0.85PF	MVA		
Maximum top oil temperature			
(a) CMR			
(b) ONAN rating	^{0}C		
(c) At site ambient of	^{0}C		
Maximum flux density in iron at			
(a) Cores	Tesla	1	
(b) Yokes	Tesla	1	
Magnetizing Current	%		
Maximum current density in windings			
(a) HV winding	A/m		
(b) LV winding	A/m		
Losses			
No-load losses at rated voltage, ratio and frequency	kW		
Auxiliary losses at CMR	kW		
Load losses at 75^{o}C and nominal ratio			
(a) CMR	kW		
(b) ONAN rating	kW		
Total losses at 75^{o}C and nominal ratio			
(a) CMR including input to	kW		
(b) ONAN rating	kW		

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Step down Auxiliary Transformers	
		Required	Offered
Efficiency			
Efficiencies at:			
(a) Full load, unity power factor	%		
(b) Full load, 0.8 power factor	%		
(c) 80% load unity power factor	%		
(d) 80% load 0.8 power factor	%		
(e) 60% load unity power factor	%		
(f) 60% load 0.8 power factor	%		
MVA at 0.95PF leading			
(e)Maximum flux density in iron under these conditions	Tesla		
Impedance voltage at 75°C and CMR			
(a) Between HV and LV windings	%	10**%**	
Zero phase sequence impedances			
(a) HV to LV	%		
(b) LV to HV	%		
DETAILS OF CONSTRUCTION			
Types of winding:			
(a) HV			
(b) LV			
Insulation of:			
(a) HV windings			
(b) LV windings			
Insulation of tapping connections			
Insulation of:			
(a) Core bolts			
(b) Side plates			
(c) Core laminations			
Winding connections (brazed or crimped)			
Availability of facility provided for adjustment of axial pressure on windings			

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Step down Auxiliary Transformers	
		Require	Offered
Dimensions of Transformer Tank			
(a) Thickness of sides	mm		
(b) Thickness of base	mm		
(c) Length of base	mm		
(d) Skid base	mm		
Material used for Gaskets for all tight joints			
RADIATORS AND FANS			
Thickness of radiator plates and/or cooling	mm		
Equipment for ON cooling			
(a) Radiators on main tank or			
(b) Separate cooler banks			
Auxiliary equipment for ONAF			
(a)Forced air cooling of Radiators on tank			
(b) Separate forced air Cooler bank			
Number of Coolers/Radiators/Tubes or Cooler banks per Transformer			
Thermal rating of each cooler Radiator Bank	kW		
Number of air blowers per Transformer			
Speed of air blowers	rpm		
Rating of each Air Blower Motor	kW		
Starting current of each Blower Motor	A		

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Step down Auxiliary Transformers	
		Require	Offered
OIL VOLUMES AND WEIGHTS			
Total oil required including cooler system	litres		
Volume of oil above level of the top	litres		
Total volume of conservator	litres		
Volume of oil in conservator between highest and lowest visible graduations	litres		
Weight of core and winding assembly	kg		
Total weights of complete transformer, including attached coolers, voltage regulating equipment, all fittings and oil	kg		
Transport weight and dimensions of largest part of transformer (approx.)			
(a) Weight	kgs		
(b) Length	mm		
(c) Width	mm		
(d) Height	mm		
Whether the type of offered transformer is the sealed or unsealed type?			
TRANSFORMER BUSHING INSULATORS			
Maker	HV		
	LV		
Insulator material (solid/srbp/oil/paper)	HV		
	LV		
Maker's type reference and rated voltage	HV		
	LV		
Length of insulator (overall)	HV		
	LV		
Weight of insulator	HV		
	LV		

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Step down Auxiliary Transformers	
		Require	Offered
Electrostatic capacity of complete	HV		
	LV		
50Hz dry voltage withstand	HV		
	LV		
Lightning impulse flashover voltage (1.2/50 wave)	HV		
	LV		
Full wave lightning impulse voltage	HV		
	LV		
50HZ wet withstand voltage without arcing horns	HV		
	LV		
Total creepage distance of shedding	HV		
	LV		
Protected creepage distance of shedding			
Whether Additional information to be provided with the Bid:			
Brief description of transformer or parts thereof subjected to short circuit test or for which short circuit calculations are available			
Buchholz Protection Device			
Manufacturer			
Type			
Number of contacts/elements			
Winding Temperature Device			
Manufacture			
Type			
Number of Contacts/Elements			

SECTION 7A – GUARANTEES & TECHNICAL PARTICULARS FOR OIL FILLED THREE PHASE TRANSFORMERS (Cont.)

Description		Step down Auxiliary Transformers	
		Require	Offered
Air Drying Device			
Manufacture			
Type			

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Date ……

SECTION 7B – GUARANTEES & TECHNICAL PARTICULARS FOR DRY TYPE TRANSFORMERS

Description		Unit Auxiliary Transformers		Excitation Transformer	
		Required	Offered	Required	Offered
Dry type transformer					
Manufacturer					
continuous maximum rating at site	MVA				
Type of Cooling		ANAF		AN	
Rated Frequency	Hz	50			
Number of Phases		3			
Highest System Voltages (HV/LV)	kV	6.6/0.415			
One-minute power frequency withstand	kV	28 kV			
Designed Impulse Withstand	kV	95 kV			
Rated fault current					
Vector group		DyN			
Transformation ratio at no-load					
Voltage control equipment (Tap changer)					
(a) Make and type		ABB Sweden or MR Germany			
(b) Whether on-load or off-load		Off-load			
(c) HV or LV winding		HV			
(d) Range		+5% to -5% at 2.5% steps			

SECTION 7B – GUARANTEES & TECHNICAL PARTICULARS FOR DRY TYPE TRANSFORMERS (Cont.)

Description		Unit Auxiliary Transformers		Excitation Transformer	
		Required	Offered	Required	Offered
(e) Power frequency withstand Test voltage to latest IEC standards					
i) first and last contacts of the selector switch	kV				
ii) any two adjacent contacts of the selector	kV				
iii)open diverter switch contacts	kV				
(f) Type test certificate reference					
(g) Size of Tapping		2.5%			
Dry type transformer Cont…					
Hot temperature at CMR to IEC 60076 or latest	^{0}C	55			
Maximum temperature rise by resistance	^{0}C				
Winding		Vacuum cast with copper			
Temperature class		Class F			
Transformer Enclosure		Fabricated from steel with protection degree IP23			
Audible sound Level (NEMA ST-20)					
Enclosure painting average thickness >		70µm			

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Date ……

KELANITISSA GAS TURBINE PROJECT
BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 8 - GUARANTEES & TECHNICAL PARTICULARS FOR BLACKSTART AND EMERGENCY DIESEL GENERATORS

Description	Units	Required	Offered
Blackstart generators for 6kV busbar Cont..			
Diesel Engine			
Name of Manufacturer			
Country of manufacture			
Year of manufacture			
Name of Local agent			
Type reference			
Model Number			
Number, type and arrangement of cylinders			
No. of strokes			
Compressor ratio			
Fuel tank capacity			
Fuel consumption			
Starting system			
Lubricating oil liters			
Recommended hours between overhauls			
Cooling system description			
Engine speed	rpm		
Description of Speed governing system and fuel control system			
Duty cycle			

SCHEDULE 8 - GUARANTEES & TECHNICAL PARTICULARS FOR BLACKSTART AND EMERGENCYDIESEL GENERATORS (Cont.)

Description	Units	Required	Offered
Blackstart generators for 6kV busbar Cont..			
Generator			
Warranty period	years	02	
Name of Manufacturer			
Country of manufacture			
Year of manufacture			
Type reference			
Model Number			
Base Load KVA rating	kVA		
Generator Terminal Voltage	V		
Rated current	A		
Power Factor			
Minimum continuous load	kW		
Efficiency			
At 0.8 pf	%		
At 1.0 pf	%		
Percentage rise on voltage when full load is rejected at 0.8 pf operation	V		
Guaranteed rate of unit load	kW/min		
Auxiliary power consumption	kW		
Generator speed	rpm		

SCHEDULE 8 - GUARANTEES & TECHNICAL PARTICULARS FOR BLACKSTART AND EMERGENCY DIESEL GENERATORS (Cont.)

Blackstart generators for 6kV busbar Cont..	**Units**	**Required**	**Offered**
Max. starting time required	min		
Inst. Max. short-circuit current at nominal voltage			
Transient reactance X_d'. pu			
Sub-transient reactance Xd".			
Synchro. Reactance Xd. pu			
Negative seq. reactance. pu			
Zero seq. reactance. pu			
Initial time constant, Td"	S		
Field time constant, Td0'	S		
Transient time constant, Td	S		
Critical speed above and below			
Max. starting time required from standstill to full speed	min		
Min. time required for applying full load to unit from - cold standby - warm shutdown			
Maximum vibration limit	mm/sec		
Noise at a distance of 100 m			

SCHEDULE 8 - GUARANTEES & TECHNICAL PARTICULARS FOR BLACKSTART AND EMERGENCY DIESEL GENERATORS (Cont.)

Blackstart generators for 6kV busbar Cont..	**Units**	**Required**	**Offered**
Net Heat Rate at Site Condition Base Load, KJ/kWh	kJ/kWh		
Grid dead condition sensing		Yes	
Estimated hours between, at or below base rating: - Minor inspection - Normal inspection - Major overhaul	 Hours Hours Hours		
Estimated shutdown period, hour and man-hours for - Minor inspection - Normal inspection - Major overhaul			
Number, type and arrangement of cylinders			
Number of strokes			
Compressor pressure ratio			
Description of Speed governing system and fuel control system			
Fuel consumption At 25% load At 50% load At 75% load At 100% load			
Description of cooling			

SCHEDULE 8 - GUARANTEES & TECHNICAL PARTICULARS FOR BLACKSTART AND EMERGENCY DIESEL GENERATORS (Cont.)

