

NTPC Limited

(A Government of India Enterprise)



**EPC PACKAGE FOR SETTING UP 700 TPD (2 X 350 TPD)
WASTE TO ENERGY PROJECT AT KAWAS, SURAT**

TECHNICAL SPECIFICATION

FOR

EPC PACKAGE

PART – G

(TECHNICAL DATA SHEETS)

SECTION - VI

BID DOC. NO.: CS-2600-001-9

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PART – G

TECHNICAL DATA SHEETS

CLAUSE NO.	BIDDER'S NAME.....		एनटीपीसी NTPC	
	GENERATOR (To be submitted with the proposal)			
1.00.00	GENERATOR PARAMETERS			
1.01.00	Manufacturer's Name			
1.01.01	Type Designation			
1.01.02	Model No.			
1.02.00	Rated/economic maximum	MVA		
	Continuous output	MW		
1.03.00	Rated terminal voltage KV			
1.04.00	Rated stator current Amps			
1.05.00	Rated frequency Hertz			
1.06.00	Rated power factor			
1.07.00	Field current at economic Amps maximum continuous rating			
1.08.00	Field voltage at economic Volts maximum continuous rating			
1.09.00	Maximum continuous permissible variation range in a) Rated terminal voltage % b) Rated frequency % c) Combined permissible variation of frequency and voltage %			
1.10.00	a) Number of Phases b) Number of parallel paths/phase c) Line terminals brought out d) Neutral terminals brought out			
1.11.00	Compliance with IEC standard No.			
1.12.00	Type & class of insulation system a) Stator b) Rotor			
1.13.00	Details of winding support system			
1.14.00	Details of core and core support system			
1.15.00	Type of Excitation system			
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9		DB:01 GENERATOR AND GENRATOR AUXILLIARIES
PAGE 1 OF 42				

CLAUSE NO.	BIDDER'S NAME.....	
1.16.00	Generator efficiency at : a) 100% load % b) MCR condition %	
1.17.00	Minimum guaranteed short circuit ratio corresponding to economic maximum continuous capability	
1.18.00	Type of Cooling & cooling medium a) Stator Winding b) Stator Core c) Rotor d) Bushing	
1.19.00	Main Weights and shipping dimensions d) Weight of complete generator Tonnes e) Generator shipping dimensions LXBXH	
	TRANSFORMERS (TO BE SUBMITTED WITH THE PROPOSAL)	
1.00.00	OIL FILLED TRANSFORMER	
1.01.00	Manufacturer's name and address	
1.02.00	Project Name	
1.03.00	Standard Applicable	
1.04.00	Rating (MVA)	
1.05.00	Voltage ratio	
1.06.00	Vector group	
1.07.00	Type of cooling with (% capacity)	
1.08.00	Impedance data Guaranteed positive sequence impedance between HV & LV at 75 deg.C at Principal tap (& tolerance) Maximum tap (& tolerance) Minimum tap (& tolerance)	
1.09.00	Tap changing equipment (Make, Type & range)	
1.10.00	Number of coolers and rating as % of transformer cooling equipment(as applicable)	
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9
		DB:01 GENERATOR AND GENRATOR AUXILLIARIES
		PAGE 2 OF 42

CLAUSE NO.	BIDDER'S NAME.....	
1.11.00 1.12.00 1.13.00 1.14.00 1.15.00 1.16.00 1.17.01 1.18.00	Fan/ Pump (Nos. & rating of fan motors) (AS APPLICABLE) Permissible Thermal Data (irrespective of tap) a) Temperature rise in top oil over an ambient of 50 deg.C (deg.C) (not applicable for dry type) b) Temperature rise in winding by resistance measurement method over an ambient of 50 deg.C. Bushings (AS APPLICABLE) a) High voltage i) Manufacturer ii) Type b) Neutral (HV) i) Manufacturer ii) Type c) Low voltage (LV) i) Manufacturer ii) Type d) Neutral (LV) i) Manufacturer ii) Type Proposed method of transformer Transportation (i). Oil filled or N2 or Dry air filled (ii). Road Freight/ Rail Freight Tap changing equipment (Make & Type) Approximate Dimensions a) Tank (lxbxh) (mm) (if applicable) b) Overall dimensions with coolers/enclosure (lxbxh) (mm) c) Height for un-tanking (mm) d) Shipping dimensions e) Dimensions of largest package (lxbxh) (mm) Approx. Weights of Transformer including oil & coolers/radiators/enclosure Tank cover-Conventional/BellType/Enclosure IP ❖ Drawings to be submitted:- Outline and Foundation drawings of transformer showing principal	
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES
		PAGE 3 OF 42

CLAUSE NO.	BIDDER'S NAME.....			
	dimensions with reference to C/L and location of components.			
	GENERATOR AND GENERATOR AUXILIARY SYSTEMS			
1.00.00	GENERATOR PARAMETERS			
1.01.00	Manufacturer's Name			.....
1.01.01	Type Designation			.....
1.01.02	Model No.			.....
1.02.00	Rated/economic maximum continuous output at rated Hydrogen Pr. and secondary cooling water temp. mentioned in specification (Part-B)	MVA		.....
		MW		.....
1.02.01	Maximum continuous output (with VWO, HP heaters out conditions etc.) at rated hydro-gen pressure and secondary cooling water temperature mentioned in specification (Part-B)	MVA		.....
		MW		.....
1.03.00	Rated terminal voltage	KV		.....
1.04.00	Rated stator current	Amps		.....
1.05.00	Rated frequency	Hertz		.....
1.06.00	Rated power factor			.....
1.07.00	Field current at economic maximum continuous rating	Amps		.....
1.08.00	Field voltage at economic maximum continuous rating	Volts		.....
1.09.00	Maximum continuous permissible variation range in			.....
	a) Rated terminal voltage	%		.....
	b) Rated frequency	%		.....
	c) Combined permissible variation of frequency and voltage	%		.....
1.10.00	a) Number of Phases			.....
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 4 OF 42

CLAUSE NO.	BIDDER'S NAME.....	एनटीपीसी NTPC		
	b) Number of parallel paths/phase c) Line terminals brought out d) Neutral terminals brought out 1.11.00 Whether space provided in generator leads to mount bushing current transformers? Yes/No 1.12.00 Compliance with IEC standard No. 1.13.00 Type & class of insulation system a) Stator b) Rotor 1.14.00 Details of winding support system 1.15.00 Details of core and core support system 1.16.00 Type of Excitation system 1.17.00 Generator efficiency at : a) 100% load % b) 80% load % c) 60% load % d) 40% load % e) 25% load % f) MCR condition % 1.18.00 Minimum guaranteed short circuit ratio corresponding to economic maximum continuous capability 1.19.00 Permissible tolerance in SCR +/- 1.20.00 Enclosure class of protection for the generator 1.21.00 Rated Hydrogen pressure (gauge) Kg/cm² 1.22.00 Rated hydrogen cooling Kg/cm² 			
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 5 OF 42

CLAUSE NO.	BIDDER'S NAME.....			एनटीपीसी NTPC	
	water pressure at (gauge)				
	i)	Cooler inlet		.....	
	ii)	Cooler outlet		.....	
1.23.00	Hydrogen cooling water flow at normal load		m ³ /hr	.....	
1.24.00	Basic impulse insulation withstand voltage of stator winding with respect to earth (For standard wave kVshape of 1.2/50 micro sec)		(peak)	.....	
1.25.00	Symmetrical run short circuit current with generator isolated-initial saturated value and sustained value			Initial Value	Sustained Value
	a)	3 phase	KA	.....	.....
	b)	Single phase to neutral	KA	.....	.....
1.26.00	Short circuit current		P.U		
1.26.01	Subtransient current				
	a)	on 3 phase short circuit		.....	
	b)	on 2 phase short circuit		.....	
	c)	on 1 phase short circuit		.....	
1.26.02	Transient Current				
	a)	On 3 phase short circuit		.....	
	b)	On 2 phase short circuit		.....	
	c)	On 1 phase short circuit		.....	
1.26.03	Steady state current on 2 phase short circuit			.....	
1.27.00	Whether suitable for specified earth fault current and duration		Yes/No.....		
1.28.00	Indicate values of earth current and duration			.....	
1.29.00	3 phase short circuit withstand time		Secs	.....	
1.30.00	Saturation factor			.....	
1.31.00	Waveform factor			.....	
1.32.00	Permissible unbalanced loading				
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9		DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 6 OF 42	

CLAUSE NO.	BIDDER'S NAME.....	
	subject to rated current not being exceeded in any phase a) Maximum continuous negative phase sequence current (I_2) amps b) Maximum value of $I_2^2 t$ for transient operation under system conditions (where 't' is in seconds) 1.33.00 Maximum permissible capacitive loading at full load MVAR 1.34.00 Maximum capacitive loading for stability at rated voltage and zero power factor MVAR 1.35.00 Generator reactances in percent at rated KV and MVA 1.35.01 Direct axis synchronous reactance (unsaturated) X_d % 1.35.02 Direct axis synchronous reactance (saturated) X_d % 1.35.03 Quadrature axis synchronous reactance (unsaturated) X_q % 1.35.04 Direct axis transient reactance (unsaturated) X_d' % 1.35.05 Direct axis transient reactance (saturated) X_d' % 1.35.06 Quadrature axis transient reactance (unsaturated) X_q' % 1.35.07 Direct axis sub-transient reactance (saturated) X_d'' % 1.35.08 Direct axis sub-transient reactance (unsaturated) X_d'' % 1.35.09 Quadrature axis sub-transient reactance (unsaturated) X_q'' % 1.35.10 Quadrature axis sub-transient reactance (saturated) X_q'' %	
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 7 OF 42

CLAUSE NO.	BIDDER'S NAME.....	एनटीपीसी NTPC
1.35.11	Negative phase sequence reactance (unsaturated) X_2 % 	
1.35.12	Negative phase sequence reactance (saturated) X_2 % 	
1.35.13	Zero phase sequence reactance (unsaturated) X_0 % 	
1.35.14	Zero phase sequence reactance (saturated) X_0 % 	
1.35.15	Potier reactance X_p % 	
1.35.16	Leakage reactance X_l a) Combined % b) Stator % c) Rotor % d) Damper winding % 1.35.17 Permissible tolerance in all guaranteed reactance values % +/- 1.35.18 Effective winding capacitance to earth a) Per phase Micro farad b) All phases connected together Micro farad 1.35.19 Effective surge impedance to neutral per phase Ohms 1.35.20 Synchronous impedance Ohms 1.35.21 The Harmonic voltage generated by the generator at 100%, 75%, 50%, 25% and no load 1.36.00 Armature resistance per phase at: a) 25 deg. C Ohms b) 75 deg. C ohms 1.37.00 Field resistance at : a) 25 deg. C Ohms 	
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 8 OF 42

CLAUSE NO.	BIDDER'S NAME.....	
	b) 75 deg. C Ohms 1.38.00 Effective negative sequence resistance 1.39.00 Zero sequence resistance 1.40.00 Guaranteed maximum temperatures with the secondary cooling water inlet temperature as per specification (Part-B) while output considered after excluding excitation power for static excitation system. 1.40.01 Guaranteed maximum absolute temperatures when generator delivers at its terminals 800MW at 0.85 p.f a) Stator windings deg.C b) Stator core c) Primary water at inlet of stator winding deg.C d) Primary water at outlet of stator winding deg.C e) Rotor windings deg.C f) Cold gas deg.C g) Hot gas in the stator and rotor deg.C h) Water at inlet of gas cooler deg.C i) Water at outlet of gas cooler deg.C 1.40.02 Guaranteed maximum absolute temperatures when generator delivers maximum capacity of its turbine (with VWO, HP heaters out etc.) at 0.85 p.f. at its terminals a) Stator Windings deg.C..... b) Stator core deg.C..... c) Primary water at inlet of stator winding deg.C..... d) Primary water at outlet of stator winding deg.C..... e) Rotor windings deg.C..... f) Cold gas deg.C.....	
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 9 OF 42

CLAUSE NO.	BIDDER'S NAME.....			
1.42.00	g)	Hot gas in the stator and rotor	deg.C.....	
	h)	Water at inlet of gas cooler	deg.C.....	
	i)	Water at outlet of gas cooler	deg.C.....	
	Generator losses (Indicate where one loss component is included in another one)			
	a)	No load loss	KW	.....
	i)	Iron loss	KW	.....
	ii)	Rotor copper loss	KW	.....
	b)	Full load loss	KW	.....
	i)	Iron loss	KW	.....
	ii)	Stator copper loss	KW	.....
	iii)	Stray load loss	KW	.....
	iv)	Rotor copper loss	KW	.....
	v)	Friction and windage loss	KW	.....
	vi)	Mechanical losses including bearing losses	KW	.....
	vii)	Exciter and exciter rheostat losses	KW	.....
	viii)	Collector brush contact losses	KW	.....
	ix)	Rotary rectifier losses	KW	.....
	x)	Fan loss	KW	.....
	xi)	Shaft seal loss	KW	.....
	xii)	Eddy current loss	KW	.....
xiii)	Any other loss (to be defined)	KW	.....	
xiv)	Total loss at full load	KW	.....	
1.43.00	Type of Cooling & cooling medium			
a)	Stator Winding		.....	
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9		DB:01 GENERATOR AND GENRATOR AUXILLIARIES
				PAGE 10 OF 42

CLAUSE NO.	BIDDER'S NAME.....	
1.46.00	b) Stator Core c) Rotor d) Bushing Inertia constant (H) a) Generator & Exciter KW-Sec/KVA b) Complete turbine KW-Sec/KVA	
1.51.00	Main Weights and shipping dimensions a) Heaviest lift of generator stator with trunnions etc. b) Weight of complete Generator Stator Tonnes c) Weight of complete rotor Tonnes d) Weight of complete generator Tonnes e) Weight of lifting beam assembly Tonnes f) Stator shipping dimensions LXBXH	
1.52.00	Critical speeds of Gen. + Exciter (if any) a) First RPM b) Second RPM c) Third RPM	
1.53.00	Paint Shade	
1.54.00	Value of generator shaft torsion oscillation (in rad) (a) Maximum value (b) Minimum value	
1.55.00	Intertia (Kg/m2) of each TG shaft section including the rotor and exciter (a) (b)	
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 11 OF 42

CLAUSE NO.	BIDDER'S NAME.....	
1.56.00	(c)	
	(d)	
	(e)	
	(f)	
	Spring constant/stiffness (Nm/rad) for each coupling between TG shaft section	
	(a)	
	(b)	
	(c)	
	(d)	
	(e)	
	(f)	
1.57.00	Time constants:	
	i) T'do	
	ii) T"do	
	iii) T'qo	
	iv) T"qo	
1.58.00	Generator Minimum Air gap	
2.00.00	EXCITATION SYSTEM	
2.01.00	Voltage regulation under conditions of rated speed, voltage & output	
	a) at 0.85 power factor lag	
	i) with AVR %	
	ii) without AVR %	
	b) at unity power factor	
	i) with AVR %	
	ii) without AVR %	
	c) at 0.90 power factor lead	
	i) with AVR %	
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES
PAGE 12 OF 42		