Description	Units	Required	Offered
Emergency generators for 400V busbar Cont..			
Diesel Engine			
Name of Manufacturer			
Country of manufacture			
Year of manufacture			
Name of Local agent			
Type reference			
Model Number			
Number, type and arrangement of cylinders			
No. of strokes			
Compressor ratio			
Fuel tank capacity			
Fuel consumption			
Starting system			
Lubricating oil liters			
Recommended hours between overhauls			
Cooling system description			
Engine speed	rpm		
Description of Speed governing system and fuel control system			
Duty cycle			

SCHEDULE 8 - GUARANTEES & TECHNICAL PARTICULARS FOR BLACKSTART AND EMERGENCY DIESEL GENERATORS (Cont.)

Description	Units	Required	Offered
Emergency generators for 400V busbar Cont..			
Generator			
Warranty period	years	02	
Name of Manufacturer			
Country of manufacture			
Year of manufacture			
Type reference			
Model Number			
Base Load KVA rating	kVA		
Generator Terminal Voltage	V		
Rated current	A		
Power Factor			
Minimum continuous load	kW		
Efficiency			
At 0.8 pf	%		
At 1.0 pf	%		
Percentage rise on voltage when full load is rejected at 0.8 pf operation	V		
Guaranteed rate of unit load	kW/min		
Auxiliary power consumption	kW		
Generator speed	rpm		

SCHEDULE 8 - GUARANTEES & TECHNICAL PARTICULARS FOR BLACKSTART AND EMERGENCY DIESEL GENERATORS (Cont.)

Emergency generators for 400V busbar Cont..	**Units**	**Required**	**Offered**
Max. starting time required	min		
Inst. Max. short-circuit current at nominal voltage			
Transient reactance X_d'. pu			
Sub-transient reactance Xd".			
Synchro. Reactance Xd. pu			
Negative seq. reactance. pu			
Zero seq. reactance. pu			
Initial time constant, Td"	S		
Field time constant, Td0'	S		
Transient time constant, Td	S		
Critical speed above and below			
Max. starting time required from standstill to full speed	min		
Min. time required for applying full load to unit from - cold standby - warm shutdown			
Maximum vibration limit	mm/sec		
Noise at a distance of 100 m			

SCHEDULE 8 - GUARANTEES & TECHNICAL PARTICULARS FOR BLACKSTART AND EMERGENCY GENERATORS (Cont.)

Emergency generators for 400V busbar Cont..	**Units**	**Required**	**Offered**
Net Heat Rate at Site Condition Base Load, KJ/kWh	kJ/kWh		
Grid dead condition sensing		Yes	
Estimated hours between, at or below base rating: - Minor inspection - Normal inspection - Major overhaul	 Hours Hours Hours		
Estimated shutdown period, hour and man-hours for - Minor inspection - Normal inspection - Major overhaul			
Number, type and arrangement of cylinders			
Number of strokes			
Compressor pressure ratio			
Description of Speed governing system and fuel control system			
Fuel consumption At 25% load At 50% load At 75% load At 100% load			
Description of cooling			

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Date ……

KELANITISSA GAS TURBINE PROJECT

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SCHEDULE 9 – GUARANTEES & TECHNICAL PARTICULARS FOR 132kV SWITCHGEAR EQUIPMENT

Not applicable

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT

Description		Required	Offered
6 kV Switchgears			
General			
Manufacturer			
Type reference / Model			
Type			
Medium of arc extinction (Vacuum or SF6)			
Number of phases		3	
Rated nominal service voltage	kV		
Impulse withstand on 1.2/50 microsecond wave	kV		
Frequency	Hz	50	
Normal circuit breaker current rating	A		
Overload rating (emergency) percentage of normal	%		
- Duration in any 24 hour period	hours		
Busbars			
Busbar current rating	Amp		
Maximum temperature rise at rated busbar current above 40°C ambient	^{0}C		
Material used for busbar			
Cross section of busbar	mm^2		
Insulation medium			

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT (Cont.)

Description		Required	Offered
6 kV Switchgear Cont…			
Type Tests			
Short time withstand current of Switchgear and busbars: a) One second b) Three second	 kA_{rms} kA_{rms}		
Breaking capacity a) Symmetrical b) Asymmetrical	 kA_{rms} kA_{rms}		
Making capacity	kA		
Peak asymmetric current rating of Busbars and connections	kA		
Testing Authority			
Test certificate report reference			
First phase to clear factor			
Operating particulars			
Opening time a) Without current b) At 100% rated breaking current	 ms ms		
Max.arc duration of any duty cycle of BS	ms		
Duty cycle on which max. arc duration occurs	%		
Make time (BS.5311)	ms		
Time from closing switch to completion of closing stroke during fault making	ms		

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT (Cont.)

Description		Required	Offered
6 kV Switchgear Cont…			
Arc circuit breaker re-strikes free?			
Rated inductive breaking current	A		

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On behalf of ……

Address ……..……

Date ……

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT

Description		Required	Offered
6 kV Switchgear Cont…..			
Rated line charging breaking current	A		
Rated characteristics for short line faults			
Maximum guaranteed switching overvoltage	pu		
Rated out of phase breaking current	kA		
Constructional features			
Is an external series break incorporated in breaker?			
Is any device used to limit transient recovery voltage?			
Method of closing			
Method of tripping			
Closing solenoid coil current and duration at rated Voltage	A		
Closing solenoid coil rated voltage	V d.c.	110V d.c	
Trip coil current and duration at rated voltage	ms		
Trip coil rated voltage	V d.c.	110V d.c	
Minimum D.C. voltage required for successful Closing at make rating			
Minimum dc voltage required for successful Interruption of rated breaking current			
Is the circuit breaker trip free?			
Type of arcing contact or arc control device			
Type of main contact			

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT (Cont.)

Description		Required	Offered
6 kV Switchgear Cont…..			
Material of contact surfaces			
Does magnetic effect of load current increase			
Number of breaks per phase			
Length of each break	mm		
Length of stroke	mm		
Arc slow closing facilities included?			
Minimum clearances: a) Between phases b) Between live parts and earth c) Across circuit breaker poles	 mm mm mm		
Minimum insulation creepage in air: (circuit breakers and busbars) a) Phase to earth b) Phase to phase	 mm mm		
Minimum (taut string) clearance in air (circuit breakers and busbars) a) Phase to earth b) Phase to phase	 mm mm		
Material of tank or container			
Material of moving contact tension rod			
Loading of heaters for circuit breakers	W		
Period of time equipment has been in Commercial operation			

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT (Cont.)

Weight and Dimensions (per panel)			
(a) Height	mm		
(b) Length	mm		
(c) Width	mm		
(d) Weight (total)	kg		
(e) Weight of moving portion	kg		
(f) Minimum distance required for withdrawal of moving portion	mm		
(g) Minimum height for removal of voltage transformer	mm		
(h) Minimum distance to rear for	mm		
(i) Maximum shock load imposed on foundations when opening under fault conditions (state whether tension or compression)	kN		
Overall Dimensions of Switchboard			
a) Height	mm		
b) Length	mm		
c) Width	mm		

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT (Cont.)

Description		Required	Offered
6 kV Voltage Transformers			
(to be completed for each C.T.)			
Manufacturer			
Country			
Rated Voltage	kV		
Maximum design voltage	kV		
Rated primary voltage	kV		
Rated secondary voltage: Core 01	V		
Core 02	V		
Core 03	V		
Rated frequency	Hz	50	
Impulse withstand voltage (peak)	kV		
Power frequency withstand voltage (1 mm)	kV		
No of cores			
For metering			
For protection			
Accuracy class			
For metering			
For protection			
Rated burden			
For metering	VA		
For protection	VA		
Short time current rating for 1 sec	kA		
Rated for non-effectively Earth System?			

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT (Cont.)

6 kV Current Transformers			
(to be completed for each C.T.)			
Manufacturer			
Country			
Rated Voltage	kV		
Maximum design voltage	kV		
Rated primary current	kA		
Rated secondary current: Core 01	A		
Core 02	A		
Core 03	A		
Core 04	A		
Rated short time current	kA		
Rated frequency	Hz	50	
Knee Point Voltage	V		
Impulse withstand voltage (peak)	kV		
Power frequency withstand voltage (1 mm)	kV		
No of cores			
For metering			
For protection			
Accuracy class			
For metering			
For protection			
Rated burden			
For metering	VA		
For protection	VA		

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT (Cont.)

Description		Required	Offered
6 kV NEUTRAL EARTHING			
Switchgear General			
Manufacturer			
Type number			
Class (i.e. fault make/load break			
switch or circuit breaker)			
Method of arc extinction			
Number of phases		3	
Rated nominal service voltage	kV		
Making Capacity	kA		
Impulse withstand on 1.2/50 microsecond wave	kV		
Frequency	Hz	50	
Normal current rating			
Method of Closing			
Method of Opening	peak kA		
Busbars			
Busbar current rating	Amps		
Material used for busbar			
Cross section of busbar	mm^2		
Insulation material			
Type of insulators			
Dry flashover voltage of insulators (rms)	V		

SCHEDULE 10 – GUARANTEES & TECHNICAL PARTICULARS FOR 6kV SWITCHGEAR & NEUTRAL EARTHING EQUIPMENT (Cont.)

Description		Required	Offered
Minimum clearances a) to earth b) phase to phase	 mm mm		
RESISTOR			
Manufacturer			
Type			
Rated Voltage	kV		
Current Rating	A		
Rated Duration	Secon		
Resistance Value	ohms		
Temperature rise after passing rated Current for rated duration	^{0}C		

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On behalf of ……

Address ……

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SCHEDULE 11 – GUARANTEES & TECHNICAL PARTICULARS FOR 11~15kV SWITCHGEAR EQUIPMENT

Description		Required	Offered
11~15kV Generator Circuit Breaker (GCB)			
Manufacturer			
Country			
Year of Manufacture			
Standard specifications to which it conforms			
Type			
No of phases		03	
Rated maximum voltage	kV		
Rated frequency	Hz	50	
Rated continuous current at 40 ^{0}C	A		
Rated full wave impulse withstand voltage (peak)	kV		
Rated short current duty cycle			
Rated short circuit symmetrical current	kA		
Rated short circuit asymmetrical current	kA		
Maximum asymmetrical short circuit peak current	kA		
Short time current for 1sec / 3sec	kA		
Assigned out of phase switching current at			
Interrupting time			

SCHEDULE 11 – GUARANTEES & TECHNICAL PARTICULARS FOR 11~15kV SWITCHGEAR EQUIPMENT (Cont.)

11~15kV Generator Circuit Breaker Cont...		**Required**	**Offered**
Arch quenching medium	SF_6/ Vacuum		
Minimum CO operations at rated breaking current before a major overhaul		**10,000**	
SF_6 gas pressure at 20 ^{0}C	bar		
Mass of SF_6 gas for one pole	kg		
Alarm pressure for the insulation	bar		
Minimum pressure for the insulation	bar		
Auxiliary voltage for open/close coils	V_{dc}	110V dc	
Auxiliary voltage for heating elements	V_{ac}		
Operating mechanism			
No of auxiliary contacts (C/O, N/O & N/C)			
Standard for the GCB to comply		62271-37-013-2015 - IEEE/IEC	
GCB overhauling frequency Years No of operating duties SF6 gas condition reaching to Electrical wear condition			

SCHEDULE 11 – GUARANTEES & TECHNICAL PARTICULARS FOR 11~15kV SWITCHGEAR EQUIPMENT (Cont.)

Description		Required	Offered
11~15kV Disconnector Switch of GCB			
Manufacturer			
Country			
Year of Manufacture			
Standard specifications to which it conforms			
Type			
Rated maximum voltage	kV		
Rated frequency	Hz	50	
Rated continuous current at 40 ^{0}C	A		
Impulse withstand voltage (peak)	kV		
Rated short circuit symmetrical current	kA		
Rated short circuit asymmetrical current	kA		
Maximum asymmetrical short circuit peak current	kA		
Rated short time current for 1sec / 3sec	kA		
Operating mechanism			
No of auxiliary contacts (C/O, N/O & N/C)			
GCB overhauling frequency Years No of operating duties SF6 gas condition reaching to Electrical wear condition			

SCHEDULE 11 – GUARANTEES & TECHNICAL PARTICULARS FOR 11~15kV SWITCHGEAR EQUIPMENT (Cont.)

Description		Required	Offered
11~15kV Earth Switch of GCB			
Manufacturer			
Country			
Year of Manufacture			
Standard specifications to which it conforms			
Type			
Rated maximum voltage	kV		
Rated frequency	Hz	50	
Rated continuous current at 40 ^{0}C	A		
Impulse withstand voltage (peak)	kV		
Rated short circuit symmetrical current	kA		
Rated short circuit asymmetrical current	kA		
Maximum asymmetrical short circuit peak current	kA		
Rated short time current for 1sec / 3sec	kA		
Operating mechanism			
No of auxiliary contacts (C/O, N/O & N/C)			
GCB overhauling frequency Years No of operating duties SF6 gas condition reaching to Electrical wear condition			

SCHEDULE 11 – GUARANTEES & TECHNICAL PARTICULARS FOR 11~15kV SWITCHGEAR EQUIPMENT (Cont.)

Description		Required	Offered
11~15kV Voltage Transformers			
(to be completed for each type of V.T.)			
Manufacturer			
Country			
Rated Voltage	kV		
Maximum design voltage	kV		
Rated primary voltage	kV		
Rated secondary voltage: Core 01	V		
Core 02	V		
Core 03	V		
Rated frequency	Hz	50	
Impulse withstand voltage (peak)	kV		
Power frequency withstand voltage (1 mm)	kV		
No of cores			
For metering			
For protection			
Accuracy class			
For metering			
For protection			
Rated burden			
For metering	VA		
For protection	VA		
Short time current rating for 1 sec	kA		

SCHEDULE 11 – GUARANTEES & TECHNICAL PARTICULARS FOR 11~15kV SWITCHGEAR EQUIPMENT (Cont.)

11~15kV Current Transformers			
(to be completed for each type of C.T.)			
Manufacturer			
Country			
Rated Voltage	kV		
Maximum design voltage	kV		
Rated primary current	kA		
Rated secondary current: Core 01	A		
Core 02	A		
Core 03	A		
Core 04	A		
Rated short time current	kA		
Rated frequency	Hz	50	
Knee Point Voltage	V		
Impulse withstand voltage (peak)	kV		
Power frequency withstand voltage (1 mm)	kV		
No of cores			
For metering			
For protection			
Accuracy class			
For metering			
For protection			
Rated burden			
For metering	VA		
For protection	VA		

SCHEDULE 11 – GUARANTEES & TECHNICAL PARTICULARS FOR 11~15kV SWITCHGEAR EQUIPMENT (Cont.)

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On behalf of ……

Address ……..……

Date ……

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 12 – GUARANTEES & TECHNICAL PARTICULARS FOR 11~15kV INSULATED PHASE BUS BAR (IPB)

Description		Required	Offered
11~15kV Insulated Phase Bus Bar (IPB)			
Manufacturer			
Country of manufacture			
Type designation			
Applicable standard			
Number of cores			
Insulation material			
Cross-section of conductor, mm^2			
Conductor material Type of conductor (round, stranded, compacted)			
Outer sheath material			
Min. Permissible bending radius	mm		
Weight per meter	kg		
Delivery length	m		
Voltage designation	V		
1 sec. short circuit current after full load at 70^0C cond. Temp.	A		
Max. conductor resistance at 20^0C - DC - AC	 Ω/km Ω/km		

SCHEDULE 12 – GUARANTEES & TECHNICAL PARTICULARS FOR 11~15kV INSULATED PHASE BUS BAR (IPB) Cont..

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On behalf of ……

Address ……..……

Date ……

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BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT

Description		Required	Offered
15A: Generator Protection			
Over/Under Voltage			
Generator Differential			
Loss of Excitation			
Reverse Power			
95% Stator earth fault			
100% Stator earth fault			
Rotor earth fault			
Over/Under frequency			
Under Impedance			
Stator thermal Over load			
Negative phase sequence			
Voltage Restraint Over current			
Pole Slipping protection			
Loss of potential			
Excitation Transformer Over current			
In advertent energization			
Over/Under Voltage			
Generator Differential			
Trip Relays			
Synchronizing Relay			
15B: Generator Transformer (Unit Transformer)			
Transformer Differential (2 winding)			
Transformer Block Differential (3 winding)			
Over Fluxing			
HV and MV side Over current			
HV side Restricted earth fault			
Transformer HV side Neutral Over Current			
MV bus earth fault			
15C: 132kV Cable Protection			
Line Differential (To match with remote end relay)			
Cable Over Current			
Breaker failure protection			

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description		Required	Offered
15D: 11/6kV Step Down Auxiliary			
Transformer Differential (2 winding)			
Transformer Block Differential (3 winding)			
Over Fluxing			
HV and MV side Over current			
HV side Restricted earth fault			
Transformer HV side Neutral Over Current			
MV bus earth fault			
15E: Unit Starter Motor			
Over Current Protection			
15F: Black Start Generator			
Over/under voltage protection			
Voltage restraint over current protection			
Earth fault protection			
Over/under frequency protection			
Reverse power protection			
15G: Other functions for the operations			
Breaker failure protection			
V/T fuse failure protection			
Trip circuit supervision			
Trip Relays			
Auxiliary Flag Relay			

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description		Generator Prot. & Control		Turbine Prot. & Control		6kV Control Panels	
		Reqd	Offered	Reqd	Offered	Reqd	Offered
Protection Panels							
Manufacturer							
Thickness of panel sheeting	mm						
Dimensions of each section							
Height	mm						
Depth	mm						
Width	mm						
Weight	kg						
Number of Sections							
Paint Finish							
Control Panels							
Manufacturer							
Thickness of panel sheeting	mm						
Dimensions of each section							
Height	mm						
Depth	mm						

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description		Generator Prot. & Control		Turbine Prot. & Control		6kV Control Panels	
		Reqd	Offered	Reqd	Offered	Reqd	Offered
Protection Panels							
Width	mm						
Weight	kg						
Number of Sections							
Paint Finish							
Alarm Annunciators							
Manufacturer							
Type Reference							
Number of Ways							
Dimensions (L x W)	mm						

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description	Units	Required	Offered
Voltmeter			
Manufacturer			
Catalogue No. / Part No.			
Measurement type (ac or dc)			
Display type (Analog or Digital)			
Input Voltage	V		
VT ratio			
Burden	VA		
Frequency	Hz	50	
Scaling	V, kV		
Accuracy Class			
Dimension			
Standards			
Ammeter			
Manufacturer			
Catalogue No. / Part No.			
Measurement type (ac or dc)			
Display type (Analog or Digital)			
Input Current	A		
CT ratio			
Frequency	Hz	50	
Burden	VA		

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description	Units	Required	Offered
Ammeter Cont..			
Scaling	A, kA		
Accuracy Class			
Dimension			
Standards			
Frequency Meter			
Manufacturer			
Catalogue No. / Part No.			
Display type (Pointer or Reed)		Pointer	
Input Voltage	V		
VT ratio			
Frequency	Hz	50	
Burden	VA		
Scaling	Hz		
Accuracy Class			
Dimension			
Standards			