CLAUSE NO.	BIDDER'S NAME.....	
2.02.00 2.03.00 2.04.00 2.05.00	ii) without AVR % Excitation requirement at Volts & Amps a) Rated load b) No load c) At maximum capacitive load (at Zero Active power) d) Under field forcing condition Short circuit as a ratio of full load torque Number, type and rating of CTs and PTs used exclusively for EHG and generator excitation system Automatic Voltage Regulators a) Manufacturer b) Type c) Power supply to the regulator Volts. d) Range of generator voltage adjustment %..... i) in auto position ii) in manual position e) Frequency range of operation Hz f) Temperature range of operation deg.C g) Accuracy % h) Dead band i) Excitation system response time with AVR (The time for the generator field voltage to attain 95% of the difference between field forcing voltage& rated excitation voltage with 5% drop in generator terminal voltage and generator rated MVA)	
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES
		PAGE 13 OF 42

CLAUSE NO.	BIDDER'S NAME.....	
2.06.00 2.06.01	j) Time required for the generator terminal voltage to get restored to within 2% of the nominal preset value when subjected to sudden loss of rated output k) Excitation system response ratio, as defined in clause 3.2.6 of IEEE-421 A standard l) Excitation control system band width as defined in IEEE 421 A m) Overall dimension of the AVR panel (mmxmmxmm) n) Total heat lost in AVR panel (KW) Static Excitation System Rectifier Transformer a) Type b) Frequency Hz c) Phase d) Capacity kVA e) Voltage i) High Voltage Volts ii) Low Voltage Volts f) Percentage impedance g) Vector Group h) Mode of connection between low Voltage terminals and thyristor converter i) Class of insulation j) Conductor cross-section area of i) HV Winding mm² ii) LV Winding mm² k) Type of cooling	
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 14 OF 42

CLAUSE NO.	BIDDER'S NAME.....			
2.06.02	l)	Weight of the transformer (Kg)		
	m)	Overall dimension LxBxH (mm X mm X mm)		
	n)	Recommended location		
	Rectifier Assembly			
	a)	Type Designation		
	b)	Rated rectifier current output amp		
	c)	Rated rectifier voltage output Volts		
	d)	Ceiling current rating output amps		
	e)	Ceiling voltage rating output Volts		
	f)	Ceiling duty duration sec		
	g)	Rectifier sink/base temp. for field forcing duty at MCR deg.C		
	h)	Rated peak inverse voltage of rectifier used Volts		
	i)	Frequency of input supply voltage Hz		
	j)	Voltage drop across rectifier cell Volts		
	k)	Type of bridge 3phase/ 2phase/ any other		
	l)	Over voltage with-standing capacity		
	m)	Overall dimension of each panel/assembly for rectifier/convertor (mmxmmxmm)		
	n)	Resistance of the discharge resistor in generator field circuit at 20 deg. C ohm		
	o)	Total heat loss in rectifier/converter panel at rated output KW		
	p)	Type of converter cooling arrangement KW		
q)	Maximum temp. of rectifier			
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 15 OF 42	

CLAUSE NO.	BIDDER'S NAME.....			
2.06.03	cell for ceiling duty			
	i)	Junction temp.		
	ii)	Sink temp.		
	r)	Total no. of rectifier cells per parallel path of a bridge arm		
	s)	No. of parallel paths per bridge arm		
	t)	Total no. of 3 phase bridges		
	u)	Maximum no. of rectifier cells/ bridge without which the rectifier can give output corresponding to generator MCR including field forcing requirement		
	v)	Total no. of panels for the complete rectifier/converter power circuits		
	Generator field breaker			
	a)	Manufacturer		
	b)	Type designation		
	c)	Rated Voltage Volts		
	d)	Rated Current Amps		
	e)	Catalogues attached as annexure no.		
2.07.00	f) Overall dimension of panel (mmxmmxmm)			
	Brushless Excitation System (if applicable)			
2.07.03	Exciter			
	a)	Manufacturer		
	b)	Type designation		
	c)	Type of drive		
	d)	Normal speed rpm		
	e)	Rated rectified voltage Volts		
	f)	Rated rectified current amps		
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 16 OF 42

CLAUSE NO.	BIDDER'S NAME.....	
2.07.04	g) Ceiling rectified voltage Volts 	
	h) Ceiling rectified current amps 	
	i) Exciter field voltage with manual control (rectified)	
	i) Maximum Volts 	
	ii) Minimum Volts 	
	j) Field current at generator MCR and rated power factor lagging amp 	
	k) Nominal exciter response ratio 	
	l) Class of insulation 	
	m) Insulation material on rotor winding 	
	Exciter rectifier assembly	
	a) Manufacturer 	
	b) Type designation 	
	c) Type of rectifier bridge three phase/ multiphase 	
	d) (i) Total number of rectifier rings 	
	(ii) Total no. of rectifier cells per ring 	
	e) (i) Number of parallel paths per bridge arm 	
	(ii) No. of redundant parallel branch per bridge arm 	
	(iii) Total no. of rectifier cells per parallel path per bridge arm 	
	f) (i) No. of parallel bridges 	
	(ii) No. of redundant bridges 	
	g) Maximum number of rectifier cells/bridge without which the rectifier can give output corresponding to generator MCR including field forcing requirements. 	
	h) Maximum peak inverse voltage rating of cell Volts 	
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9 DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 17 OF 42

CLAUSE NO.	BIDDER'S NAME.....			
2.07.06	i)	Number of rectifier cells in series in each bridge arm	.....	
	j)	Method of overvoltage protection	.....	
	k)	Overload rating of the rectifier cell	.....	
	l)	(i) Ceiling output voltage of rectifier assembly	Volts	.....
		(ii) Continuous output voltage of rectifier assembly	Volts	.....
	m)	(i) Ceiling output current of rectifier assembly	Volts	.....
		(ii) Continuous output current of rectifier assembly	Volts	.....
	n)	Ceiling duty duration	Secs	.....
	o)	Maximum thyristor temperature for field forcing duty at MCR.		
		i) Junction temp.		.....
		ii) Sink Temp.		.....
	p)	Method of mounting cells to cooling fins		.....
	q)	Make and type of cooling fins		.....
	r)	Type of visual indication provided for faulty rectifier cells		.....
	Exciter Field Breaker			
	a)	Manufacturer		.....
	b)	Type designation		.....
	c)	Rated Voltages	Volts	.....
d)	Rated Current	Amps	.....	
e)	Catalogues attached as annex. no.		.....	
4.00.00	ADDITIONAL INFORMATION TO BE FURNISHED			
4.01.00	Permissible overload versus time			
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9		DB:01 GENERATOR AND GENRATOR AUXILLIARIES
				PAGE 18 OF 42

CLAUSE NO.	BIDDER'S NAME.....	
	duration curve beyond MCR rating matching with turbine capability (with temperature limits for class F insulation) 4.01.01 Number of starts/stops for which generator is rated 4.02.00 Details of de-excitation techniques & de-excitation time (i.e. time for the generator field current to fall from rated load value to 10% of the same for a sustained internal fault) 4.03.00 Surge capacitor requirement for the generator must be stated with reasons 4.04.00 Experience in respect of providing the supervisory instrumentation system for the generator 4.05.00 What provisions are made for automatic generator runback (Turbine control point set back) on loss of cooling ? 4.06.00 Furnish permissible volts/Hz vs time characteristics of the generator 4.07.00 Details of recommended generator neutral grounding system 4.08.00 Details of generator rotor winding temperature monitoring system and rotor winding earth fault detection system 4.09.00 Basis of selecting the proven generator and excitation system, cooling arrange- ment including gas circulating fan, insulation, core and winding support system backed up with following : i) No. of units of identical size and design in operation with their years of commercial ope- ration along with utility names ii) Operational availability records from the utilities including type of failure/ breakdown and corrective actions taken etc. 4.10.00 Detailed literature for the excitation system proposed for the generator enclosed Yes/No 4.11.00 Detailed writeup on various limiters enclosed Yes/No	
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENERATOR AUXILIARIES PAGE 19 OF 42

CLAUSE NO.	BIDDER'S NAME.....							
4.12.00	Complete scheme and write-up of hot air blowing system or better arrangement to prevent condensation of moisture during long shut down of generators (as applicable)							
4.13.00	Complete scheme and detailed writeup on power system stabilizer enclosed		Yes/No					
4.14.00	Laplace domain transfer function block diagram that represents the generator excitation system in accordance with the IEEE standard excitation model is enclosed. The values of all time constants and gains are also to be furnished by manufacturer		Yes/No					
1.00.00	TECHNICAL DATA REQUIREMENTS of Transformers							
	Clause No.	Item	(For OIL FILLED Transformer)					
	1.00	Manufacturer's name and address						
	1.01	Standard Applicable						
	1.02	Rating (MVA)						
	1.03	Voltage ratio						
	1.04	Winding connection						
	1.05	Vector group						
	1.06	Number of phases						
	1.07	Frequency (Hz)						
	1.08	Type of cooling						
	1.09	Impedance data Guaranteed positive sequence impedance @ 75 deg. C						
<table border="1"> <tr> <td>Kawas WTE Project (2× 350 TPD) EPC Package</td> <td> TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9 </td> <td> DB:01 GENERATOR AND GENRATOR AUXILLIARIES </td> <td> PAGE 20 OF 42 </td> </tr> </table>					Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 20 OF 42
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 20 OF 42					

CLAUSE NO.	BIDDER'S NAME.....				
	OIL FILLED TR	HV-LV	-	-	
	At Principal Tap				
	At Maximum Tap				
	At Minimum Tap				
1.10	Guaranteed max. losses in KW at 100 % rated voltage at 75 deg. C at principal tap				
	(1) Iron loss at rated voltage & frequency				
	(2) Copper loss at full load				
	(3) Guaranteed Cooler losses at 100% load				
1.11	HV winding DC resistance at 75 deg. C				
	(a) Principal tap				
	(b) Maximum tap				
	(c) Minimum tap				
1.12	LV winding DC resistance at 75 deg. C				
1.13	Cooling Equipment Details (as applicable)				
	(a) Number of coolers and rating as % of transformer cooling equipment				
	(b) Mounting				
	(c) Fan Motor Data				
	(i) Number per cooler/radiator Cooling requirement (indicate no. of spare fans also)				
	(ii) Type & make				
	(iii) Rating				
	(iv) Speed				
Kawas WTE Project (2x 350 TPD) EPC Package TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9 DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 21 OF 42					

CLAUSE NO.	BIDDER'S NAME.....								
		(v) Locked rotor current							
		(d) Oil Pump Motor Data							
		(i) Number per cooler and rating as % of Cooling requirement (indicate no. of spare pumps also)							
		(ii) Type							
		(iii) Rating							
		(iv) Locked rotor current							
		(e) Cooler/radiator details							
		(i) Overall dimensions l x b x h (mm)							
		(ii) Type of mounting							
		(iii) Weight with oil (kg)							
		(iv) Weight without oil (kg)							
		(f) Type of oil pump & motor							
	1.14	Thermal Data							
		(a) Temperature rise in top oil over an ambient of 50 deg.C							
		(b) Temperature rise in winding by resistance measurement method over an ambient of 50deg. C.							
		(c) Thermal time constant (Hours)							
		(d) Oil temperature at cooler inlet at rated load at max temperature							
		(e) Oil temperature at cooler outlet at rated load at max temperature							
	<table border="1"> <tr> <td>Kawas WTE Project (2× 350 TPD) EPC Package</td> <td> TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9 </td> <td> DB:01 GENERATOR AND GENRATOR AUXILLIARIES </td> <td> PAGE 22 OF 42 </td> </tr> </table>					Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 22 OF 42
	Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 22 OF 42					

CLAUSE NO.	BIDDER'S NAME.....			
	(f) Calculated Hot Spot Temperature (Design value)			
1.15	Withstand time for short circuit at terminals (sec.)			
1.16	Over excitation withstand time (secs.) for % over excitation of			
	(i) 110%			
	(ii) 125%			
	(iii) 140%			
	(iv) 150%			
	(v) 170%			
1.17	Bushings(AS APPLICABLE)			
	a) High voltage			
	(i) Manufacturer			
	(ii) Type			
	(iii) Rated current (Amps)			
	(iv) Total creepage distance (mm)			
	(v) Mounting			
	b) Low voltage			
	(i) Manufacturer			
	(ii) Type			
	(iii) Rated current (Amps)			
	(iv) Total creepage distance (mm)			
Kawas WTE Project (2x 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9		DB:01 GENERATOR AND GENRATOR AUXILLIARIES
				PAGE 23 OF 42

CLAUSE NO.	BIDDER'S NAME.....						
		(v) Mounting					
		c) High voltage (N)					
		(i) Manufacturer					
		(ii) Type					
		(iii) Rated current (Amps)					
		(iv) Total creepage distance (mm)					
		(v) Mounting					
		d) Low voltage (N)					
		(i) Manufacturer					
		(ii) Type					
		(iii) Rated current (Amps)					
		(iv) Total creepage distance (mm)					
		(v) Mounting					
	1.18	Proposed method of transformer transportation					
		(i). Oil filled or N2 filled					
		(ii). Road Freight/ Rail Freight					
	1.19	Is vacuum filling required, if so state absolute pressure (mm of Hg)					
	1.20	Total quantity of oil (liters)					
	1.21	Tap changing equipment					
		(a) Make					
		(b) Type & model					
<table border="1"> <tr> <td>Kawas WTE Project (2× 350 TPD) EPC Package</td> <td>TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9</td> <td>DB:01 GENERATOR AND GENRATOR AUXILLIARIES</td> <td>PAGE 24 OF 42</td> </tr> </table>				Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 24 OF 42
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 24 OF 42				

CLAUSE NO.	BIDDER'S NAME.....			
		(c) Voltage class & current		
		(d) Number of steps		
		(e) Range		
		(f) Step voltage		
		(g) Rated Short circuit current		
		(i) Dynamic		
		(ii) Thermal		
		(h) Withstand time for Short circuit (sec.)		
		(i) Dynamic		
		(ii) Thermal		
		(i) No. of revolution to complete One step		
		(j) Insulation level of the connecting leads between tap changer & transformer winding		
		(k) Total quantity of oil		
		(l) Whether On load Type or Off load Type		
	1.22	Insulation level		
		HV Windings		
		(i) (a) Lightning impulse withstand voltage (kVp)		
		(b) CW Impulse withstand voltage (kVp)		
		(ii) Switching surge withstand voltage (kVp)		
		(iii) Power frequency withstand voltage (kV)		
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9		DB:01 GENERATOR AND GENRATOR AUXILLIARIES
				PAGE 25 OF 42