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description	Units	Required	Offered
Double voltmeter			
Manufacturer			
Catalogue No. / Part No.			
Measurement type (ac or dc)			
Display type (Analog or Digital)			
Input Voltages	V, V		
VT ratios			
Burdens	VA		
Frequency	Hz	50	
Scaling	V, kV		
Accuracy Class			
Dimension			
Standards			
Double Frequency meter			
Manufacturer			
Catalogue No. / Part No.			
Display type (Pointer or Reed)		Pointer	
Input Voltages	V, V		
VT ratios			
Burdens	VA, VA		
Frequency	Hz	50	
Scaling	Hz, Hz		

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description	Units	Required	Offered
Double Frequency meter Cont..			
Accuracy Class			
Dimension			
Standards			
Synchroscope			
Manufacturer			
Catalogue No. / Part No.			
Display type (Pointer or LED)		Pointer	
Input Voltages	V, V		
VT ratios			
Burdens	VA		
Frequency	Hz	50	
Scaling	V, kV		
Accuracy Class			
Dimension			
MW meter (Wattmeter)			
Manufacturer			
Catalogue No. / Part No.			
Display type (Analog or Digital)		Analog	
Input Voltages	V		
VT ratios			
Input Current			

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description	Units	Required	Offered
MW meter Cont..			
CT ratios	A		
Pulse output			
Maximum continuous overload			
a. Current (n x In)	A		
b. Voltage (n x Un)	V		
Burden	VA		
Frequency	Hz	50	
Connection type (3P, 4W/ 3P,3W)			
Scaling	MW		
Accuracy Class			
Dimension			
MVar meter (Varmeters)			
Manufacturer			
Catalogue No. / Part No.			
Display type (Analog or Digital)		Analog	
Input Voltages	V		
VT ratios			
Input Current	A		
CT ratios			
Pulse output			
Maximum continuous overload			
a. Current (n x In)	A		
b. Voltage (n x Un)	V		

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description	Units	Required	Offered
MVar meter Cont..			
Burden	VA		
Frequency	Hz	50	
Connection type (3P, 4W/ 3P,3W)			
Scaling	MVar		
Accuracy Class			
Dimension			
Power Factor meter			
Manufacturer			
Catalogue No. / Part No.			
Input Voltages	V		
VT ratios			
Input Current	A		
CT ratios			
Maximum continuous overload			
a. Current (n x In)	A		
b. Voltage (n x Un)	V		
Burden	VA		
Frequency	Hz	50	
Connection type (3P, 4W/ 3P,3W)			
Scaling (eg :0.5 -1 - 0.5, Capacitive/Inductive)			
Accuracy Class			
Dimension			

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description	Units	Required	Offered
Transducers			
Manufacturer			
Supply voltage (ac and dc)	V		
Catalogue No. / Part No.			
Output Range (mV / mA)			
Surge voltage	kV		
Accuracy Class			
Standard			
Temperature Monitors			
Manufacturer			
Type Reference			
Catalogue No. / Part No.			
Number of Ways			
Setting Range			
Accuracy Class			
Supply voltage (ac or dc)	V		
Recorders			
Manufacturer			
Type Reference			
Chart Size			
Chart Speed			
Operating Voltage			
Means of Back up supply			

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description	Units	Required	Offered
CT Terminal Blocks			
Manufacturer			
Type Reference			
Catalogue No. / Part No.			
Additional features, if any (isolating, shorting)			
Current Rating	~~A~~		
Mounting			
crimp connector type			
VT Terminal Blocks			
Manufacturer			
Type Reference			
Catalogue No. / Part No.			
Additional features, if any (isolating, shorting)			
Voltage Rating	~~V~~		
Mounting			
crimp connector type			
Control Terminal Blocks			
Manufacturer			
Type Reference			
Catalogue No. / Part No.			
Additional features, if any (isolating, shorting)			
Voltage/Current Rating	A, V		

SCHEDULE 13 – GUARANTEES & TECHNICAL PARTICULARS FOR PROTECTION & CONTROL PANELS AND EQUIPMNT (Cont.)

Description	Units	Required	Offered
Mounting			
crimp connector type			
Terminal Blocks for PLC			
Manufacturer			
Type Reference			
Catalogue No. / Part No.			
Additional features, if any (isolating, shorting)			
Voltage/Current Rating	V, A		
Mounting			
crimp connector type			
Ac and dc supply Terminal Blocks			
Manufacturer			
Type Reference			
Catalogue No. / Part No.			
Additional features, if any (isolating, shorting)			
Voltage/Current Rating	V, A		
Terminal Blocks for Power Cables			
Manufacturer			
Type Reference			
Catalogue No. / Part No.			
Additional features, if any (isolating, shorting)			
Voltage/Current Rating	V, A		

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KELANITISSA GAS TURBINE PROJECT

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SCHEDULE 14 – GUARANTEES & TECHNICAL PARTICULARS FOR ENERGY METERING EQUIPMENT

Description	Units	Required	Offered
MWh Meter			
Manufacturer			
Country of Manufacture			
Type			
Catalogue No. / Part No.			
Input Voltage			
VT ratio			
Input Current			
CT ratio			
Frequency			
		50	
Accuracy Class			
Burden			
Connection (3P, 3W/3P,4W)			
Auxiliary Power Supply Voltage (ac or dc)	V		
Communication ports available			
Memory	MB		
Safe Operating temperature range			
Mounting means (Flush or Rack)		Flush	
Dimensions (mm x mm)			
Standards			

SCHEDULE 14 – GUARANTEES & TECHNICAL PARTICULARS FOR ENERGY METERING EQUIPMENT (Cont.)

Description	Units	Required	Offered
MVarh Meter			
Manufacturer			
Country of Manufacture			
Type			
Catalogue No. / Part No.			
Input Voltage			
VT ratio			
Input Current			
CT ratio			
Frequency		50	
Accuracy Class			
Burden			
Connection (3P, 3W/3P,4W)			
Auxiliary Power Supply Voltage (ac or dc)	V		
Communication ports available			
Memory	MB		
Safe Operating temperature range			
Mounting means (Flush or Rack)		Flush	
Dimensions (mm x mm)			
Standards			

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SCHEDULE 15 – GUARANTEES & TECHNICAL PARTICULARS LV SWITCHBOARDS AND CONTROL BOARDS

Description	Units	Required	Offered
Switchboards and Motor Control Boards			
Manufacturer and Country of Manufacture			
Operating voltage			
Type reference			
Type Test Certificate reference			
No of switchboards and Motor control boards provided			
Overall dimensions (L x D x W)	mm		
Access/Withdrawal space required			
a) Front	mm		
b) Rear	mm		
Overall weight	kg		
Dimensions of largest part for shipment			
Minimum clearances in air a) phase to earth b) phase to phase c) across circuit breaker distances	mm		
Minimum insulation creepage distances a) phase to earth b) phase to phase	mm mm		
Material used for insulation mouldings			
Material of busbar supports			
Material of barriers			
Busbar insulating material			

SCHEDULE 15 – GUARANTEES & TECHNICAL PARTICULARS LV SWITCHBOARDS AND CONTROL BOARDS (Cont.)

Description	Units	Main Switchboard		Motor Control Boards	
		Required	Offered	Required	Offered
Switchboards and Motor Control Boards (Cont.)					
Busbar continuous current rating at site ambient					
Busbar conductor material					
Busbar cross section	mm^2				
Earth bar cross section	mm^2				
Classification to BS.5486					
Degree of protection of enclosure to BS.5420					
Fault capacity at nominal voltage	kA/ secs				
Peak asymmetrical capacity	kA				
Temperature rise at rated current at site ambient	^oC				
Incomer type and rating	A				
Access (front/rear)					
Circuit Breakers					
Manufacturer & Country of Manufacture					
Type Reference					
Type (MCCB, MCB)					
Continuous current rating at site ambient	A/ ^oC				
Breaking capacity	rms kA				
Peak asymmetrical	kA				

SCHEDULE 15 – GUARANTEES & TECHNICAL PARTICULARS LV SWITCHBOARDS AND CONTROL BOARDS (Cont.)

Description		Main Switchboard		Motor Control Boards	
		Required	Offered	Required	Offered
Circuit Breakers (Cont.)					
Short time current (rms kA/secs)	kA				
Opening time	ms				
Type Test Certificate No.					
Type of protective device					
Setting of protection device					
Type of Closing Mechanism					
Rated close/trip coil voltages	V				
Class of insulation on coils					
Minimum operating voltage for tripping	V				
Minimum operating voltage for closing	V				
Trip coil current and duration at rated Voltage	A				
Weight of Circuit Breaker	kg				
Motor Starters					
Manufacturer & Country of Manufacture					
Type Reference					
Catalogue No. / Part No.					
Type (withdrawable/fixed)					
Contactor manufacturer					
Type Reference a) Latched b) Electrically held					

SCHEDULE 15 – GUARANTEES & TECHNICAL PARTICULARS LV SWITCHBOARDS AND CONTROL BOARDS (Cont.)

Description		Main Switchboard		Motor Control Boards	
		Required	Offered	Required	Offered
Motor Starters (Cont.)					
Current ratings	A				
Voltage at which electrically held contactor will drop out	V				
Category and class to BS.5424 Part 1					
Coil voltage and burden (V/VA) a) Latched type b) Electrically held type					
Motor Overload Device					
Manufacturer & Country of Manufacture					
Type Reference					
Catalogue No. / Part No.					
Setting range	A				
Operating time at twice setting	S				
Control Switches and Pushbuttons					
Manufacturer & Country of Manufacture					
Type Reference					
Contact Rating	A				
No. of contacts					
Switch Fuses					
Manufacturer					
Type Reference					
Current ratings at site ambient	A/ ^{o}C				
Break ratings	KA				
Type withdrawable/fixed					

SCHEDULE 15 – GUARANTEES & TECHNICAL PARTICULARS LV SWITCHBOARDS AND CONTROL BOARDS (Cont.)

Description		Main Switchboard		Motor Control Boards	
		Required	Offered	Required	Offered
Air Break Switches					
Manufacturer & Country of Manufacture					
Type reference					
Current rating at site ambient	A/ °C				
Fault make current rating	kA				
Type withdrawable/fixed					
Fuses					
Manufacturer					
Type Reference					
Catalogue No. / Part No.					
Current Ratings					
Molded Case Circuit Breakers					
Manufacturer & Country of					
Type Reference					
Catalogue No. / Part No.					
Current ratings at site ambient	A/ °C				
Break ratings	KA				
Type withdrawable/fixed					
Indicating Lamps					
Manufacturer					
Type reference					
Catalogue No. / Part No.					

SCHEDULE 15 – GUARANTEES & TECHNICAL PARTICULARS LV SWITCHBOARDS AND CONTROL BOARDS (Cont.)

Description		Main Switchboard		Motor Control Boards	
		Required	Offered	Required	Offered
Indicating Lamps Cont..					
Lamp voltage rating	V				
Power consumption	W				
Current Transformers					
Manufacturer					
Country of Manufacture					
Ratio: Core 01					
Core 02					
Class: Core 01					
Core 02					
Burden: Core 01	VA				
Core 02	VA				
Insulation					
Voltage Transformers					
Manufacturer					
Country of Manufacture					
Ratio: Core 01					
Core 02					
Class: Core 01					
Core 02					
Burden: Core 01	VA				
Core 02	VA				
Insulation					

SCHEDULE 15 – GUARANTEES & TECHNICAL PARTICULARS LV SWITCHBOARDS AND CONTROL BOARDS (Cont.)

Description		Main Switchboard		Motor Control Boards	
		Required	Offered	Required	Offered
Terminal Blocks					
Manufacturer and Country of Manufactures.					
Type					
Catalogue No. / Part No.					
Special features, if any					
Voltage/ Current Ratings	V, A				
Meters					
Manufacturer and Country of Manuf.					
Type reference					
Accuracy class					
Scale range					
Overcurrent and Earth Fault Protection					
Manufacturer and Country of Manuf.					
Manufacturers Type Reference					
Range of Current Settings					
Overcurrent	% of CT Rating				
Earth Fault	% of CT Rating				
High Set Element	% of CT Rating				
Earth Fault Protection					
Manufacturer and Country of					
Manufacturer's Type Reference					
Range of Current Settings					

SCHEDULE 15 – GUARANTEES & TECHNICAL PARTICULARS LV SWITCHBOARDS AND CONTROL BOARDS (Cont.)

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KELANITISSA GAS TURBINE PROJECT

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SCHEDULE 16 – GUARANTEES & TECHNICAL PARTICULARS BATTERIES, CHARGERS AND DC SWITCH BOARDS

Description		Required	Offered
Batteries			
Manufacturer and Country of Manufacture			
Type			
Catalogue No. / Part No.			
Electrolyte			
Specific gravity of electrolyte when cell fully charged			
Internal resistance per cell when fully charged at 10°C			
Nominal voltage per cell			
Normal float voltage per cell	V		
Boost charge voltage per cell	V		
Capacity at 1 hour rate and 10°C ambient	Ah		
Capacity at 3 hour rate and 10°C ambient	Ah		
Number of cells			
Voltage per cell at the end of normal charge	V		
Minimum voltage per cell at the end of emergency duty period	V		
- at assumed ambient temperature of	^{0}C		
- and total emergency duty, load of (at nominal voltage)	watts		
- and final resistance per cell of	ohms		
Designed life expectancy	years		
Guaranteed life expectancy	years		

SCHEDULE 16 – GUARANTEES & TECHNICAL PARTICULARS BATTERIES, CHARGERS AND DC SWITCH BOARDS (Cont.)

Description		Required	Offered
Batteries Cont.			
Normal charging rate	A		
Maximum boost charging rate	A		
Efficiency (as percentage of Nominal Capacity) a) At 3 hour rate of discharge b) At 1 hour rate of discharge	 % %		
Dimensions of cell (L x D x W)	mm^3		
Dimensions of battery complete (L x D x W)	mm^3		
Total weight of complete battery (filled)	kg		
Chargers			
Manufacturer and Country of Manufacture			
Type			
a.c input per charger in boost mode (3 phase)	kVA		
Continuous d.c output rating at max boost voltage	A		
Time to recharge batteries from zero to 100% Capacity (float charge for rated capacity)	hours		
Continuous output rating at normal float voltage	A		
Type of D.C. voltage control			
Range of adjustable float voltage control			
Range of adjustable boost voltage control			
Float voltage regulation at nominal setting	%		
Voltage rating per diode	V		

SCHEDULE 16 – GUARANTEES & TECHNICAL PARTICULARS BATTERIES, CHARGERS AND DC SWITCH BOARDS (Cont.)

Description		Required	Offered
Chargers Cont..			
Current rating per diode	A		
Number of diodes in parallel per phase			
Type of diode overvoltage protection			
Method of limiting voltage to connected load			
Overall dimensions (L x D x W)	mm^3		
Total weight	kg		
D.C. Switchboards			
Manufacturer and Country of Manufacture			
Type			
Busbar rating	A		
dc earth fault detector (a) type (b) operating range			
Overall dimensions (L x D x W)	mm^3		
DC breakers			
Manufacturer and Country of Manufacture			
Contactors			
Manufacturer and Country of Manufacture			

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SCHEDULE 17 - GUARANTEES & TECHNICAL PARTICULARS DCS SYSTEMS

A fully integrated unitary DCS has to be supplied for monitoring, control, display, alarm and recording of selected physical and electrical parameters associated with all relevant plant areas. All monitoring and control interactions shall be done via VDU, keyboard and mouse/trackball.

SECTION 17 – GUARANTEES & TECHNICAL PARTICULARS FOR DCS SYSTEM

Description	Units	Required	Offered
DCS System			
Manufacturer			
Country of manufacture			
Type and/or Version of Software and Firmware used			
Year of Manufacture			
No. of years operated in a similar gas turbine plant outside the country of origin			
Operator Station (HMI PC)			
Manufacturer			
Country of manufacture			
Max number of operations (expandable to)			
Offered number of operator stations			
Max number of monitors per operator station (expandable to)			
Offered number of monitors per operator station Monitors			
Screen diagonal	Inch		
Resolution (horizontal x vertical)	pixel		
Call time for picture change	ms		
No. of colors			

SECTION 17 – GUARANTEES & TECHNICAL PARTICULARS FOR DCS SYSTEM (Cont.)

Description	Units	Required	Offered
Operator Station Cont…			
Screen refresh rate			
Max number of process graphic			
Offered number of process graphic			
Signal change (check back signal from individual control level) up to display on monitor) s, ≤ 1			
Representation of graphs (for trending) on monitor			
- Max. number of standard curves			
- Max. number of operator configurable curve displays			
- Max. number of curves in each curve			
Keyboard			
Mouse / Trackball			
Printers			
Manufacture and country			
Type of printer			
No. Of Printers			
Resolution	dpi		
Memory size (RAM)	MB		
Processing time	Sec		
Noise level	dB(A)		
Paper size	A4		
Tray capacity			

SECTION 17 – GUARANTEES & TECHNICAL PARTICULARS FOR DCS SYSTEM (Cont.)

Description	Units	Required	Offered
Engineering Workstation (HMI PC)			
Manufacture and Country			
Max number of operations (expandable to)			
Offered number of operator stations			
Max number of monitors per operator station (expandable to)			
Offered number of monitors per operator station Monitors			
Screen diagonal			
Resolution (horizontal x vertical)			
Call time for picture change			
No. of colors			
Screen refresh rate			
Max number of process graphic displays			
Offered number of process graphic displays			
Offered number of process graphic displays			
Signal change (check back signal from individual control level) up to display on monitor) s, ≤ 1			
Representation of graphs (for trending) on monitor			
- Max. number of standard curve displays			
- Max. number of operator configurable			
- Max. number of curves in each curve			

SECTION 17 – GUARANTEES & TECHNICAL PARTICULARS FOR DCS SYSTEM (Cont.)

Description	Units	Required	Offered
Printers for Engineering workstation			
No. of Printers			
Type of printer			
Country of manufacture			
Resolution	dpi		
Memory size (RAM)	MB		
Processing time	Sec		
Noise level	dB(A)		
Paper size	A4		
Tray capacity			
Process Station			
Power failure protection for the			
Scanning periods			
Data acquisition			
Binary values	ms		
Analogue values	ms		
Time critical binary values like position of torque			
Check back signals	ms		
Close loop control	ms		
Fast control loops	ms		
Slow control loops	ms		
Closed-loop control modules			
Type			
Number of control loops per module			

SECTION 17 – GUARANTEES & TECHNICAL PARTICULARS FOR DCS SYSTEM (Cont.)

Description	Units	Required	Offered
Process Station Cont..			
Drive control modules			
Type			
Number of control loops per module			
Binary input modules			
Type			
Number of inputs per module			
Galvanic isolation between input channels yes/no			
Binary output modules			
Type			
Number of outputs per module			
Galvanic isolation between output channels yes/no			
Short-circuit protection	Yes/No		
Analogue input modules			
Type			
Number of inputs per module			
Galvanic isolation between input channels	Yes/No		
Digital representation of input signal bit, 12			
Fault signal if range exceeded (<4mA, 20mA)	Yes/No		
Analogue output modules			
Type			
Number of outputs per module			
Galvanic isolation between output channels	Yes/no		
Output ranges	mA		
Digital representation of output signal bit, 12			
Short-circuit protection	Yes/No		

SECTION 17 – GUARANTEES & TECHNICAL PARTICULARS FOR DCS SYSTEM (Cont.)