CLAUSE NO.	BIDDER'S NAME.....				
		(iv) HV winding insulation (Graded/ Uniform)			
		LV Windings			
		(i) Lightning impulse withstand voltage (kVp)			
		(ii) Power frequency withstand voltage (kV)			
		HV Bushings			
		(i) (a) Lightning impulse withstand voltage(kVp)			
		(b) CW Impulse withstand voltage (kVp)			
		(ii) Switching surge withstand voltage (kVP)			
		(iii) Power frequency withstand voltage (KV)			
		LV Bushings			
		(i) Lightning impulse withstand voltage (kVp)			
		(ii) Power frequency withstand voltage (kV)			
		HVN Bushings			
		(i) Lightning impulse withstand voltage (kVp)			
		(ii) Power frequency withstand voltage (kV)			
		LVN Bushings			
		(i) Lightning impulse withstand voltage (kVp)			
		(ii) Power frequency withstand voltage (kV)			
	1.23	Approximate Dimensions			
		a) Tank (lxbxh) (mm)			
		b) Overall dimensions with coolers (lxbxh) (mm)			
	Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9		DB:01 GENERATOR AND GENRATOR AUXILLIARIES
					PAGE 26 OF 42

CLAUSE NO.	BIDDER'S NAME.....			
		c) Height for un-tanking (mm)		
		d) Shipping dimensions		
		e) Dimensions of largest package(lxbxh) (mm)		
	1.24	Weights of Transformer Components		
		a) Core (kg.)		
		b) Windings (kg.)(copper)		
		c) Total cellulose weight (kg)		
		d) Weight of Paper insulation (kg)		
		e) Weight of Press board, frame, barrier, spacer etc (kg)		
		f) Tank and fittings (kg)		
		g) Oil (kg)		
		h) Untanking weight (heaviest piece) (kg)		
		i) Total weight (kg)		
		j) Weight of heaviest pkg. (kg)		
		k) Total shipping weight (kg)		
		l) Parts detached for transport(furnish list)		
	1.25	Permissible overloading (% of rating and time in minutes)		
	1.26	(a.)Clearances to tank in oil (mm)		
		(b.) Minimum clearance of HV winding to earth in oil (mm)		
		(c.) Clearance between coils & core(mm)		
		(d.) Clearance between coils (mm)		
	Kawas WTE Project (2× 350 TPD) EPC Package TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9 DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 27 OF 42			

CLAUSE NO.	BIDDER'S NAME.....		
	(e.) Clearance between neutral to ground (mm)		
1.27	Conservator		
	a) Total volume (Liters)		
	b) Volume between highest and lowest levels (Liters)		
1.28	Capacitance Values (pF)		
	a) LV to earth		
	b) HV to LV		
	c) Tap winding to earth		
1.29	a) Type of oil preservation		
	b) Material of diaphragm/air cell		
	c) Continuous temperature withstand/ capability of the diaphragm/air cell		
1.30	Oil	Before filling in main tank	
	a) Quality of oil		
	i) Moisture content (ppm)		
	ii) Max. tan-delta value		
	iii) Interfacial tension(N/m)		
	iv) Breakdown strength (kV)		
	b) Total Quantity including 5% extra (liters)		
		Before Energizing	
	i) Moisture content (ppm)		
	ii) Max. tan-delta value		
Kawas WTE Project (2× 350 TPD) EPC Package TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9 DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 28 OF 42			

CLAUSE NO.	BIDDER'S NAME.....				
		iii) Interfacial tension(N/m)			
		iv) Breakdown strength (kV)			
		b) Total Quantity including 5% extra (liters)			
		c) Oil flow inside Transformer (Directed/ Forced/ Normal)			
	1.31	Core			
		a) Type of construction(core/shell)			
		b) Net core area (mm ²)			
		c) Core material and grade used			
		d) Type of joint between core and yoke			
		e) Thickness of stamping (mm)			
		f) Percentage silicon content (%)			
		g) Maximum flux density in core at rated frequency and at			
		i) 90% voltage (wb/m ²)			
		ii) 100% voltage (wb/m ²)			
		iii) 110% voltage (wb/m ²)			
	1.32	Winding			
		a) Type of winding			
		i) HV			
		ii) LV			
		iv) Tap			
		b) Current density at rated load			
		i) HV (A/mm ²)			
	Kawas WTE Project (2× 350 TPD) EPC Package TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9 DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 29 OF 42				

CLAUSE NO.	BIDDER'S NAME.....			
		ii) LV		
		iv) Tap		
		c) Conductor area (mm2)		
		i) HV		
		ii) MV		
		iv) Tap		
		d) Magnetizing inrush current(Amps)		
		i) % Component of 2 nd harmonic current (max & min)		
		e) No load current (Amps) at rated frequency and at		
		i) 90% voltage		
		ii) 100% voltage		
		iii) 110% voltage		
		f) Magnetising current at rated frequency and at rated voltage		
		g) Leakage reactance		
		i) HV		
		iii) LV		
		h) Resistance		
		i) HV		
		iii) LV		
		i) Air core reactance of HV winding		
	1.33	Tank		
		a) Tank cover-Conventional/Bell Type		
		b) Approximate thickness of		
		i) Side (mm)		
	Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES
				PAGE 30 OF 42

CLAUSE NO.	BIDDER'S NAME.....			
1.1		ii) Bottom (mm)		
		iii) Cover		
	1.34	Vacuum withstand capability of		
		a) Main tank		
		b) Coolers and accessories		
	1.35	Minimum draw bar pull required to move the transformer on level track(kg)		
	1.36	Size of filter hose		
	1.37	Fault level		
		1.38.00 Tan delta value at 20 deg C <1%	(Yes/No)	
Technical Particulars and Drawings of Cables a) Sectional drawings of cables : b) Approx. Weight of metallic and non metallic items of each cable size (Kgs) Metallic (Kgs/Km) : Non Metallic (Kgs/Km) : c) Rating factors for variation				
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9		DB:01 GENERATOR AND GENRATOR AUXILLIARIES PAGE 31 OF 42

CLAUSE NO.	BIDDER'S NAME.....		एनटीपीसी NTPC				
1.2	in ambient air temp.	:	.....				
	d) Rating factors for vibration in amb. In ambient air temp.	:	.....				
	e) Rating factors for variation depth of laying in ground	:	.....				
	f) Rating factors for variation in thermal resistivity of soil	:	.....				
	g) Grouping factors for cables laid in open air racks	:	.....				
	h) Grouping factors for cables in build up concrete trenches with restricted air circulation	:	.....				
	i) Grouping factors for cables laid in ground	:	.....				
	j) Particulars of cable drums	:	.....				
	k) Grouping factors for cables laid in ducts/pipes	:	.....				
	Test Certificates						
Complete test reports including Type Tests, Routine tests and Acceptance Tests	:	.....					
Kawas WTE Project (2× 350 TPD) EPC Package		TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9		DB:01 GENERATOR AND GENRATOR AUXILLIARIES		PAGE 32 OF 42	

CLAUSE NO.	BIDDER'S NAME.....			
1.3	Instruction manual for storage for prolonged duration, unpacking, handling at site, erection, pre-commissioning test etc. :			
1.4	Technical Data			
1.4.1	The following technical data shall be submitted by the contractor for each type and size of the cable for Employer's approval. 1. Make : 2. Country of manufacturer : 3. Type designation : 4. Applicable standard : 5. Cable size (No. of Cores x mm2) : 6. Rated Voltage : 7. Continuous current rating for maximum conductor temp. when laid in air at ambient of 50 deg. C. a) When metallic screen /armour			
Kawas WTE Project (2x 350 TPD) EPC Package		TECHNICAL DATA SHEETS	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 33 OF 42
		SECTION – VI PART-G		
		BID DOC NO : CS-2600-001-9		

CLAUSE NO.	BIDDER'S NAME.....			
	is earthed at one end (Amps) : b) When metallic screen/armour is earthed at both the ends (Amps) : c) For unscreened, unarmoured Cables (Amps) : 8. Continuous current rating for max. conductor temp. when buried in soil having thermal resistivity of 150 deg. C Cm/N at a depth of 1 mtr. and at ground ambient temp. of 40 deg. C. a) When metallic screen / armour is earthed at one end (Amps) : b) When metallic screen/ armour is earthed at both the ends (Amps) : c) For unscreened, unarmoured cables (Amps) : 9. Short circuit withstand capacity and duration for : a) Conductor : b) Metallic screen :			
Kawas WTE Project (2x 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 34 OF 42	

CLAUSE NO.	BIDDER'S NAME..... 			
	c) Armour : 10. Conductor a) Material (Copper or Aluminium) : b) Grade : c) Nominal cross sectional area (Sq. mm) : d) Number and diameter of wire before compacting of conductor strands i) No. of wires (min.) : ii) Dia of wires in mm : e) Shape of conductor : f) Diameter over conductor (mm) : i) Fictitious : (as per IS 10462 (Part-1)-1983) ii) Approximate :			
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 35 OF 42	

CLAUSE NO.	BIDDER'S NAME.....			
	g) Direction of lay of stranded layers : h) Conductor resistance (DC) At 20 deg C in Ohm/Km (max.) : i) Conductor resistance (AC) a) at 20 deg. C ohm/Km (Approx) : b) at 90 deg. C in ohm/Km (Approx) (for XLPE cables) : j) Reactance per phase at 50 Hz in ohm/km : k) Capacitance at 50 hz in micro Farads / Km : l) Conductor screening (wherever applicable) a) Material and type : b) Thickness of extruded layer (mm) : 12. Insulation a) Composition of insulation : b) Nominal thickness of insulation :			
Kawas WTE Project (2x 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 36 OF 42	

CLAUSE NO.	BIDDER'S NAME..... 			
	(mm) c) Tolerance on thickness of Insulation (mm) : d) Filled or unfilled (for XLPE only) : e) Type of curing (for XLPE only) : f) Min. insulation resistance at 20 deg. C (Mega Ohm/Km) : g) Identification of cores : 13. Insulation screening (wherever applicable) : a) Material & type : b) Thickness of extruded layer (mm) : 14. Metallic Screen a) Material : b) Size of tape /wire (mm) : c) No. of wires / tapes :			
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 37 OF 42	

CLAUSE NO.	BIDDER'S NAME.....			
	d) Short circuit capacity of metallic screen : e) Cross sectional area of screen (sq. mm) : f) Dia below metallic screen i.e. below copper tape/wire (mm) : 15. Inner sheath a) Material : b) Diameter over the laid up cores (mm) i) Calculated : (By fictitious calculations as per IS 10462 (part-1)-1983) ii) Approximate : c) Thickness of sheath (Min) (mm) : d) Colour of sheath : e) Tolerance in thickness of inner sheath (mm) : 16. Type of filler material :			
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 38 OF 42	

CLAUSE NO.	BIDDER'S NAME.....			
	17. Armour (in case of armoured cables) a) Type of material of armour : b) Formed wire / wire : c) Diameter of cable over inner sheath (under armour) mm i) Calculated : (By Fictitious calculations as per IS 10462 (part-1)-1983) ii) Approximate : d) Dimension of formed wire / wire in mm : e) No. of armour formed wires /wires : f) Approx. cross sectional area of armour (Sq. mm) : g) Resistivity of armour wire : at 20 deg. C (ohm- cm.)			
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 39 OF 42	

CLAUSE NO.	BIDDER'S NAME.....			
	h) Direction of lay of armour : 18. Outer Sheath a) Material and type : b) Diameter under the sheath (mm) i) Calculated : (By Fictitious calculations as per IS 10462 (part-1) - 1983) ii) Approximate : c) Thickness of sheath (mm) : d) Tolerance on Nominal thickness of sheath (mm) : e) Colour of sheath : 19. a) Overall diameter of cable (mm) : b) Tolerance on overall diameter (mm) : c) Eccentricity : d) Ovality :			
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 40 OF 42	

CLAUSE NO.	BIDDER'S NAME.....			
	20. Weight per 1000 mtrs (Kg) : 21. Recommended min installation radius (mm) : 22. Safe pulling force when pulled by pulling eye on the conductor (kg) : 23. Cable Drums a) Type (Wooden/steel) : b) Dimensions (Approx) : i) Flange diameter (mm) : ii) Barrel diameter (mm) : iii) Traverse (mm) : c) Weight of cable drum with Cables (Kgs) : 24. Max. / standard length per drum for each size of cable (mtr.) and tolerance (%) : 25. Guaranteed value of min. oxygen index of outer sheath :			
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 41 OF 42	

CLAUSE NO.	BIDDER'S NAME.....			
	26. Max. acid gas generation by weight (%) : 27. Maximum smoke density rating (%) : 28. Voltage developed in the screen/armour per 100 mt run with screen / armour earthed at one end when cables is carrying (for single core cables only) a) Rated current (Volts) : b) Short circuit current (Volts) i) in the screen : ii) in the armour : 29. Circulating current developed in the screen/armour for 100 mt. run, with screen/armour earthed at both ends when cable is carrying (for single core cables only) a) Rated current(Amps) : b) Short circuit current (amps) : i) in the screen : ii) in the armour :			
Kawas WTE Project (2× 350 TPD) EPC Package	TECHNICAL DATA SHEETS SECTION – VI PART-G BID DOC NO : CS-2600-001-9	DB:01 GENERATOR AND GENRATOR AUXILLIARIES	PAGE 42 OF 42	

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	ESSENTIAL DATA SHEETS FOR WATER SYSTEM Essential Data to be necessarily furnished with the Bid 1.00.00 Raw Water booster Pumps (if applicable) a). Type of pump : b). No of pumps : c). Capacity of pump : d). Pump Head : e). Motor input power : 2.00.00 PT Plant a). Pre-Treatment process/Type : b). PT plant capacity : 3.00.00 DM Plant a). DM Treatment process/Type : b). DM Plant Capacity : 4.00.00 Leachate Treatment plant a). Design rating : b). Steam Consumption : 5.00.00 Effluent Treatment plant a). Effluent Treatment Process : b). Design rating : 6.00.00 Condensate polishing unit a). Effluent Treatment Process : b). Design rating :			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-I SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 1 OF 1

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	CHAPTER - II			
1.00.00	GENERAL TECHNICAL INFORMATION /DATA/DRAWINGS TO BE SUBMITTED ALONGWITH THE BID			
1.01.00	Performance Data		Reference Drg.	
	i)	Boiler efficiency vs. load curves	.....	
	ii)	Characteristics curves showing the variation of superheated Steam temperature with load, clearly indicating the regime of attemperation	.....	
	iii)	Characteristics curves of steam generating unit showing variation in efficiency, steam temperature and pressure with loads	.....	
	iv)	Correction curves for steam generator efficiency for variation in parameters such as :	.....	
	a)	Load	.....	
	b)	Superheater outlet temperature	.....	
	c)	Superheater outlet pressure	.....	
	d)	Feed water inlet temp.	.....	
	e)	Excess air (at economiser outlet)	.....	
	f)	Humidity	.....	
	g)	Variation in waste fuel quality parameters (eg. H ₂ , H ₂ O, Ash)	.....	
	h)	Flue gas temperature at boiler outlet	.....	
	i)	Ambient air temperature	.....	
	v)	Curve indicating departure		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL-STEAM GENERATOR)	PAGE 1 OF 14