Data bus (Plant bus)/ Information Network	**Units**	**Required**	**Offered**
Manufacturer			
Country of manufacture			
Type			
"Open" bus as per ISO reference model			
Redundancy			
Transmission rate (useful data rate)			
Transmission medium LWL			
Max. Number of stations that can be			
Data bus (Terminal bus)/ Automation Network			
Manufacturer			
Country of manufacture			
Type			
"Open" bus as per ISO reference model			
Redundancy			
Transmission rate (useful data rate)			
Transmission medium LWL			
Max. Number of stations that can be			

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SCHEDULE 18 – GUARANTEES & TECHNICAL PARTICULARS COMMUNICATION SYSTEM

	Item	Units	Required	Offered
01	**SCADA Gateway**	**units**	**2**	
(i)	**Main Services**			
1.	Manufacturer's name & address			
2.	Manufacturer's type designation & model number			
3.	Standards		IEC 60870 & IEC 61850	
4.	Working temperature range	Deg C	15-40	
5.	Relative humidity			
6.	Working voltage	V DC		
7.	Power consumption	W		
8.	Type of Mounting		in server rack	
9.	Size (W x D x H)	mm		
(ii)	**Interface & function**			
1.	Number of optical signal Ethernet ports		≥ 02	
2.	Number of electric signal Ethernet ports		≥ 02	
3.	Numbers of IEC60870-5-101 serial ports		≥ 02	
4.	Numbers of IEC 60870-5-104 Ethernet ports		≥ 04	
5.	Connectivity		Min 5000 data points	
6.	Access port by the maintenance laptop PC		Yes	
7.	License for Configuration and maintenance of Gateway		Equipped	

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KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING

Description		Units	Required	Offered
132kV Power Cables				
Manufacturer				
Year of manufacture				
Country of manufacture				
Voltage between phases of 3 phase circuit		kV		
Class of cable				
Number of cores				
CONDUCTOR	Cross section of area Type and material Diameter of axis	mm^2 mm		
INSULATION THICKNESS	Between Conductors Between Conductors and sheath Between Conductors and core screen	mm mm mm		
CORE SCREEN	Material	mm		
ARMOUR BEDDING	Material Thickness of bedding	mm mm		
ARMOUR	Material wire or tape Wire No & Diameter Tape Size	 mm mm		
OUTER COVERING	Material thickness type of termite repellant	 mm		
COMPLETED CABLE	Overall diameter Weight per metre Maximum drum length	mm kg/m m		
DRUMS	Diameter Width Weight loaded	mm mm kg		

KELANITISSA GAS TURBINE PROJECT

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SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered
132kV Power Cables Cont..			
Horizontal distance between supporting racks	mm		
Minimum radius of bend round which cable can be laid	mm		
Nominal internal diameter of ducts through	mm		
Maximum sustained current rating per conductor at the conditions specified			
a) direct in the ground	A		
b) in ducts	A		
c) in air	A		
Maximum conductor temperature for conditions specified			
a) laid direct in the ground	^{0}C		
b) drawing into duct	^{0}C		
c) laid in air	^{0}C		
Maximum d.c resistance of conductor per meter of cable at 20 ^{0}C	micro ohm/km		
Maximum d.c resistance of conductor per meter of cable at maximum Conductor temperature	micro ohm/km		
Equivalent star reactance per meter of cable at 50Hz	micro ohm		
Maximum capacitance per phase per meter of cable	pF/km		
Maximum charging current per meter of cable at nominal voltage and frequency	mA		

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered
132kV Power Cables Cont..			
Combined sheath and armour losses meter of cable at normal frequency and maximum current			
(a) laid direct in the ground	W		
(b) drawn into ducts	W		
(c) laid in air	W		
Maximum dielectric loss per meter of cable			
Conductor short circuit current carrying capacity for one second, cable loaded as above before short circuit and final conductor temperature of 160^{o}C	kA		
SHEATH EARTH FAULT CURRENT carrying capacity for one second, cable fully loaded prior to earth fault and final sheath temperature of	^{0}C		
Maximum dielectric loss per meter of 3 phase circuit when laid direct in the ground at normal working voltage and frequency and at maximum conductor temperature			
Maximum power factor of cable at 20^{o}C and normal frequency			
a) at 9.5 KV			
Horizontal distance between cable supporting racks	m		

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered
132kV Power Cables Cont..			
Conditions upon which current carrying capacities are based			
a. ground temperature	^{0}C		
b. air temperature	^{0}C		
c. soil thermal resistivity	Deg C-m/W		
d. burial depth	m		
e. axial spacing between phase cables	mm		
f. axial spacing between circuits	mm		
g. type of bonding and earthing			

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description		Units	Required	Offered	
6kV (M.V) POWER CABLES				**a**	**b**
Manufacturer, Country					
Year of manufacture					
Voltage between phases of 3 phase circuit		kV			
Class of cable					
Number of cores					
CONDUCTOR	- Cross section of area - Type and material - Diameter of axis	mm^2 mm			
INSULATION THICKNESS	- Between Conductors - Between Conductors and sheath - Between Conductors and core screen	mm mm mm			
CORE SCREEN	- Material - Thickness	 mm			
ARMOUR BEDDING	- Material - Thickness)	mm mm			
ARMOUR	- Material - wire or tape ? - Wire No & Dia - Tape Size	 mm mm			
OUTER COVERING	- Material - thickness - type of termite repellant	 m			
COMPLETED CABLE	- Overall diameter - Weight per meter - Maximum drum length	mm kg mm			
DRUMS	- Diameter - Width - Weight loaded	m m kg			

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered	
6kV Power Cables Cont..			**a**	**b**
Horizontal distance between supporting racks	mm			
Minimum radius of bend round which cable can be laid	mm			
Nominal internal diameter of ducts through which cable can be drawn	mm			
Maximum sustained current rating per conductor at the conditions specified				
a) direct in the ground	A			
b) in ducts	A			
c) in air	A			
Maximum conductor Temperature for conditions specified				
a) laid direct in the ground	^{0}C			
b) drawing into duct	^{0}C			
c) laid in air	^{0}C			
Maximum de resistance of conductor per meter of cable at 20 ^{0}C	micro-ohm/km			
Maximum de resistance of conductor per meter of cable at maximum Conductor temperature	micro-ohm/km			
Equivalent star reactance per meter of cable at 50Hz	micro-ohm			

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered	
6kV Power Cables Cont..			**a**	**b**
Maximum capacitance per phase per meter	pF/ km			
Maximum charging current per meter of cable at nominal voltage and frequency	mA			
Combined sheath and armour losses meter of cable at normal frequency and maximum current				
(a) laid direct in the ground	W			
(b) drawn into ducts	W			
(c) laid in air	W			
Maximum dielectric loss per meter of				
Conductor short circuit current carrying capacity for one second, cable loaded as above before short circuit and final conductor temperature of 160^{o}C	kA			
SHEATH EARTH FAULT CURRENT carrying capacity for one second, cable fully loaded prior to earth fault and final sheath temperature of	^{0}C			
Maximum dielectric loss per meter of 3 phase circuit when laid direct in the ground at normal working voltage and frequency and at maximum conductor temperature				
Maximum power factor of cable at 20^{o}C and normal frequency at 9.5 KV				
Horizontal distance between cable supporting racks	m			

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered	
6kV Power Cables Cont..			**a**	**b**
Conditions upon which current carrying capacities are based				
a. ground temperature	^{0}C			
b. air temperature	^{0}C			
c. soil thermal resistivity	^{0}C-m/W			
d. burial depth	m			
e. axial spacing between phase cables	mm			
f. axial spacing between circuits	mm			
g. type of bonding and earthing				

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered		
			a	b	c
LV POWER CABLES (to be completed for each size/type used)					
Type 01					
Manufacturer					
Country of Manufacture					
Voltage rating	V				
Class of cable					
Standard complied					
Type 02					
Manufacturer					
Country of Manufacture					
Voltage rating	V				
Class of cable					
Standard complied					
Type 03					
Manufacturer					
Country of Manufacture					
Voltage rating	V				
Class of cable					
Standard complied					

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered		
			a	b	c
MULTIPAIR CONTROL CABLES (to be completed for each size/type used)					
Type 01					
Manufacturer					
Country of Manufacture					
Voltage rating	V				
Class of cable					
Number of twisted pairs					
Conductor sectional area:					
Standard complied					
Type 02					
Manufacturer					
Country of Manufacture					
Voltage rating	V				
Class of cable					
Number of twisted pairs					
Conductor sectional area:					
Standard complied					

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered		
			a	b	c
PVC insulated Multicore control cables (To be completed for each size/type used)					
Type 01					
Manufacturer					
Country of Manufacture					
Voltage rating	V				
Class of cable					
Number of twisted pairs					
Conductor sectional area:					
Standard complied					
Type 02					
Manufacturer					
Country of Manufacture					
Voltage rating	V				
Class of cable					
Number of twisted pairs					
Conductor sectional area:					
Standard complied					

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered		
			a	b	c
110 V d.c Cables					
Manufacturer					
Country of Manufacture					
Voltage rating	V				
Class of cable					
Standard complied					
EARTHING					
Earthing Strips					
Manufacturer					
Type and material		Cu			
Earthing Conductor					
Manufacturer					
Type and material		Cu			

SCHEDULE 19 – GUARANTEES & TECHNICAL PARTICULARS CABLING AND EARTHING (Cont.)

Description	Units	Required	Offered		
			a	b	c
Jointing					
Details of method of jointing of earth strip, earthing conductors, earth rods etc:					
Installation Materials					
Manufacturer of cable ladders					
Country of manufacture					
Type reference					
Material					
Finish					
Cable Trays					
Manufacturer of cable ladders					
Country of manufacture					
Type reference					
Material					
Finish					
Thickness					

Signed……...……

On behalf of ……

Address ……..……

Date ……

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT

Description	Units	Required	Offered
WATER TREATMENT PLANT			
Nominal capacity of the plant	m^3/h		
Maximum capacity of the plant	m^3/h		
Type		Package type/ built at site	
Intake water quality to the offered plant 1. Conductivity 2. Total dissolved solids	µS/cm mg/l		
Discharge water quality from the offered plant 1. Conductivity 2. Total dissolved solids	µS/cm mg/l		
Coagulant conditioning/feed tank			
Material			
Capacity			
Designed/recommended coagulant			
Coagulant dosing pumps			
Manufacturer			
Country of manufacture			
Type of pump			
Model			
No. of pumps			
Pump capacity	Lts/h		
Discharge pressure	bar		

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Coagulant aid conditioning/feed tank			
Material			
Capacity			
Designed/recommended coagulant			
Coagulant aid dosing pumps			
Manufacturer			

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Coagulant aid dosing pumps Cont…			
Country of manufacture			
Type of pump			
Model			
No. of pumps			
Pump capacity	Lts/h		
Discharge pressure	bar		
Raw water pumps			
Manufacturer			
Country of manufacture			
Type of pump			
No. of pumps			
Pump capacity	m^3/h		
Motor rating	kW		
Discharge pressure	bar		
Clarifier			
Manufacturer			
Country of manufacture			
Type		Lamella	
Nominal Flow rate	m^3/h		
Maximum Flow rate	m^3/h		
Chemicals required			

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Clarifier Cont…			
Effective volume	m^3		
Sludge, % solids by volume	%		
Solid capture	%		
Recommended Biocide			
Solids in blow down	mg/lts		
Quantity of chemicals required at design flow			
- Coagulant	mg/lts		
- Coagulant aid	mg/lts		
Sludge drain pit			
Volume	m^3		
Material			
Sludge treatment method			
Pressure Filter			
Material			
Filter media type			
Volume of Filter media per vessel	m^3		
Normal flow rate per	m^3/h		
Total backwash	m^3		
Max. back wash flow rate	m^3/h		

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Filtered water Tank			
Type			
Capacity	m^3		
Filtered water pumps			
Manufacturer			
Country of manufacture			
Type of pump			
No. of pumps			
Pump capacity	m^3/h		
Discharge pressure	bar		
Clarified water pumps			
Manufacturer			
Country of manufacture			
Type of pump			
No. of pumps			
Pump capacity	m^3/h		
Discharge pressure	bar		
Backwash water pumps			
Manufacturer			
Country of manufacture			
Type of pump			
No. of pumps			

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Backwash water pumps Cont…			
Pump capacity	m^3/h		
Discharge pressure	bar		
Backwash drain water pumps			
Manufacturer			
Country of manufacture			
Type of pump			
No. of pumps			
Pump capacity	m^3/h		
Discharge pressure	bar		

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
DEMINERALIZED WATER			
No. of trains			
No. of maximum possible simultaneously operating trains			
No. of carbon filters per train			
RO Plant			
Manufacturer		CODELINE or equivalent	
Country of manufacture			
Designed flow rate			
Operating pressure			
No. of trains			
No. of maximum possible simultaneously operating trains			
Permeate flow rate	m^3/h		
Recovery	%		
No. of pressure vessels			
Pressure rating	bar		
Pressure vessel arrangement			
Cartridge filters			
Manufacturer			
Country of manufacture			
Filter material			
Cut-off size	microns		

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
RO feed pumps			
Manufacturer			
Country of manufacture			
Type of pump			
No. of pumps			
Pump capacity	m^3/h		
Motor capacity	kW		
Discharge pressure	bar		
Maximum possible inlet water conductivity	µS/cm		
Discharge water conductivity	µS/cm		
Permeate storage tank			
Material			
Capacity	m^3		
RO cleaning solution preparation			
Material			
Capacity	m^3		
No. of pressure vessels			
Design Data			
No. of carbon filters per train			
No. of mixed bed ion exchangers per train			
Test pressure for piping, valves and vessels	bar		

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Design Data Cont…			
Net flow rate of one train	m^3/h		
Type of regeneration process			
Net capacity between two regenerations (one train)	m^3		
Operating time between two regenerations	h	> 24h	
Installed load of all electrical consumers in total	kW		
Specific electrical consumption	kWh/m^3		
Carbon Filters			
No. of units			
Type filter material			
Design Pressure			
Material of construction			
Size of the vessel			
Type of inner corrosion protection			
Volume of filter material			
Mixed bed exchangers			
No. of units			
Manufacturer			
Type resin material			
Design Pressure			
Material of construction			

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Mixed bed exchangers Cont…			
Size of the vessel			
Type of inner corrosion protection			
Volume of resin material			
Regeneration Chemicals			
Type of acid for regeneration			
Concentration of acid			
Type of caustic regeneration			
Concentration of caustic			
Chemical storage capacity	days	> 30 days requirement	
Chemical consumption per regeneration (chemical as 100% concentration)			
Acid demand	kg/Reg.		
Caustic demand	kg/Reg.		
Overall regeneration water demand	m^3		
Main piping			
Size	mm		
Material			
Design pressure			
Code for piping design and installation			
Resins			
Cation resins for mixed bed			
Type			

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Cation resins Cont…			
Quantity per unit			
Bed depth			
Operating capacity			
Annul loss of resins of all types			
Filtered water storage tank			
Numbers supplied			
Effective volume of the tank			
Design pressure			
Material of construction			
Size of the tank			
Inside corrosion protection			
Demineralized water tank			
Numbers supplied	No.	01	
Effective volume of the tank	m^3	900	
Design pressure	bar		
Material of construction		Stainless steel	
Size	H x r		
Design code			
No. of manholes			
Size of manhole			
Acid storage tanks			
No. of tanks supplied			

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Acid storage tanks Cont…			
Type			
Stock capacity for operation	days	30 days	
Net storage capacity for unit	m^3		
Material of construction			
Size	H x r		
Design code			
Inner lining/thickness	mm		
No. of manholes			
Size of manhole			
Corrosion protection			
Caustic storage tanks			
No. supplied			
Type			
Stock capacity for operation	days	90 days	
Net storage capacity for unit	m^3		
Material of construction			
Size	H x r		
Design code			
Inner lining/thickness	mm		
No. of manholes			
Size of manhole			
Corrosion protection			

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Neutralization tanks			
No. supplied			
Type			
Stock capacity for operation	hrs	24	
Net storage capacity for unit	m^3		
Material of construction			
Size	H x r		
Design code			
Inner lining/thickness	mm		
No. of manholes			
Size of manhole			
Corrosion protection			
Demineralization water discharge pump			
No. of		02	
Manufacturer		DMW/KSB or equivalent	
Type			
Design capacity	m^3/h		
Design head pressure	Bar		
Flow rate	m^3/h		

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Continued)

Description	Units	Required	Offered
Cooling water makeup pumps (if any)			
Manufacturer			
Country of manufacture			
Type of pump			
Model			
No. of pumps			
Pump capacity	Lts/h		
Discharge pressure	bar		

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
WATER TREATMENT PLANT Measuring instruments			
Field instruments and local control devices as a minimum requirement			
Flow meters			
Flow transmitters		Rosemount or equivalent	
Pressure gauges		Ashcroft, Wika or equivalent	
Pressure switches			
Pressure transmitters		Rosemount or equivalent	
Diff. Pressure gauges		Ashcroft, Wika or equivalent	
Diff. Pressure switches			
Diff. Pressure transmitters		Rosemount or equivalent	
Level indicators			
Level switches			
Level Transmitters		Rosemount or equivalent	
Temp. indicators			
Temp. switches			
Temp. Transmitters		Rosemount or equivalent	
Conductivity analyzers			

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Measuring instruments Cont…			
pH analyzers			
Pressure regulators			
Pneumatic actuators			
Control valves			
Electrical actuators			
Solenoid valves			
Local control cubicles			
Control relays			

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On behalf of ……

Address ……..……

Date ……

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

A fully integrated electrical control & monitoring equipment to be supplied for monitoring, control, display, alarm and recording of selected physical and electrical parameters associated with all relevant to the water treatment plant.

Description	Units	Required	Offered
WATER TREATMENT PLANT **Operator Station (HMI PC)**			
Manufacturer			
Country of manufacture			
Offered number of operator stations			
Max number of monitors per operator station			
Programmable Logic Controllers			
Manufacturer		Allen Bradley, ABB or equivalent	
Country of manufacture			
Make/ Model			
No. Input cards			
No. Output cards			
Memory			

SCHEDULE 20 – GUARANTEES & TECHNICAL PARTICULARS FOR WATER TREAMENT PLANT (Cont.)

Description	Units	Required	Offered
Water treatment plant Cont…			
Programmable Logic Controllers			
Manufacturer		Allen Bradley, ABB or equivalent	
Country of manufacture			
Make/ Model			
No. Input cards			
No. Output cards			
Memory			

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 21 - GUARANTEES & TECHNICAL PARTICULARS FOR AIR CONDITIONING AND VENTILATION

SCHEDULE 21A – GUARANTEES & TECHNICAL PARTICULARS FOR AIR CONDITIONING EQUIPMENT

Description	Units	Required	Offered
Air conditioner			
Areas served – All Control Rooms, Switch Gear Rooms, Electronic and server room			
Number of Units			
Manufacturer			
Country of Origin			
Type		Split/ ducted	
Redundancy of 2 x 100%		Yes	
Design code			

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On behalf of ……

Address ……..……

Date ……

SCHEDULE 21B – GUARANTEES & TECHNICAL PARTICULARS FOR VENTILATION EQUIPMENT

Description	Units	Required	Offered
Ventilation Equipment			
Areas served – All Control Rooms, Switch Gear Rooms, Electronic and server room			
Number of Units			
Manufacturer			
Country of Origin			
Type		Split/ ducted	
Redundancy of 2 x 100%		Yes	
Design code			

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Address ……

Date ……

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SCHEDULE 22 - GUARANTEES & TECHNICAL PARTICULARS FIRE PROTECTION EQUIPMENT (Cont.)