CLAUSE NO.	BIDDER'S NAME			
1.02.00	from Nucleate Boiling for each furnace wall			
	vi)	ID,FD & PA fan stall lines, equal efficiency lines, system resistance lines with all fans in service at 50 Hz and 47.5 Hz respectively showing the 100% BMCR, 100% TMCR, 80% TMCR Test Block and other load points		
	xi)	Temperature characteristics of the superheaters with load		
	xii)	Characteristic curves showing the acid dew point temperature Vs. Sulphur content, moisture content in the fuel and percentage of excess air		
	xiii)	Comprehensive information design basis and calculations for the furnace cooling factor, Proposed Heat Liberation Rate, Max. Net heat Input per unit plan area of the furnace, furnace residence time, Burner zone heat release rate and other design parameters of the proposed design and how they are arrived at		
	xiv)	Characteristic curves for air flow meters (differential pressure vs flow)		
	Supplementary Data			
	i)	A complete list of all the equipment requiring the following shall be furnished indicating parameters, continuous requirement and the maximum requirement		
	a)	Auxiliary steam	Minimum	Normal
		Continuous	.....	.....
	Intermittent	.....	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 2 OF 14

CLAUSE NO.	BIDDER'S NAME			
		Hot	Warm	Cold
	Start up	.....	.....	.....
	b) Cooling water	.....		
	c) Service air	.....		
	d) Instrument air	.....		
	e) Number and electrical rating of A.C. and D.C. power supply feeders at available voltage for each of control & Instrumentation system in Bidder's Scope	.....		
	ii) A detailed list of steam generator auxiliaries with the respective continuous power consumption (in KW of each auxiliary)	.....		
	iii) Complete schedule of motors giving voltage, KW rating (calculated and installed capacity) service factor, etc.	.....		
	iv) Complete valve schedule giving design conditions, normal working conditions, pressure drop across valves, type, body/trim material, pressure and temperature rating, make, size etc.	.....		
	Requirement of actuator alongwith KW rating shall also be furnished	.....		
	v) Pressure Parts			
	a) Details of furnace construction	.....		
	b) Details of Drum	.....		
	c) Details of economiser, superheater	.....		
	d) Details of other pressure vessels like flash tank etc.,	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 3 OF 14	

CLAUSE NO.	 BIDDER'S NAME		
	e) Details of safety valves f) Weight, water volume, and dimensions including tube size, materials, and spacing of all components in a,b,c, items vi) Mode of erection sequence and other relevant particulars in respect of installation of: a) Structural Steel b) Pressure parts c) Rotating and static equipment d) Ducting e) and others, as applicable vii) Details of recommended procedures for welding and erection viii) A comparison and history of all steam generators in service of similar design and size to that proposed, including description of operating difficulties experienced and design changes made of eliminate difficulties ix) Complete fuel firing equipment description x) Complete description and functional write-up of the furnace safe guard and supervisory system and secondary air damper control system and general arrangement and cutout details of console inserts with bill of materials xi) General arrangement and write-up on flue gas to air heaters / SCAPH giving details & instrumentation (same shall also be		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL-STEAM GENERATOR)	PAGE 4 OF 14

CLAUSE NO.	BIDDER'S NAME			
	furnished for tubular air heaters in case they are offered as an alternative) xii) Soot blowing system description complete with control system write-up, console, mimic diagram and logic panel, general arrangement and cut-out drawing. xiii) General description of air & flue gas ducts and dampers xiv) Recommended functional block diagrams with write-ups for each control loop required for safe and efficient steam generator operation xv) A complete list of instruments, sensing devices and control equipment integral, local gauge board, local instrument rack, enclosure, local panel mounted, CER mounted, loose instruments to be mounted on Units. Control Panel/ Board covered in the proposal with type, make, accuracy, range, connection sizes, contact details, dial size etc. in the Bidder's scope xvi) Write up on interlocks and protections with logic diagrams xvii) Complete write up of structural design concepts and buck stay design calculations xviii) Complete write-up on the method of fuel flow control and maintaining desired operating temperature and residence time in the boiler xix) Start-up and shutdown procedures xx) Start-up diagrams which will show the following quantities plotted w.r.t. time from			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 5 OF 14

CLAUSE NO.	BIDDER'S NAME			
	ignition of oil burner to 100% BMCR (full fuel flow 400 TPD) a) Oil fuel input b) Main fuel input c) Drum pressure and temperature d) Feed water flow e) Steam flow through superheater f) Primary superheater outlet temperature g) Intermediate superheater outlet temperature h) Superheater attemperator spray water flow i) Final superheater outlet temperature j). Secondary burner oil input l) Total time in minutes m) Ramp rate n) Grate stoker speed (if applicable) (The required start up diagrams shall be for a cold start, hot start and a warm start. Shutdown conditions for overnight and weekend shutdowns shall also be specified so that the fastest warm start up rates may be obtained). xxi) Limiting condition if any for quick starting and loading for cold, warm and hot start xxii) a) Schedule of valves with full particulars of valves and their actuators (for powered valves) such as type, make, motor rating/ pneumatic consumption, limit & torque switch details, time for full opening / closing			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 6 OF 14

CLAUSE NO.	BIDDER'S NAME	
	etc. b) Schedule of control valves giving type and make of valves and actuators, size, body and trim material etc. stroke length, stroking time and full technical particulars of valves and their actuators and associated accessories c) Schedule of dampers and vanes with full particulars of dampers and their actuators, (for powered dampers) such as type of actuator, make, torque rating, stroke and stroking time, electrical rating/ pneumatic consumption limit and torque switch position transmitter details etc. including details of associated accessories. xxiii) List of special maintenance tools included in the proposal xxiv) Complete description and functional write-ups with necessary diagrams and schemes elaborating pressure and temperature controls, interlocks, etc. and cutout and over all dimensions, details of console and list of console mounted items, local instruments, accessories, etc. in respect of Aux. PRDS. xxv) List of insert panels, control cabinets and local control panels included in the proposal with GA drawings, mounting and cutout details xxvi) List of flow elements covered in the proposal with full particulars such as design details data sheets, make and dimensions xxvii) List of locally mounted junction boxes included in the proposal	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)
		PAGE 7 OF 14

CLAUSE NO.	BIDDER'S NAME	
	xxviii) Instrument and control equipment to be made available for light up & steam blowing xxix) Temperature sensors calibration standards xxx) Boiler GA drawing for marking instrument tapping points xxxi) Particulars of prefabricated & other cables xxxii) Electromatic impulse safety valve functional write-up type make & cutout details of the remote control station (if applicable) xxxiii) Boiler tube metal Thermo-couple details, number, type, make etc. a) Water wall b) SH xxxiv) Pressure and temperature for instruments xxxv) Detailed description of Elevators xxxvi) Write-up on interlocks and safety devices for elevators xxxvii) Schedule of motors xxxviii) Write-up on chemical cleaning of boiler with schemes xxxix) Write-up on the superheater temperature control with waste fuel / oil firing xxxx) Write up on the boiler variable and constant pressure operations (if applicable) xxxxi) Detailed write-up with supporting technical literature and calculations on the method proposed to limit NOx emis-	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 8 OF 14

CLAUSE NO.	BIDDER'S NAME			
	sion (both thermal NOx and fuel NOx) Bidder to detail the changes (if any) in the proposed steam generator design to achieve NOx level xxxxii) Complete list of grate wear parts with material and anticipated life of each part xxxxiii) Logic diagrams describing system functions for all controls and protections xxxxiv) Complete bill of materials including all hardware items/ equipments and accessories for combustion control xxxxv) Confirm that all additional hardware and software over and above those indicated in the proposal section and bill of material, if required during detailed engineering stage for fully meeting the intent and requirements of the specification (both functional and parametric) shall be furnished with in the quoted price. (This is essential since Bidder has full responsibility on system completeness) xxxxvi) Power distribution single line diagram giving capacity and ratings of feeders xxxxvii) Calculations for total heat load predicated for panels and controls integral with SG xxxxviii) Description of design features provided in the system which enable compliance with SWC requirements specified L) Description of shop and site tests and test procedures for panels and controls in SG Scope Description of the facilities available with the Bidder for			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL-STEAM GENERATOR)	PAGE 9 OF 14

CLAUSE NO.	BIDDER'S NAME	एनटीपीसी NTPC
	conducting elevated temperature test and SWC test as per specifications. The Bidder shall provide details and results of the tests conducted for similar systems if the Bidder has conducted such tests in the past Li) Complete description and functional write-up with diagram & schemes elaborating the acoustic pyrometer detection system offered Lii) Technical details of pitot tube including calibration curves Liii) Write-up, scheme calculations, curves with list and calibration of thermocouples (In case drum material call for stress evaluation of drum) Liv) Comprehensive information on basis of arriving at heat liberation rate, maximum net heat input per unit plan area of the furnace, furnace cooling factor, residence time etc. Lv) Criteria governing rate of loading /unloading of steam generator with particular reference to the thermocouples and their location on steam generator for establishing loading/unloading rate Lvi) Description of the design details operation philosophy etc. for steam generator start-up circulation as applicable. Lvii) Functional description, design details of grate system Lviii) List of temporary equipments supplied by Bidder for pre-commissioning activities including all piping, valves, fittings, instruments and chemicals etc.	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 10 OF 14

CLAUSE NO.	BIDDER'S NAME	
Lix) Complete description and functional writeup elaborating the Boiler Maintenance work station features 1.03.00 Drawings 1.03.01 Steam Generator i) Plan of steam generator and its auxiliaries at ground floor level, at oil burner, grate, SNCR, feed hopper, ash extractor, drum level and at an intermediate level (preferably at the long retractable soot blower level), indicating the galleries, platforms and stairways. The plan drawing shall indicate the minimum distance recommended, from the last steam generator column to the steam generator enclosure ii) Front elevation, side elevation and cross section of the steam generating unit showing location of headers and drum iii) Layout of steam generator structural steel columns upto stack. These shall indicate the size of members and main dimensions, with design loadings and all lifting facilities for purposes of maintenance iv) Layout of interconnecting platforms with the lift and platform meant for connecting the steam generator floors to the turbine operating floor v) Preliminary layout of air and gas ducts showing damper location, manholes, expansion joints, supports etc. vi) Drawing for full gas tight dampers clearly indicating how sealing is effected and the gas tightness efficiency (on flow) is achieved		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 11 OF 14

CLAUSE NO.	BIDDER'S NAME	एनटीपीसी NTPC		
	vii) General arrangement drawings of the Bag filter, gas conditioning tower, lime / activated carbon dosing, system, storage including locations of various dampers / valves viii) Schematic drawings of the grate, feeding system, secondary and primary burner equipment. ix) General arrangement drawings showing arrangement of FD, ID, PA and GR (if applicable), SA fans (if applicable) , burner air fan, burner sealing or sealing air fan, air heaters, ducting arrangement between the boiler and the bag filter with dimensions and weight. x) Arrangement drawings showing arrangement, dimensions, pitching, supporting arrangement, clearances etc. for the pressure parts. xi) Schematic diagram indicating and instrumentation and controls integral with Steam Generator circuits clearly indicating pipe-duct size (OD's and ID's), operating parameters, maximum fluid velocities, insulation thickness and material specifications of main steam piping type of actuators. a) Steam flow b) Feed water flow c) Blow down d) Vents and Drains e) Air, fuel and flue gas f) Grate system g) High pressure chemical dosing h) Fuel oil system in the			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 12 OF 14

CLAUSE NO.	BIDDER'S NAME				
1.03.02		boiler area and burner system for oil fuel	.....		
	i)	Fuel oil system for secondary burner	.....		
	j)	Lubrication system of fans, fan motors and any other equipment	.....		
	k)	SCAPH / air heaters	.....		
	l)	Auxiliary steam system	.....		
	m)	Cooling water	.....		
	n)	Service Air	.....		
	o)	Instrument air	.....		
	xii)	Drawings of drum with preliminary dimensions and indicating stubs locations and details for local and remote instruments and controls	.....		
	xiii)	General arrangement drawing of the boiler maintenance cradle (s) and sketches showing how the cradles will be introduced, assembled and lifted up for maintenance, step by step	.....		
	xiv)	Drawings showing number and locations of temporary and permanent thermocouples	.....		
	xv)	General arrangement of boiler showing location of the probes of acoustic steam leak detection system (as applicable)	.....		
	xvi)	GA & Foundation Drawings of all Boiler Auxiliaries like fans/ grate etc.	.....		
		Boiler and Duct Supporting Columns			
	i)	Location Plan: Details of location and arrangement . scheme of columns, embedments and fixing details, sizes			
	KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 13 OF 14

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	of pedestals, levels, blocknuts & anchor bolts and channels indicating scope of supply of Bidder. ii) Loading on foundations :Axial load, bending moments and shear forces transmitted to foundation for following loading combinations separately indi- cating Ash loading considered per design. a) Dead load b) Live load c) Wind load d) Seismic load e) Temperature load iii) Complete bracing arrang- ement for boiler and combi- nations of (+ve) and (-ve) forces for the seismic or wind (whichever is governing) iv) Percentage of the load considered for calculating wind and seismic forces 			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 14 OF 14

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)	एनटीपीसी NTPC
	Provide data for all these loading conditions	LP 1, LP2, LP3, LP 4, LP5, LP DESIGN	
2.00.00	ANTICIPATED PERFORMANCE DATA UNDER STIPULATED GUARANTEE CONDITIONS		
2.01.00	General		
	i) Steam flow at superheater outlet (Tonnes/hr)	.....	.....
	ii) Steam pressure at superheater outlet (kg/cm ²) abs	.....	.....
	iii) Steam temperature at superheater outlet (degC)	.....	.....
	x) Feed water temperature (deg.C)	.....	.....
	xi) Steam generator efficiency based on the HHV of design fuel	.....	.....
	xii) Heat liberated by fuel per unit furnace volume (kcal/m ³ /hr) (if applicable)	.....	.....
	xiii) Furnace cooling factor (kcal/m ² /hr) (if applicable)	.....	.....
	xiv) Burner zone heat release rate (kcal/m ² /hr) (if applicable)	.....	.....
	xv) Plan area heat release rate (kcal/m ² /hr (if applicable)	.....	.....
	xviii) Weight of fuel fired (tonnes/hr)	.....	.....
	xix) Furnace exit gas temperature (deg.C)	.....	.....
	xx) Steam Purity at SH outlet (ppm)		
	a) Total dissolved solids	.....	.....
	b) Silica	.....	.....
	c) Sodium	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 1 OF 16

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)
2.02.00 2.02.01 2.02.02 2.02.03	Provide data for all these loading conditions	LP 1, LP2, LP3, LP 4, LP5, LP DESIGN
	d) Chlorides	.....
	e) Copper	.....
	f) Iron	.....
	xxi) Furnish thermal load diagram and adjustment factor considered	.....
	Temperature (deg. C)	
	Air	
	Design Ambient	.....
	Inlet to the APH (Primary air)	.....
	Outlet of APH (Primary air)	.....
	Inlet to the APH (Secondary air)	.....
	Outlet of the APH (Secondary air)	.....
	Secondary air at Inlet to grate	.....
	Hot Primary air in the common duct before grate	.....
	Hot primary air at the inlet to grate	.....
	Fuel & air mixture	
	i) Fuel and air mixture in the grate	.....
	Flue Gases (Actual Temperatures)	
	iii) Theoretical combustion temperature in the combustion zone	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL-STEAM GENERATOR) PAGE 2 OF 16