Description	Units	Required	Offered
Fire Pumps			
Motor driven fire pump			
Manufacturer			
Country of manufacture			
Type of pump			
Model			
Pump capacity	m^3/min		
Discharge pressure	Psi/bar		
Engine driven fire pump			
Manufacturer			
Country of manufacture			
Type of pump			
Model			
Pump capacity	m3/min		
Discharge pressure	Psi/bar		
Jockey fire pump			
Manufacturer			
Country of manufacture			
Type of pump			
Model			
Pump capacity	m3/min		
Discharge pressure	Psi/bar		
Type and Catalogue No.			

SCHEDULE 22 - GUARANTEES & TECHNICAL PARTICULARS FIRE PROTECTION EQUIPMENT (Cont.)

Fire Alarm Mimic Diagram			
Manufacturer			
Type and Catalogue No.			
Dimensions	Lx W x H		
Automatic Fire (Smoke) Detector			
Manufacturer			
Type and Catalogue No.			
Rated Voltage			
Alarm current			
Supervisory current			
Ambient temperature			
Mounting Method			
Humidity Range			
Automatic Fire (Flame) Detector			
Manufacturer			
Type and Catalogue No.			
Rated Voltage			
Alarm current			
Supervisory current			
Ambient temperature			

SCHEDULE 22 - GUARANTEES & TECHNICAL PARTICULARS FIRE PROTECTION EQUIPMENT (Cont.)

Description	Units	Required	Offered
Flame Detector Continued...			
Spectral sensitivity (UV band)			
Humidity Range			
Automatic Fire (Heat) Detector			
Manufacturer			
Type and Catalogue No.			
Rated Voltage	V		
Alarm current	A		
Supervisory current			
Ambient temperature	^{0}C		
Humidity Range			
Temperature Alarm Sensitivity			
Automatic Fire (Linear Heat) Detector			
Manufacturer			
Type and Catalogue No.			
Rated Voltage	V		
Temperature Alarm Sensitivity			
Sensor temperature range	^{0}C		
Maximum Ambient temperature			
Alarm Sounders			
Manufacturer			
Type and Catalogue No.			
Sound output	dB(A)1m		

SCHEDULE 22 - GUARANTEES & TECHNICAL PARTICULARS FIRE PROTECTION EQUIPMENT (Cont.)

Description		Required	Offered
Automatic Extinguishing System			
Manufacturer			
Type and Catalogue No.			
Maximum concentration			
Time to achieve extinguishing concentration			
Portable Extinguisher (Dry Powder)			
Manufacturer			
Type and Catalogue No.			
Minimum duration of discharge			
Weight of extinguishant			
Filled weight of extinguisher			
Portable Extinguisher (CO_2)			
Manufacturer			
Type and Catalogue No.			
Minimum duration of discharge			
Weight of extinguishant			
Filled weight of extinguisher			
Wheeled Extinguisher (Dry Powder)			
Manufacturer			
Type and Catalogue No.			
Minimum duration of discharge			
Weight of extinguishant			
Filled weight of extinguisher			

SCHEDULE 22 - GUARANTEES & TECHNICAL PARTICULARS FIRE PROTECTION EQUIPMENT (Cont.)

Description	Units	Required	Offered
Wheeled Extinguisher (Foam)			
Manufacturer			
Type and Catalogue No.			
Type of foam formed			
Water pressure for effective operation			
Fire Blankets			
Manufacturer			
Type and Catalogue No.			
Size			
Automatic Fire Vents			
Manufacturer			
Type and Catalogue No.			
Effective opening size			
Fire Main Pipe Work			
Material			
Bore			
Wall thickness			
Control Panel			
Manufacturer, Country			
Type and Catalogue No.			
Features			

SCHEDULE 22 - GUARANTEES & TECHNICAL PARTICULARS FIRE PROTECTION EQUIPMENT (Cont.)

Description	Units	Required	Offered
Battery			
Manufacturer, Country			
Type and Catalogue No.			
Capacity at 3 Hours Rate	Ah		
Number of Cells			
Voltage	V		
Aspiration Smoke Detection System			
Manufacturer, Country			
External Supply Voltage			
Power Reset time			
Standards complied			
Sensitivity class (A, B or C)			
Average Operating Current	A		
Alarm Sensitivity at each sampling hole	% obs/ft		
Transport time	sec		
Sampling Point Coverage Area	m^2		
Sampled Air Temperature			
Operating Temperature			
Humidity			
IP Rating			
Air Movement Speed			

SCHEDULE 22 - GUARANTEES & TECHNICAL PARTICULARS FOR FIRE PROTECTION EQUIPMENT (Cont.)

Description	Units	Required	Offered
Aspiration Smoke Detection Cont..			
Relay Contact Ratings			
Operating Temperature			
Sampled Air Temperature			
Exterior Dimensions of			
Pipe Network Size Up to an area of			
Spare capacity for signaling/detection loop			

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On behalf of ……

Address ……

Date ……

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULE 23 – GUARANTEES & TECHNICAL PARTICULARS FOR CIVIL ENGINEERING WORKS PROPOSALS

The Contractor shall indicate below whether the offered civil engineering works comply (Yes) or not comply (No) with the Bidding Document .If any item is not applicable, he is to write NA

Description	Offer (Yes/No)
SUBSTRUCTURES	
(i) Type of foundation (Vol 3 – Cl 5.1.10.)	
a) Gas Turbine & Generator	
b) Local Control room	
c) Inlet air filter house	
d) Power house	
e) Exhaust stacks	
f) Heat exchanger/cooler	
g) Inlet air chillers if applicable	
h) EDG/Black start Generator building	
i) Canteen building	
j) Permanent washrooms	
k) Transformers	
l) Switchgear room	
m) Fuel pump house	
n) Fire pump house	
o) Cable pits	
p) Clarifier	
q) Demin water tanks	
r) Chemical storage tanks	
s) Neutralization tank	
t) Chemical stores	
u) Water treatment plant v) Fuel Oil Treatment Plant	

SCHEDULE 23 – GUARANTEES & TECHNICAL PARTICULARS FOR CIVIL ENGINEERING WORKS PROPOSALS (Cont.)

	Description	Offer (Yes/No)
SUBSTRUCTURES		
(ii)	Protection of power house basement against Ingress of ground water Vol 3 Cl 5.14 If applicable)	
(iii)	Soil anti-termite treatment (Vol 3 – Cl 5.1.10.1)	
(iv)	Method of minimizing the transmittal of vibration from Gas Turbine and Generator sets to other Structures (Vol 3 – Cl 5.1.10.1)	
POWER STATION SUPERSTRUCTURE (As per Vol 3 – Cl 5.2.3.1, Vol 3 – Cl 5.3.8)		
(i)	Structure, material etc.	
(ii)	Internal walls	
(iii)	External walls	
(iv)	Fire protection to structural Frame	

SCHEDULE 23 – GUARANTEES & TECHNICAL PARTICULARS FOR CIVIL ENGINEERING WORKS PROPOSALS (Cont.)

Description	Offer (Yes/No)
REINFORCED CONCRETE	
Concrete works and reinforcing steel as per Vol 3 – Cl 5.2, Cl 5.7, Cl 5.8	
STRUCTURAL STEELWORK	
Structural steelwork, corrosion protection and fire protection as per Vol 3 – Cl 5.2, Cl5.9	
LIGHTWEIGHT CLADDING	
Lightweight cladding of walls and roofs including thermal and acoustic insulation as per Vol 3 – Cl 5.2, Cl 5.9, Cl 5.16.3	
FLOOR FINISHES Proprietary floor finishes, supply material and products proposed as per Vol 3 – Cl 5.2, Cl 5.2.3.7	
a) Machine	
b) Power House	
c) Local Control room	
d) Central control room	
e) Heat Exchanger/coolers	
f) EDG Building/Black Start generator	
g) Canteen building	
h) Water Treatment Plant	
i) Permanent wash rooms	
j) Switchgear room	
k) Fuel pump house	
l) Fire pump house	
m) Fuel Oil Treatment Plant	
Roof finishes Roof finishes as per Vol 3 – Cl 5.2, 5.16.4	

SCHEDULE 23 – GUARANTEES & TECHNICAL PARTICULARS FOR CIVIL ENGINEERING WORKS PROPOSALS (Cont.)

Description	Offer
List of standards and codes of practice forming the basis of the bid where different from those mentioned in Vol 3 Section 5 of the specification.	Pl. state
SUBCONTRACTORS	
List of subcontractors for any principal items of Civil Engineering or building works. If whole of Civil Engineering works to be sublet then the details in accordance with the specification must be given.	Pl. state

Signed……...……

On behalf of ……

Address ……

Date ……

KELANITISSA GAS TURBINE PROJECT

BID NO. CEB/KGTP/PROC/01/Re

SCHEDULES 24 - TECHNICAL PARTICULARS – SCHEDULED INSPECTIONS AND MANDATORY SPARES OF THE OFFERED GAS TURBINE MODEL - (VOL. 3- 2.1.1.3), Available as offered unit

Type of scheduled maintenance	Due operating hours (Actual running Hrs.)	Required spares in hand	Spares necessary to replace	Required Outage period (Days)
CI				
HGPI				
MI				
Any other				

Mandatory spares supplied for	Spare Part	Quantity
CI		
HGPI		
MI		
Any Other		

Signed……

On behalf of ……

Address ……

Date ……