CLAUSE NO.	BIDDER'S NAME		PERFORMANCE (GUARANTEE CONDITION)			
2.02.04	Provide data for all these loading conditions				LP 1, LP2, LP3, LP 4, LP5, LP DESIGN	
	iv)	At furnace arch level (Furnace arch level is defined as the level at the entrance to radiant super heater.)	.....	.....		
	v)	At Furnace arch exit (as defined in the specification for FEGT)	.....	.....		
	vi)	Entrance to superheater				
		Stage I	.....	.....		
		Stage II	.....	.....		
		Stage III	.....	.....		
	vii)	Exit of Superheater				
		Stage I	.....	.....		
		Stage II	.....	.....		
		Stage III	.....	.....		
	x)	Entrance of economiser	.....	.....		
	xi)	Exit of economiser	.....	.....		
	xii)	Entrance to primary air heater	.....	.....		
	xvi)	Exit of primary air heater (Uncorrected)	.....	.....		
	xix)	Entrance of bag filter	.....	.....		
	xx)	Exit of bag filter	.....	.....		
	xxi)	Entrance of ID fans	.....	.....		
	xxii)	Entrance to Chimney	.....	.....		
		Feed Water				
		iii)	Water entering economiser			
	KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL-STEAM GENERATOR)	PAGE 3 OF 16

CLAUSE NO.	BIDDER'S NAME		PERFORMANCE (GUARANTEE CONDITION)		एनडीपीसी NTPC	
2.02.05	Provide data for all these loading conditions		LP 1, LP2, LP3, LP 4, LP5, LP DESIGN			
	iv)	Water leaving economiser	.....	.....		
	v)	Desuperheating spray water temperature				
	a)	Superheater	.....	.....		
	Steam					
	iii)	Inlet of superheater				
		1st Stage	.....	.....		
		2nd Stage	.....	.....		
		3rd Stage	.....	.....		
	iv)	Outlet of superheater				
		1st Stage	.....	.....		
		2nd Stage	.....	.....		
		3rd Stage	.....	.....		
		vii)	Outlet of drum			
2.03.00	Pressure					
2.03.01	Air (mmwc)					
	i)	Forced draft fan silencer outlet	.....	.....		
	ii)	Forced draft fan discharge	.....	.....		
	iii)	Air heater inlet (Secondary air )	.....	.....		
	iv)	Air heater outlet (Secondary air)	.....	.....		
	v)	Before grate (Secondary air)	.....	.....		
	vi)	Primary air fan inlet	.....	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL-STEAM GENERATOR)		PAGE 4 OF 16

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)	एनडीपीसी NTPC
2.03.03	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN		
	vii) Primary air fan discharge	.....	.....
	viii) Air heater inlet (Primary air)	.....	.....
	ix) Air heater outlet (Primary air)	.....	.....
	x) Hot primary air in the common duct before grate	.....	.....
	xi) Cold primary air header	.....	.....
	xii) Hot primary air at the inlet to grate	.....	.....
	Feed Water (kg/cm²) abs		
	i) Inlet to economiser (at the specified terminal point)	.....	.....
	ii) At Economiser inlet	.....	.....
	iii) Outlet of Economiser	.....	.....
	iv) Attenuation water for superheater	.....	.....
2.03.04	Drum Pressure (Kg/cm²) abs.	.....	.....
2.03.05	Steam (kg/cm²)(abs)		
	Inlet of superheater	.....	.....
	Outlet of superheater	.....	.....
	Inlet of drum	.....	.....
	Outlet of drum	.....	.....
2.04.00	Pressure Drop		
2.04.01	Air Path: (mmwc)		
	i) Primary air circuit		
	a) In air ducts including bends dampers, vanes etc.	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 5 OF 16

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)		
	Provide data for all these loading conditions	LP 1, LP2, LP3, LP 4, LP5, LP DESIGN		
	b) Across aerofoil (flow measuring device)	.....	.....	
	c) Across APH	.....	.....	
	d) Total loss through the system	.....	.....	
2.04.02	Fuel Path (mmwc)			
	i) Across the grate	.....	.....	
2.04.03	Flue Gas Path (mmwc)			
	i) Furnace pressure (back draught)	.....	.....	
	ii) Across SH convection path	.....	.....	
	iii) Across economisers	.....	.....	
	iv) Across air heaters	.....	.....	
	v) In gas ducts			
	a) Between boiler outlet and bag filter funnel inlet	.....	.....	
	b) Between outlet of bag filter & inlet of ID fan	.....	.....	
	c) Between ID fan outlet and chimney inlet	.....	.....	
	vi) Total loss through the system	.....	.....	
2.04.04	Steam Path (kg/cm²)			
	i) Saturated steam connections including horizontal and vertical hangers	.....	.....	
	ii) Superheater Stage I	.....	.....	
	iii) Superheater Stage II	.....	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 6 OF 16

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)
2.04.05	Provide data for all these loading conditions	LP 1, LP2, LP3, LP 4, LP5, LP DESIGN
	iv) Superheater Stage III v) Superheater desuperheater	
2.04.05	Feed Water Path (kg/cm²)	
2.05.00	i) Valves and connected piping	
	ii) Economiser	
2.05.00	Velocities (m/sec)	
	i) Grate throat gas velocity	
2.05.00	ii) Maximum gas velocity through tube banks of economizer	
	iii) Minimum gas velocity through tube banks of economizer	
2.05.00	Superheater	
	Stage I	
2.05.00	Stage II	
	Stage III	
2.05.00	Economiser	
	Stage I	
2.05.00	Stage II	
	(provide for other economiser as well- if applicable)	
2.05.00	iii) Gas/air velocities through the air heater heating elements	
	a) Gas	
2.05.00	- Primay APH	
	- Secondary APH (if applicable).....	
2.05.00		
2.05.00		
2.05.00		
2.05.00		
2.05.00		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 7 OF 16

CLAUSE NO.	BIDDER'S NAME		PERFORMANCE (GUARANTEE CONDITION)		
2.06.00	Provide data for all these loading conditions		LP 1, LP2, LP3, LP 4, LP5, LP DESIGN		
	b) Air				
	- Primary APH		.....	.....	
	- Secondary APH(if applicable).....		.....	.....	
	iv) Air velocities				
	a) Cold air ducts		.....	.....	
	b) Hot air ducts		.....	.....	
	v) Gas velocities in gas ducting sections				
	a) AH to Eco.		.....	.....	
	b) Boiler out to gas conditioning tower		.....	.....	
	c) Boiler outlet to Bag filter		.....	.....	
	d) Bag filter to ID fan		.....	.....	
	e) ID fan to stack		.....	.....	
	Percentage of Oxygen in flue gas				
	i) At furnace exit		.....	.....	
	ii) At economiser outlet		.....	.....	
	iii) At air heater outlet (primary)		.....	.....	
	v) In the duct before Bag filter		.....	.....	
	vi) At bag filter outlet		.....	.....	
	vii) At ID fan inlet		.....	.....	
2.07.00	Flow rate of air (kg/hr)				
	i) FD fan outlet		.....	.....	
	ii) PA fan outlet		.....	.....	
	iii) Air heater inlet		.....	.....	
	a) Primary air		.....	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 8 OF 16

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)	
2.08.00	Provide data for all these loading conditions b) Secondary air iv) Air heater outlet a) Primary air b) Secondary air v) Wall air / cooling air vi) Total air to each section of grate vii) Total combustion air	LP 1, LP2, LP3, LP 4, LP5, LP DESIGN	
	Flow rate of flue gases (kg/hr) i) Airheater inlet iii) Airheater outlet iv) Economiser outlet v) Bag filter inlet vi) Bag filter outlet vii) ID fan inlet viii) Recirculation gas flow (Applicable for the cases where gas recirculation is being used to control NOx /steam temperature)		
2.09.00	Excess Air (%) i) At grate ii) At furnace exit iii) At economiser outlet iv) At the air heater exit (primary) vi) At Bag filter inlet vii) At I.D. fan inlet		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)
2.10.00	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN Leakages (Tonnes per hour) i) Primary air Ducts/Dampers ii) Secondary air Wind box Ducts/Dampers	
2.11.00	Heat Balance (based on GCV of design fuel fired) i) Total fuel fired (tonnes/hr) ii) Gross Calorific value of fuel (Kcal/kg) iii) Heat absorbed per kg. of fuel in a) Air preheaters (kcal) - Primary - Secondary b) Economiser (kcal) c) Superheater (kcal) Stage I Stage II Stage III Roof tubes Convective pass enclosure Steam cooled hanger tubes e) Water walls Wall tubing	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL-STEAM GENERATOR)

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)	
2.12.00	Provide data for all these loading conditions		
	LP 1, LP2, LP3, LP 4, LP5, LP DESIGN		
	Screen tubes	.....	.....
	Any other	.....	.....
	iv) Total heat absorbed effectively by the unit (per kg of waste (kcal) be)	.....	.....
	Heat losses in the Steam Generator Heat losses in the Steam Generator		
	i) Heat loss due to flue gasses (%)	.....	.....
	- Dry gas loss	.....	.....
	- Hydrogen in the fuel	.....	.....
	- Moisture in the fuel	.....	.....
	- Moisture in the air	.....	.....
	- Total heat loss due to flue gases	.....	.....
	ii) Heat loss due to unburnt carbon (%) in:	.....	.....
	- Furnace bottom ash	.....	.....
	- Fly ash	.....	.....
	- Total heat loss due to unburnt carbon	.....	.....
	iii) Sensible heat loss (%) in:	.....	.....
	- Furnace bottom ash	.....	.....
	- Economiser hopper ash	.....	.....
	- Air heater hopper ash	.....	.....
	- Any other hopper ash (multi pass boiler)	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL-STEAM GENERATOR)
		PAGE 11 OF 16	

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)
2.13.00	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN	
	- Total sensible heat loss	.....
	iv) Heat loss due to radiation (%)	.....
	v) Unaccounted heat loss (%) (give details)	.....
	vi) Total heat losses {sum of the (i) to (v)}	.....
	vii) Heat credits (give details of equipment and breakup)	.....
	viii) Steam generator efficiency (%)	.....
	Weight and Distribution of Ash collected	
	i) Grate hopper (kg/hr)	.....
	ii) Economiser hopper (kg/hr)	.....
	iii) Air heater hopper (kg/hr)	.....
	iv) 2 / 3/ 4 pass boiler hoppers (kg/hr)	.....
	v) Gas conditioning hoppers (kg/hr)	.....
	vi) Bag filter hoppers (kg/hr)	.....
2.14.00	Furnace Design Data	
2.14.01	Net Heat Input	
	a) Heat input by oil fuel	.....
	b) Heat input by waste fuel	.....
2.14.03	Superheater Spray Quantity in T/hr.	
	a) Spray quantity	.....
2.15.00	Furnace Performance Data Description(As per Clause 1.05.01	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 12 OF 16

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)
2.16.00	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN Section-VI, Part B Sub-section-A-02) i) Total heat duty (10^6 Kcal/hr) ii) Efficiency (%) iii) Total heat generated (10^6 Kcal/hr) iv) Net heat input (10^6 Kcal/hr) (Unburnt) v) Furnace Plan area (M^2) vi) Furnace EPRS (M^2) vii) Furnace Volume (M^3) viii) Net heat input/plan area (10^6 Kcal/m^2/hr) ix) Net heat input /EPRS (10^6 Kcal/m^2/hr) x) Volumetric Heat Release rate (10^6 Kcal/m^2/hr) xi) Furnace exit gas temp. (Deg.C) xii) Residence time* (Sec) * Bidder to furnish the residence time calculation along with the bid	
	Mass velocity in evaporator (kg/m^2 sec.) i) Maximum ii) Minimum	
2.17.00	Mass flow through (Kg/m^2 sec) i) Front water walls ii) Rear water walls iii) Side Walls	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)		
	Provide data for all these loading conditions	LP 1, LP2, LP3, LP 4, LP5, LP DESIGN		
2.18.00	Auxiliary Steam Consumption i) Steam conditions a) Pressure range (kg/cm ²) (abs) b) Temperature range (deg.C) ii) Steam coil air pre-heater (kg/hr)Max. a) Primary b) Secondary			
2.19.00	Start ups			
2.19.01	Recommended Startup time periods to bring steam Generator to full load from ignition (with HP bypass system) i) Cold start, (hours), ii) Warm start (hours) iii) Hot start (hours) iv) Time between start (hours) v) Hot restart after trip out with less than one hour shut down			
2.19.02	Number of start ups/life (Nos.) of following type for which the unit has been designed a) Cold startup b) Warm startup c) Hot startups			
2.21.00	SH drains during starting a) Flow rate of drain water from			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 14 OF 16

CLAUSE NO.	BIDDER'S NAME		PERFORMANCE (GUARANTEE CONDITION)		
2.22.00	Provide data for all these loading conditions		LP 1, LP2, LP3, LP 4, LP5, LP DESIGN		
		primary superheater header (kg/hr)	.....		
	b)	Flow rate of drain water from SH final header (kg/hr)	.....		
	c)	Flow rate of drain water from SH final header (kg/hr)	.....		
	Wind box performance				
	i)	Free air area (M²)	.....		
	ii)	Secondary air flow into the wind box (M³/sec)	.....		
	iii)	Secondary air density (kg/M³)	.....		
	iv)	Secondary air temperature in the wind box (deg.C)	.....		
	v)	Secondary air velocity (M/sec)	.....		
	vi)	Differential pressure with respect to the furnace (mmwc)	.....		
	2.23.00	Combustion Data			
		i)	Stoichiometric dry air required kg/kg fuel		
		ii)	Stoichiometric wet air required kg/kg fuel		
iii)		Volume of flue gas at Eco outlet per Kg of Coal (NM³)	.....		
iv)		Emissivity at mean firing zone (Correct upto fifth place of decimal)	.....		
a)		Flame Emissivity	.....		
b)		Gas Emissivity	.....		
c)		Total Emissivity	.....		
v)		Specific heat of flue gases	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 15 OF 16	

CLAUSE NO.	BIDDER'S NAME	PERFORMANCE (GUARANTEE CONDITION)		
	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN at mean firing zone (correct upto fifth place of decimal) vi) Weight of flue gas produced by burning 1 kg of fuel (kg) at Eco outlet 			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 16 OF 16

CLAUSE NO.	BIDDER'S NAME 
3.00.00 3.01.00	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN ANTICIPATED PERFORMANCE DATA OF GRATE AND STEAM GENERATOR FOR FUEL BASED ON DIFFERENT OPERATING CONDITION (RANGE OF MSW FUEL) General i) Steam flow at superheater outlet (Tonnes/hr) ii) Steam pressure at super-heater outlet (kg/cm²) abs iii) Steam temperature at superheater outlet (degC) ix) Control point (% MCR) x) Feed water temperature (deg.C) xi) Steam generator efficiency based on the HHV of design fuel xii) Heat liberated by fuel per unit furnace volume (kcal/m³/hr) xiii) Furnace cooling factor (kcal/m²/hr) xiv) Burner zone heat release rate (kcal/m²/hr) xv) Plan area heat release rate (kcal/m²/hr) xviii) Weight of fuel fired (tonnes/hr) xix) Furnace exit gas temperature (deg.C) xx) Steam Purity at SH outlet (ppm) a) Total dissolved solids
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 1 OF 16

CLAUSE NO.		BIDDER'S NAME					एनटीपीसी NTPC	
		Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN						
		b)	Silica	.....	.....	.....	.....	.....
		c)	Sodium	.....	.....	.....	.....	.....
		d)	Chlorides	.....	.....	.....	.....	.....
		e)	Copper	.....	.....	.....	.....	.....
		f)	Iron	.....	.....	.....	.....	.....
		xxi)	Furnish calculations for plan area heat release rate, burner zone heat release rate, volumetric heat release rate furnace cooling factor & heat input per burner alongwith details of EPRS calculation, basis for the fouling factor/surface adjustment factor considered	.....	.....	.....	.....	.....
3.02.00		Temperature (deg.C)						
3.02.01		Air						
		iii)	Design Ambient	.....	.....	.....	.....	.....
		iv)	Inlet to the APH (Primary air)	.....	.....	.....	.....	.....
		v)	Outlet of APH (Primary air)	.....	.....	.....	.....	.....
		vi)	Inlet to the APH (Secondary air)	.....	.....	.....	.....	.....
		vii)	Outlet of the APH (Secondary air)	.....	.....	.....	.....	.....
		viii)	Secondary air at Inlet to grate	.....	.....	.....	.....	.....
		ix)	Hot Primary air in the common duct before grate	.....	.....	.....	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 2 OF 16	

CLAUSE NO.	BIDDER'S NAME					
3.02.03	Provide data for all these loading conditions					LP 1, LP2, LP3, LP 4, LP5, LP DESIGN
	x)	Hot primary air at the inlet to grate	.....	.....	.....	.....
	Flue Gases (Actual Temperatures)					
	iii)	Theoretical combustion temperature in the combustion zone	.....	.....	.....	.....
	iv)	At furnace arch level	.....	.....	.....	.....
		(Furnace arch level is defined as the level at the entrance to radiant super heater.)				
	v)	At Furnace arch exit (as defined in the specification for FEGT)	.....	.....	.....	.....
	vi)	Entrance to superheater				
		Stage I	.....	.....	.....	.....
		Stage II	.....	.....	.....	.....
		Stage III	.....	.....	.....	.....
	vii)	Exit of Superheater				
		Stage I	.....	.....	.....	.....
		Stage II	.....	.....	.....	.....
		Stage III	.....	.....	.....	.....
	x)	Entrance of economiser	.....	.....	.....	.....
	xi)	Exit of economiser	.....	.....	.....	.....
xii)	Entrance to primary air heater	.....	.....	.....	.....	
xiii)	Entrance to secondary air heater	.....	.....	.....	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 3 OF 16

CLAUSE NO.	BIDDER'S NAME				
	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN				
	xix)	Entrance of bag filter	.....	.....	.....
	xx)	Exit of bag filter	.....	.....	.....
	xxi)	Entrance of ID fans	.....	.....	.....
	xxii)	Entrance to Chimney	.....	.....	.....
	3.02.04	Feed Water			
		Water entering economiser	.....	.....	.....
		Water leaving economiser	.....	.....	.....
		Desuperheating spray water temperature			
	a)	Superheater	.....	.....	.....
	3.02.05	Steam			
	iii)	Inlet of superheater			
		1st Stage	.....	.....	.....
		2nd Stage	.....	.....	.....
		3rd Stage	.....	.....	.....
	iv)	Outlet of superheater			
		1st Stage	.....	.....	.....
		2nd Stage	.....	.....	.....
		3rd Stage	.....	.....	.....
	vii)	Outlet of drum	.....	.....	.....
	3.03.00	Pressure			
3.03.01	Air (mmwc)				
	i)	Forced draft fan silencer outlet	.....	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 4 OF 16	

CLAUSE NO.	BIDDER'S NAME					
	Provide data for all these loading conditions					LP 1, LP2, LP3, LP 4, LP5, LP DESIGN
	ii)	Forced draft fan discharge	.....	.....	.....	.....
	iii)	Air heater inlet (Secondary air )	.....	.....	.....	.....
	iv)	Air heater outlet (Secondary air)	.....	.....	.....	.....
	v)	In grate windbox (Secondary air)	.....	.....	.....	.....
	vi)	Primary air fan inlet	.....	.....	.....	.....
	vii)	Primary air fan discharge	.....	.....	.....	.....
	viii)	Air heater inlet (Primary air)	.....	.....	.....	.....
	ix)	Air heater outlet (Primary air)	.....	.....	.....	.....
	x)	Hot primary air in the duct before grate	.....	.....	.....	.....
	xi)	Cold primary air header	.....	.....	.....	.....
	xii)	Hot primary air at the inlet to grate	.....	.....	.....	.....
3.03.03	Feed Water (kg/cm²) abs					
	i)	Inlet to economiser (at the specified terminal point)	.....	.....	.....	.....
	ii)	At Economiser inlet	.....	.....	.....	.....
	iii)	Outlet of economiser	.....	.....	.....	.....
	iv)	Attemperation water for superheater	.....	.....	.....	.....
3.03.04	Drum Pressure (Kg/cm²) abs.					
3.03.05	Steam (kg/cm²)(abs)					
	i)	Inlet of superheater	.....	.....	.....	.....
	ii)	Outlet of superheater	.....	.....	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 5 OF 16

CLAUSE NO.	BIDDER'S NAME						
	Provide data for all these loading conditions					LP 1, LP2, LP3, LP 4, LP5, LP DESIGN	
3.04.00	vi) Outlet of drum					.....	.....
	Pressure Drop						
3.04.01	Air Path: (mmwc)						
	i) Primary air circuit						
	a) In air ducts including bends dampers, vanes etc.					.....	.....
	b) Across aerofoil (flow measuring device)					.....	.....
	c) Across APH					.....	.....
	d) Total loss through the system					.....	.....
3.04.02	Fuel Path (mmwc)						
	i) Across grate					.....	.....
3.04.03	Flue Gas Path (mmwc)						
	i) Furnace pressure (back draught)					.....	.....
	ii) Across SH convection path					.....	.....
	iii) Across economisers					.....	.....
	iv) Across air heaters					.....	.....
	v) In gas ducts						
	a) Between air heater outlet and Bag filter inlet					.....	.....
	b) Between outlet of bag filter & inlet of ID fan					.....	.....
	c) Between ID fan outlet and chimney inlet					.....	.....
	vi) Total loss through the system					.....	.....
3.04.04	Steam Path (kg/cm²)						
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 6 OF 16

CLAUSE NO.	BIDDER'S NAME					
3.04.05	Provide data for all these loading conditions					LP 1, LP2, LP3, LP 4, LP5, LP DESIGN
	i)	Saturated steam conn- ections including horizontal and vertical hangers	.....	.....	.....	.....
	ii)	Superheater Stage I	.....	.....	.....	.....
	iii)	Superheater Stage II	.....	.....	.....	.....
	iv)	Superheater Stage III	.....	.....	.....	.....
	v)	Superheater desuperheater	.....	.....	.....	.....
	Feed Water Path (kg/cm²)					
	i)	Valves and connected piping	.....	.....	.....	.....
	ii)	Economiser	.....	.....	.....	.....
	3.05.00	Velocities (m/sec)				
i)		Furnace throat gas velocity	.....	.....	.....	.....
ii)		Maximum gas velocity through tube banks of TSH	.....	.....	.....	.....
iii)		Maximum gas velocity through tube banks of economiser	.....	.....	.....	.....
a)		Superheater				
		Stage I	.....	.....	.....	.....
		Stage II	.....	.....	.....	.....
		Stage III	.....	.....	.....	.....
c)		Economiser				
		Stage I	.....	.....	.....	.....
	Stage II	.....	.....	.....	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 7 OF 16

CLAUSE NO.	BIDDER'S NAME					एनटीपीसी NTPC
3.06.00	Provide data for all these loading conditions					LP 1, LP2, LP3, LP 4, LP5, LP DESIGN
	iii)	Gas/air velocities through the air heater heating elements				
	a)	Gas				
		- Secondary APH	.....	.....	.....	.....
		- Primary APH	.....	.....	.....	.....
	b)	Air				
		- Secondary APH	.....	.....	.....	.....
		- Primary APH	.....	.....	.....	.....
	iv)	Air velocities				
	a)	Cold air ducts	.....	.....	.....	.....
	b)	Hot air ducts	.....	.....	.....	.....
	v)	Gas velocities in gas ducting sections				
	a)	AH to Eco	.....	.....	.....	.....
	b)	Eco. gas bypass ducts	.....	.....	.....	.....
	c)	Eco to Bag filter	.....	.....	.....	.....
	d)	Bag filter to ID fan	.....	.....	.....	.....
	e)	ID fan to stack	.....	.....	.....	.....
	Percentage of Oxygen in flue gas					
	i)	At furnace exit	.....	.....	.....	.....
ii)	At economiser outlet	.....	.....	.....	.....	
iii)	At air heater outlet (primary)	.....	.....	.....	.....	
iv)	At air heater outlet (secondary)	.....	.....	.....	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 8 OF 16

CLAUSE NO.	BIDDER'S NAME					
3.07.00	Provide data for all these loading conditions					LP 1, LP2, LP3, LP 4, LP5, LP DESIGN
	v)	Inlet of Bag filter	.....	.....	.....	.....
	vi)	At bag filter outlet	.....	.....	.....	.....
	vii)	At ID fan inlet	.....	.....	.....	.....
	Flow rate of air (kg/hr)					
	i)	FD fan outlet	.....	.....	.....	.....
	ii)	PA fan outlet	.....	.....	.....	.....
	iii)	Air heater inlet	.....	.....	.....	.....
	a)	Primary air	.....	.....	.....	.....
	b)	Secondary air	.....	.....	.....	.....
	iv)	Air heater outlet	.....	.....	.....	.....
	a)	Primary air	.....	.....	.....	.....
	b)	Secondary air	.....	.....	.....	.....
	v)	Cool air / Wall air	.....	.....	.....	.....
	vi)	Total air to grate	.....	.....	.....	.....
	vii)	Total combustion air	.....	.....	.....	.....
	3.08.00	Flow rate of flue gases (kg/hr)				
i)		Primary Airheater inlet	.....	.....	.....	.....
ii)		Secondary Airheater inlet	.....	.....	.....	.....
iii)		Primary airheater outlet	.....	.....	.....	.....
iv)		Secondary airheater outlet	.....	.....	.....	.....
v)		Bag filter inlet	.....	.....	.....	.....
vi)		Bag filter outlet	.....	.....	.....	.....
vii)		ID fan inlet	.....	.....	.....	.....
viii)		Recirculation gas flow				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 9 OF 16	

CLAUSE NO.	BIDDER'S NAME				
	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN				
	(Applicable for the cases where gas recirculation is being used to control NOx and steam temperature) 				
3.09.00	Excess Air (%)				
	i)	At grate	.....	.....	.....
	ii)	At furnace exit	.....	.....	.....
	iii)	At economiser outlet	.....	.....	.....
	iv)	At the air heater exit (primary)	.....	.....	.....
	v)	At the airheater exit (secondary)	.....	.....	.....
	vi)	At Bag filter inlet	.....	.....	.....
	vii)	At I.D. fan inlet	.....	.....	.....
3.10.00	Leakages (Tonnes per hour)				
	i)	Primary air			
		a) air preheater	.....	.....	.....
		b) Ducts/Dampers	.....	.....	.....
	ii)	Secondary air			
		a) air heater	.....	.....	.....
		b) Wind box	.....	.....	.....
		c) Ducts/Dampers	.....	.....	.....
3.11.00	Heat Balance (based on GCV of Design fuel fired)				
	i)	Total fuel fired (tonnes/hr)	.....	.....	.....
	ii)	Gross Calorific value of fuel (Kcal/kg)	.....	.....	.....
	iii)	Heat absorbed per kg.			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 10 OF 16	

CLAUSE NO.	BIDDER'S NAME				
3.12.00	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN				
	of fuel in				
	a) Air preheaters (kcal)				
	- Primary				
	- Secondary				
	b) Economiser (kcal)				
	c) Superheater (kcal)				
	Stage I				
	Stage II				
	Stage III				
	Roof tubes				
	Convective pass enclosure				
	Steam cooled hanger tubes				
	e) Water walls				
	Wall tubing				
Screen tubes					
Any other					
iv) Total heat absorbed effectively by the unit (per kg of fuel (kcal) be)					
Heat losses in the Steam Generator					
Heat losses in the Steam Generator shall be quoted for guarantee conditions also:					
i) Heat loss due to flue gasses (%)					
- Dry gas loss					
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 11 OF 16		

CLAUSE NO.	BIDDER'S NAME 
	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN - Hydrogen in the fuel - Moisture in the fuel - Moisture in the air - Total heat loss due to flue gases ii) Heat loss due to unburnt carbon (%) in: - Furnace bottom ash - Fly ash - Total heat loss due to unburnt carbon iii) Sensible heat loss (%) in: - Furnace bottom ash - Economiser hopper ash - Air heater hopper ash - Bag filter hopper ash - Total sensible heat loss iv) Heat loss due to radiation (%) v) Unaccounted heat loss (%) (give details) vi) Total heat losses {sum of the (i) to (v)} vii) Heat credits (give details of equipment and breakup) viii) Steam generator efficiency (%)
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 12 OF 16

CLAUSE NO.	BIDDER'S NAME					
	Provide data for all these loading conditions					LP 1, LP2, LP3, LP 4, LP5, LP DESIGN
3.13.00	Weight and Distribution of Ash collected					
	i)	Furnace bottom hopper (kg/hr)	.....	.....	.....	.....
	ii)	Economiser hopper (kg/hr)	.....	.....	.....	.....
	iii)	Multi pass boiler hopper (kg/hr)	.....	.....	.....	.....
	iv)	Bag filter hoppers (kg/hr)	.....	.....	.....	.....
3.14.00	Furnace Design Data					
3.14.01	Net Heat Input					
	a)	Net heat input	.....	.....	.....	.....
3.14.03	Superheater Spray Quantity in T/hr.					
	a)	Spray quantity	.....	.....	.....	.....
3.15.00	Furnace Performance Data					
	Description (As per Clause 1.05.01 Section-VI, Part B, Sub-section-A-02)					
	i)	Total heat duty (10 ⁶ Kcal/hr)	.....	.....	.....	.....
	ii)	Efficiency (%)	.....	.....	.....	.....
	iii)	Total heat generated (10 ⁶ Kcal/hr)	.....	.....	.....	.....
	iv)	Net heat input (10 ⁶ Kcal/hr) (Unburnt)	.....	.....	.....	.....
	v)	Furnace Plan area (M ²)	.....	.....	.....	.....
	vi)	Furnace EPRS (M ²)	.....	.....	.....	.....
	vii)	Furnace Volume (M ³)	.....	.....	.....	.....
	viii)	Net heat input/plan area (10 ⁶ Kcal/m ² /hr)	.....	.....	.....	.....
	ix)	Net heat input /EPRS (10 ⁶ Kcal/m ² /hr)	.....	.....	.....	.....
	x)	Volumetric Heat Release rate (10 ⁶ Kcal/m ² /hr)	.....	.....	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 13 OF 16

CLAUSE NO.	BIDDER'S NAME 
	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN xi) Furnace exit gas temp. (Deg.C) xii) Residence time* (Sec) * Bidder to furnish the residence time calculation along with the bid 3.16.00 Mass velocity in evaporator tubes (Kg/m² sec.) i) Maximum ii) Minimum 3.17.00 Tube Mass Velocity (Kg/m²sec.) i) Front water walls ii) Rear water walls iii) Side Walls 3.18.00 Auxiliary Steam Consumption i) Steam conditions a) Pressure range (kg/cm²) (abs) b) Temperature range (deg.C) ii) Steam coil air pre-heater (kg/hr)Max. a) Primary b) Secondary 3.19.00 Start ups 3.19.01 Recommended Startup time periods to bring steam Generator to full load from ignition (with HP bypass system)
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 14 OF 16

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	Provide data for all these loading conditions	LP 1, LP2, LP3, LP 4, LP5, LP DESIGN		
3.19.02	i)	Cold start, (hours)	.....	
	ii)	warm start, (hours)	.....	
	iii)	Hold start, (hours)	.....	
	Number of start ups/life (Nos.) of following type for which the unit has been designed			
	i)	Cold start, (hours)	.....	
	ii)	warm start, (hours)	.....	
3.21.00	iii)	Hold start, (hours)	.....	
	SH drains during starting			
	a)	Flow rate of drain water from primary superheater header (kg/hr)	.....	
	b)	Flow rate of drain water from SH final header (kg/hr)	.....	
	c)	Flow rate of drain water from SH final header (kg/hr)	.....	
	Wind box performance			
3.22.00	i)	Free air area (M ²)	.....	
	ii)	Secondary air flow into the wind box (M ³ /sec)	.....	
	iii)	Secondary air density (kg/M ³)	.....	
	iv)	Secondary air temperature in the wind box (deg.C)	.....	
	v)	Secondary air velocity (M/sec)	.....	
	vi)	Differential pressure with respect to the furnace (mmwc)	.....	
3.23.00	Combustion Data			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 15 OF 16

CLAUSE NO.	 BIDDER'S NAME		
	Provide data for all these loading conditions LP 1, LP2, LP3, LP 4, LP5, LP DESIGN i) Stoichiometric dry air required kg/kg fuel ii) Stoichiometric wet air required kg/kg fuel iii) Volume of flue gas at Eco outlet per Kg of fuel (NM³) iv) Emissivity at mean firing zone (Correct upto fifth place of decimal) a) Flame Emissivity b) Gas Emissivity c) Total Emissivity v) Specific heat of flue gases at mean firing zone (correct upto fifth place of decimal) vi) Weight of flue gas produced by burning 1 kg of fuel (kg) at Eco outlet 		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 16 OF 16

CLAUSE NO.	BIDDER'S NAME			
8.00.00	STEAM GENERATOR AND PRESSURE PARTS			
8.01.00	General			
	i)	Manufacturer	.....	
	ii)	Location	Outdoor (Inside the Acoustic enclosure)	
	iii)	Operation	Base load/Cyclic	
	iv)	Design Code	.....	
	v)	Type of firing	.....	
	vi)	Type of grate & steam generator	.....	
	vii)	Total auxiliary power (kW) consumption at Different load points	.....	
	viii)	Not used		
	ix)	Minimum load at which:		
	(a)	Steam generator can be operated continuously with complete flame stability g without gas	.....	
	(b)	Steam generator can be operated continuously with complete flame stability with gas	.....	
	xii)	Fuel oil for start-up	.....	
	xiii)	Maximum continuous throughput	.....	
	xiv)	Percentage load change per minute from full load to 60 % load without exce- eding limits on unburnt combustibles or NOx while maintaining safe flame conditions.	.....	
	xv)	Total water content of the steam generator for hydraulic test (Tonnes)	.....	
	xvi)	Time required for draining the complete steam gene- rator when it is an atmos- pheric pressure (minutes)	.....	
	xvii)	Maximum load after that no oil support is required (%)	.....	
	xix)	Details of permanent thermocouples giving the number and their		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 1 OF 19

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC		
8.02.00		location	.....			
	xx)	Write up on Furnace safe guard and supervisory system (FSSS)	.....			
	xxi)	Acid dew point temperature (°C)	Coal.....	Oil		
	xxii)	Margin over the acid dew point temperature adopted (°C)	Coal.....	Oil		
	xxiii)	Total cooling water required for all the boiler auxiliaries assuming inlet temperature of 33 and 36 deg.C. (M³/hour)	.....			
	xxiv)	Recommended inter locks and protections of the boiler auxiliaries	.....			
	xxv)	Submit evidence to support adequacy of design proposed considering furnace slagging, cold end corrosion, erosion, superheater fouling, hot end corrosion, etc.	.....			
		Furnace				
	i)	Type	.....			
	ii)	Wall	Water/steam cooled			
	iii)	Bottom	Dry			
	iv)	Draft	Balanced			
	v)	Tube arrangement	Membrane/Inclined			
	vi)	Explosion/implosion withstand capacity (mmwg)	.....			
	vii)	Residence time for fuel particles in the furnace (to be supported with calculations) (Seconds)	.....			
	viii)	Effective volume used to calculate the residence time (M³)	.....			
	ix)	Adiabatic temperature of combustion used to calculate residence time (°C)	.....			
x)	Height from top of furnace					
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		
				PAGE 2 OF 19		

CLAUSE NO.	 BIDDER'S NAME			
8.03.00	bottom ash hopper to furnace roof (M) xi) Depth (M) xii) Width (M) xiii) Furnace area (M²) a) Plan area b) EPRS (effective projected radiant surface) area (M²) of 1) Front water wall 2) Rear water wall 3) Side water wall 4) SH with Applicable section wise 5) RH with applicable section wise 6) Total (1 to 5) Bidder should indicate the break up of total EPRS area in the above format. He should not indicate just the total EPRS area. Bidder shall indicate the name of various sections also. xiv) Furnace volume (M³) xv) Furnace temperature probe a) Type b) Manufacturer c) Quantity d) Size e) Location			
	Water Walls	Front wall	Rear wall	Side wall
	i) Numbers of tubes	.....	.....	.....
	ii) Outside diameter (mm)	.....	.....	.....
	KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 3 OF 19			

CLAUSE NO.		BIDDER'S NAME			एनटीपीसी NTPC	
8.03.03	iii)	Design thickness (mm)	.....	.....	.....	
	iv)	Pitch	.....	.....	.....	
	v)	Actual thickness	.....	.....	.....	
	vi)	Design standard	.....	.....	.....	
	vii)	Material	.....	.....	.....	
	viii)	Oxidation temperature of material (degree Celsius)	.....	.....	.....	
	ix)	Total projected surface area of tubes (M²)	.....	.....	.....	
	x)	Method of joining long tubes	.....	.....	.....	
	xi)	Method of attachment to drum	.....	.....	.....	
	xii)	Method of joining headers	.....	.....	.....	
	xiii)	Total weight of tubes (kg)	.....	.....	.....	
	xiv)	Design pressure of tubes (Kg/cm²)	.....	.....	.....	
	xv)	Maximum pressure of tubes (kg/cm²)	.....	.....	.....	
	xvi)	Design metal temperature deg.C	.....	.....	.....	
	xvii)	Erosion allowance provided on tube thickness (mm)	.....	.....	.....	
	xviii)	Provision of fabricated tubes as per Sub-section-A02, Part-B, Section-VI.		Yes/No		
	xvix)	Details of the water wall tube ribbing / rifling with dimensioned sketch.	.....	.....	.....	
	xix)	Angle of inclination of water wall tubes	.....	.....	.....	
	xx)	Number and type of thermo-couples fitted to water wall tubes	.....	.....	.....	
		Furnace Surface Adjustment Factors				
i)	Front wall	.....				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 4 OF 19

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC		
8.04.00	ii)	Side walls	.....			
	iii)	Rear walls	.....			
	iv)	Roof	.....			
	Water Wall Headers					
	i)	Number of headers	.....			
	ii)	Height of the lowest header above the ground level (M)	.....			
	iii)	Outside diameter (mm)	.....			
	iv)	Design thickness (mm)	.....			
	v)	Actual thickness provided (mm)	.....			
	vi)	Length of each header (M)	.....			
	vii)	Design standards	.....			
	viii)	Total weight of headers (kg)	.....			
	ix)	Maximum header unbalance	.....			
	x)	Design pressure of header (Kg/sq.cm)(abs)	.....			
8.05.00	xi)	Maximum working pressure of headers (Kg/sq.cm)(abs)	.....			
	xii)	Material specification	.....			
	xiii)	Oxidation temperature of material (degree Celsius)	.....			
	xiv)	Flow unbalance in each header w.r.t. average flow (%)	.....			
	Drum					
	i)	Number	.....			
	ii)	Construction	.....			
	iii)	Material specification and composition	.....			
	KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	
						PAGE 5 OF 19

CLAUSE NO.	BIDDER'S NAME			
	iv)	Oxidation temperature of material (degree Celsius)	.....	
	v)	Manufacturer of plate material	.....	
	vi)	Composition	.....	
	vii)	Ultimate tensile strength of plates (Kg/cm ²)	.....	
	viii)	Design pressure (Kg/cm ²)	.....	
	ix)	Design metal temperature (deg C)	.....	
	x)	Design stress at working metal temperature (0.2% proof stress)	.....	
	xi)	Max. allowable working pressure	.....	
	xii)	Design standard	.....	
	xiii)	Design thickness for straight portion (mm)	.....	
	xiv)	Design thickness for dished ends (mm)	.....	
	xv)	Actual thickness used for straight portion (mm)	.....	
	xvi)	Actual thickness used for dished ends (mm)	.....	
	xvii)	Overall length of separator (as applicable) (mm)	.....	
	xviii)	Outside diameter of separator (as applicable) (mm)	.....	
	xvix)	Internal diameter (mm)	.....	
	xx)	Corrosion allowance (mm)	.....	
	xxi)	Elevation of separator centre line (mm)	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)
PAGE 6 OF 19				

CLAUSE NO.		BIDDER'S NAME			एनडीपीसी NTPC	
8.06.00	xxii)	Shroud material	.....			
	xxiii)	Max. permissible temperature differential between any two parts of the (deg.C)	.....			
	a)	During Normal operation	.....			
	b)	During accelerated starting	.....			
	xxiv)	Water capacity at MCR Conditions (in seconds) between normal and lowest water level permitted	.....			
	xxv)	Separator weight with internals	.....			
	xxvi)	Separator weight without internals	.....			
	Purity of Saturated Steam leaving the separator (ppm)					
	i)	Total dissolved solids	.....			
	ii)	Silica content	.....			
	iii)	Sodium	.....			
	iv)	Chlorides	.....			
	v)	Copper	.....			
	vi)	Iron	.....			
	vii)	Moisture	.....			
8.07.00	Superheater					
8.07.01	Superheater					
			Stage I	Stage II	Stage III	
i)	Type (Radiant/Convection)	.....	.....	.....		
ii)	Platen, (drainable/non-drainable)	.....	.....	.....		
iii)	Pendant (drainable/non-					
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 7 OF 19

CLAUSE NO.	BIDDER'S NAME			
	drainable)	.....	.....	.....
iv)	Horizontal headers (drainable/non-drainable)	.....	.....	.....
v)	Material specification and composition	.....	.....	.....
vi)	Oxidation temperature of materials (degree Celsius)	.....	.....	.....
vii)	Effective heating surface area (M ²)	.....	.....	.....
viii)	Total circumferential heating surface area (M ²)	.....	.....	.....
ix)	Gas flow path area (M ²)	.....	.....	.....
x)	Depth of each bank on the direction of the gas flow (mm)	.....	.....	.....
xi)	Clear space between the two bank in the direction of gas flow (mm)	.....	.....	.....
xi)	Maximum steam gas side metal temperature (deg.C)	.....	.....	.....
xii)	Maximum gas side metal temperature (deg.C)	.....	.....	.....
xiii)	Type of flow (counter or parallel)	.....	.....	.....
xiv)	Material of tube support (Composition)	.....	.....	.....
xv)	Design standard	.....	.....	.....
xvi)	Design tube thickness (mm)	.....	.....	.....
xvii)	Outside diameter (mm)	.....	.....	.....
xviii)	Actual thickness used (mm)	.....	.....	.....
xix)	Margin on tube thickness (mm)	.....	.....	.....
xx)	Effective length (m)	.....	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 8 OF 19

CLAUSE NO.	 BIDDER'S NAME			
	xxi) Gross length (per one tube) (m) xxii) Number of elements/section xxiii) Total number of tubes xxiv) Tube pitch a) Parallel to gas flow (mm) b) Across gas flow (mm) xxv) Furnace Radiation penetration features xxvi) Method of joining long tubes xxvii) Total weight of tubes (Kg) xxviii) Maximum average flue gas velocity in SH section/tube banks with transverse pitching 600 mm or less and with 25% excess air at economiser outlet for the range of specified coals and loads. (m/sec) (Refer clause 1.05.04, sub- section-A 02, Part B, Section VI) xxix) Number and type of thermo- couples fitted to superheater tubes a) In gas path b) In pent house xxix) Reference Drawings			
8.07.02	Not used.			
8.08.00	Headers Superheater i) Material specification ii) Oxidation temperature of materials (degree Celsius) iii) Location : (Outside/Inside gas path)			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 9 OF 19

CLAUSE NO.	BIDDER'S NAME एनडीपीसी NTPC
8.09.00 8.09.01	iv) Maximum operating pressure (kg/cm²)(abs) v) Design pressure (kg/cm²) (abs) vi) Design standard vii) Outside diameter (mm) viii) Thickness (mm) ix) Length (m) x) Whether any diaphragm is used in any header and if so give details xi) Details of final outlet header connection xii) Method of internal inspection xiii) Total weight (kg) xiv) Total volume (M³) xv) Maximum header unbalance Superheater Temperature Control Superheater attemperator i) Type ii) Number of stages of attemperation iii) Position in steam circuit iv) Specification of material v) Superheater steam temperature range that can be maintained between 50% TMCR to 100% of boiler MCR (deg C.) vi) Spray nozzle material vii) Maximum spray water flow
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 10 OF 19

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
			rate and corresponding steam output and the coal being fired (kg/hr)		.....
	viii)		Min. spray water rate and corresponding steam output and the coal being fired (kg/hr)		.....
	ix)		Reference Drawing		.....
8.09.02	Not Used.				
8.09.03	Not Used.				
8.10.00	Economiser				
	i)		Type (Plain, Drainable, Non-steaming, inline tube arrangement)		.....
	ii)		Material specification and composition		.....
	iii)		Oxidation temperature of material		.....
	iv)		Manufacturer		.....
	v)		Water side effective heating surface area (M²)		.....
	vi)		Gas side effective heating surface area (M²)		.....
	vi)		Gas flow path area (M²)		.....
	vii)		Maximum average flue gas velocity through the economiser tube banks in accordance with criteria specified in clause 1.05.05, sub-section- A02, Part B, Section VI. (m/sec)		.....
	viii)		Maximum localised flue gas velocity through the economiser tube banks in accordance with criteria specified in clause 1.05.05, sub-section- A02, Part B, Section VI. (m/sec)		.....
	ix)		Heat transfer co-efficient (gas to water) at 100% MCR		.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	
PAGE 11 OF 19					

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC		
	x)	Provisions made for erosion shields/cassettes baffles as per requirement of relevant clause 8.02.00 of sub-section- A03, Part B, Section VI. (Enclose arrangement drawing)	YES/NO			
	xi)	Provision made for economiser on load cleaning	YES/NO			
	xii)	Provisions of space has been kept for future addition as per relevant clause 8.04.00 of sub-section- A03, Part B, Section VI.	YES/NO			
	xiii)	Design pressure of tubes (kg/cm2) (abs)	.....			
	xiv)	Outside diameter tubes (mm)	.....			
	xv)	Design tube thickness used (mm)	.....			
	xvi)	Actual thickness used and margin on tube thickness provided (mm)	.....			
	xvii)	Length of tubes (m)	.....			
	xviii)	Pitch along gas flow (mm)	.....			
	xvix)	Pitch across gas flow (mm)	.....			
	xx)	Design standard	.....			
	xxi)	Total weight of tube (Kg)	.....			
	xxii)	Total internal volume of tubes (M³)	.....			
	xxiii)	Total number of tubes	.....			
	xxiv)	Type of tube joints	.....			
	xxv)	Tube support				
		a) Type	.....			
		b) Material	.....			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 12 OF 19

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
		xxvi)	Maximum steam gas side metal temperature (deg.C)	.....	
		xvii)	Maximum gas side metal temperature (deg.C)	.....	
		xviii)	Minimum temperature of feed water that economiser can handle safely (degC)	.....	
		xix)	Headers		
		a)	Material specification	.....	
		b)	Outside diameter (mm)	.....	
		c)	Design Thickness (mm)	.....	
		d)	Actual thickness used (mm)	.....	
		e)	Length (m)	.....	
		f)	Design standard	.....	
		g)	Type of construction	.....	
		h)	Method of internal inspection	.....	
		i)	Maximum header unbalance	.....	
		j)	Total weight (kg)	.....	
		k)	Design pressure (kg/cm²) (abs)	.....	
		l)	Maximum working Pressure (kg/cm²)(abs)	.....	
		m)	Total Internal volume (M³)	.....	
8.11.00	Boiler Mountings and Fittings				
8.11.01	Drum Safety Valves (for each safety valve)				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	
					PAGE 13 OF 19

CLAUSE NO.	एनडीपीसी NTPC BIDDER'S NAME		
8.11.02	i) Manufacturer ii) Type and rating iii) Number iv) Specification of material a) Body b) Trim/spring c) Seat v) Set Pressure (kg/cm ²)(abs) vi) Flow capacities (kg/hr) vii) Type of end connections		
	Superheater Safety Valves (for each safety valve) i) Manufacturer ii) Type and rating iii) Number iv) Specification of material a) Body b) Trim/spring c) Seat v) Set Pressure (kg/cm ²)(abs) vi) Flow capacities (kg/hr) vii) Type of end connections		
8.11.03	Not used		
8.11.04	Electromatic Relief Valve S.H. outlet (if applicable) i) Manufacturer		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 14 OF 19

CLAUSE NO.	BIDDER'S NAME			एनडीपीसी NTPC
8.12.00	ii)	Type and actuator	.....	.....
	iii)	Number	.....	.....
	iv)	Location	.....	.....
	v)	Size	.....	.....
	vi)	Capacity (kg/hr)	.....	.....
	Drum level gauges			
8.13.00	i)	Manufacturer	.....	
	ii)	Type	.....	
	iii)	Number	.....	
	iv)	Location	.....	
	v)	Size	.....	
	Flow Meters (for all the flow meters / flow nozzles)			
8.14.00	i)	Service	.....	
	ii)	Pressure drop (kg/cm ²)	.....	
	iii)	Material	.....	
	iv)	Nozzle/orifice plate	.....	
	v)	Maximum flow (kg/hr)	.....	
	vi)	Type of end connections (welded flanged)	.....	
8.14.00	D.M. Water for boiler filling : Volume (M³)			
	i)	Circulating system consisting of separator waterwall panels Headers etc.	.....	
	ii)	Economiser system	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 15 OF 19

CLAUSE NO.	BIDDER'S NAME			एनडीपीसी NTPC
8.15.00	iii)	Super heater system (From separator upto Final SH outlet header)	.....	
	iv)	Reheater system (From RH inlet header to outlet header)	.....	
	Main Steam Line			
	i)	Material specification	.....	
	ii)	Oxidation temperature of materials (degree Celsius)	.....	
	iii)	Maximum operating pressure (Kg/cm ²) (abs)	.....	
	iv)	Design pressure (kg/cm ²) (abs)	.....	
	v)	Design standard	.....	
	vi)	Outside diameter (mm)	.....	
	vii)	Thickness (mm)	.....	
8.16.00	Auxiliary Steam Pressure Reducing & Desuperheating Station		Main Steam PRDS	
	i)	Pressure Reducing valves		
		Manufacturer	.....	
		No. of valves	.....	
		Flow capacity of each valve (tonnes/hr)	.....	
		Type of valve	.....	
		Type of actuator	.....	
		Body and trim material	.....	
		Body design:	.....	
		a) Pressure (kg/cm ²)	.....	
	b) Temperature (deg.C)	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 16 OF 19

CLAUSE NO.	BIDDER'S NAME 
	ii) Desuperheaters Manufacturer Type Flow capacity (tonn/hr) Desuperheating water a) Pressure (kg/cm²) b) Temperature (deg.C) c) Quantity (kg/hr) iii) Pressure control valves (on spray water line) Manufacturer No. of valves Flow capacity of each valve (tonnes/hr) Type of valve Type of actuator Body and trim material Body design: a) Pressure (kg/cm²) b) Temperature (deg.C) iv) Temperature control valve (on spray water line) Manufacturer No. of valves Flow capacity of each valve (tonnes/hr) Type of valve
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 17 OF 19

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
8.17.00		Type of actuator	.....	.....	
		Body and trim material	.....	.....	
		Body design:	.....	.....	
		a) Pressure (kg/cm²)	.....	.....	
		b) Temperature (deg.C)	.....	.....	
	v)	Isolating valves (on steam and spray lines)			
		Manufacturer	.....	.....	
		No. of valves	.....	.....	
		Flow capacity of each valve (tonnes/hr)	.....	.....	
		Type of valve	.....	.....	
		Type of actuator	.....	.....	
		Body and trim material	.....	.....	
		Body design:	.....	.....	
		a) Pressure (kg/cm²)	.....	.....	
		b) Temperature (deg.C)	.....	.....	
		Drain Receiving vessel			
	i)	Dimensions	.....		
	ii)	Volume (m3)	.....		
	iii)	Operating pressure (kg/cm²)(abs)	.....		
	v)	Storage capcity of vessel for storing drains inaccordance with clause 1.05.18.02,Sub-Section-A02, Part B,Section VI. (minutes)	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	
				PAGE 18 OF 19	

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	vi) Material vii) Thickness (mm) 8.18.00 Not used 8.19.00 Not Used 8.20.00 Condensate Transfer Pumps (if applicable for SCAPH drain) i) No. of Pumps ii) Pump speed iii) Pump design capacity (Tonnes/hr.) iv) Maximum discharge pressure (kg/cm² abs)			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 19 OF 19

CLAUSE NO.	BIDDER'S NAME	एनटीपीसी NTPC		
	CHAPTER - III TECHNICAL INFORMATION / DATA TO BE SUBMITTED AFTER AWARD OF CONTRACT			
1.00.00	STEAM GENERATOR WITH AUXILIARIES			
1.01.00	Performance Data-Sizing calculations/Performance Curves/Diagrams			
	Contractor shall submit/furnish all relevant drawings/documents required to conform design requirements as elaborated in technical specifications. Some of the drawings/documents required are listed below,however, the list is not exhaustive. Contractor to submit all the related drawings/documents which shall be necessary to substantiate design requirements and other requirements to ensure compliance to specification requirements:			
a)	Design/sizing calculations including data sheets covering following (as a minimum): 1. Heat duty calculation 2. Air & Gas weight calculation 3. Furnace performance & sizing calculations 4. Furnace Residence Time calculation 5. Performance for design at different load point LP1 to LP 5 and LP design point 6. Boiler efficiency calculation 7. Duct design data and calculations 8. Fan sizing calculation and performance curves for FD/ID/PA/SA fans & scanner air fan 9. Air heater sizing calculation & equipment data 10. Steam coil air heater selection & sizing data/calculation 11. Gas system sizing/equipment data 12. Pressure parts schedule along with tube metal temperature calculations for xv) Evaporator, SH, Economiser and associated circulation system xvi) Circulation calculation xvii) Insulation Thickness calculations xviii) Safety valve sizing & selection xix) ERV Sizing (if applicable), selection & setting			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-III SUB-SECTION:DM1	PAGE 1 OF 15

CLAUSE NO.	BIDDER'S NAME			
b)	Performance Data-Curves/Diagrams			
	i) Furnace temperature Vs fuel input ii) MSW fuel and fuel gas consumption Vs load. iii) Boiler start-up curves including the cold and hot start conditions. iv) Characteristic curves of the various auxiliary equipment such as fans, pumps, motors, fuel burners. etc. v) Complete technical literature including characteristics curves, data sheets, sizing calculations, for all control valves, process valves and flow measuring devices. vi) Characteristic curves of all actuators is respect of valves and dampers vii) Characteristic curves showing the pressure drop at various boiler outputs for the sections. a) between the economiser inlet and boiler drum b) between the drum and superheater outlet viii) Characteristic curves for the motor showing: a) Torque-speed b) Current - speed c) Current-time d) Locked rotor withstand curves (hot and cold) e) Thermal withstand curves (hot and cold)			
1.02.00	Other Data			
	i) Description of the method to be adopted for protection of the equipment during manufacture, shipment and storage at site. ii) Shipping breakdown of all equipments. iii) Technical documents clearly bringing out the features of design and construction of the components, parts of all equipments and systems furnished. iv) Inspection for erection, testing, commissioning, operation and maintenance of all equipments.			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-III SUB-SECTION:DM1	PAGE 2 OF 15

CLAUSE NO.	BIDDER'S NAME			
	v)	A complete list of all auxiliary equipment and accessories furnished.		
	vi)	Schedule of valves and fittings schemewise along with complete tabulated data.		
	vii)	Final schedule and data sheets of actuators (Schemewise) for isolating and regulating valves, dampers and vanes incorporating the following particulars together with switch and circuit diagrams for each type of actuator:		
	a)	Manufacturer of actuator		
	b)	Type and drive		
	c)	Type, size (kW) and speed (rpm) of the motor		
	d)	Starting current of motor (amps)		
	e)	Full load current of motor (amps)		
	f)	Number of position limit switches provided for open position.		
	g)	Number of position limit switches provided for close position.		
	h)	Torque switch for full open position, if provided.		
	i)	Torque switch for full close position, if required.		
	j)	Number of auxiliary limit switches for indication and interlocks.		
	k)	Space heater, if provided. for limit switch compartment with its voltage and capacity		
	l)	Time for fully, opening and closing of the valves/dampers/vanes (seconds).		
	m)	Number and type of position transmitters provided for remote indication		
	n)	Resistance value of the position transmitter site wire Ohms)		
	o)	Remote position indicators, if any, for panel mounting with dimensional and cutout details.		
	p)	Input signal.		
	q)	Number and details of positioners provided		
	r)	Details of connecting linkages, limit switches, position transmitters, wire failure brake, supporting stand mounted or directly operated etc.		
	s)	Type-rating, and voltage of solenoid valve.		
	t)	Type and make of electro-pneumatic convertors, wherever required.		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-III SUB-SECTION:DM1
PAGE 3 OF 15				

CLAUSE NO.	BIDDER'S NAME	एनटीपीसी NTPC		
	u) Input signal voltage and frequency, for electropneumatic converter, wherever required. ix) Pressure parts drawing and detailed stress calculations specially bringing out the calculations taking care of fatigue and creep stresses developed due to start up/shut downs specified. x) Desuperheater location and details xi) Scheme, write-up and drawings for: a) Superheater and temperature control system b) Soot blowing system pressure control. xii) Details of specification of insulating materials including the procedure for applying insulation, reinforcement, cladding sheet finishing method, curing setting etc. xiii) Calculation for thermal insulation thickness and thickness envisaged for various parts of steam generator and piping. xiv) Cross sectional drawing of steam generators showing the gas velocities in M/s for each tube bank, duct and breaching and gas temperature entering various key locations at 100% boiler MCR. xv) Details of all isolating dampers including gas tight dampers. xvi) Description and details of the recommended mill rejects disposal system. xvii) Details of the procedure followed for preservation of the boiler after chemical cleaning up to the commissioning time. xviii) List of lubricants, their specifications and the respective quantities covered under the specification. xix) Operating instructions for Control and Instrumentation schemes and equipments. xx) Final list of annunciation giving the suggested set values of parameters, contact configurations, ratings and other details. xxi) Final schedule of all local instruments and primary sensing devices furnished as part of this package with the value (normal and maximum) of the associated parameters, location, manufacturer, type range, accuracy, dial size, connection details and contact details such as ratings, number and configuration. xxii) Final write up in respect of control schemes of soot blowers, lub oil system for the bearings of fans/air heaters, electromatic impulse safety valve, secondary air control etc. xxiii) Final write up on interlocks and protections for furnace safeguard supervisory system including burner management and mill automation and recommended interlocks and			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-III SUB-SECTION:DM1	PAGE 4 OF 15

CLAUSE NO.	BIDDER'S NAME			
		protections for the boiler and its auxiliaries including suggested block interlock diagrams. xxiv) List of signalling contacts/impulses for the FSSS and other systems furnished as apart of the equipment for connection to the data logger, annunciation and interlocking and protection system (DDCMIS) xxv) Final list of insert panels, cabinets and local panels furnished, together with the cable schedules, wiring diagrams, interconnection diagrams and the cable specifications. GA drawing, mounting and cutout details for panels, consoles etc. xxvi) Details of A.C. and D.C. feeders and corresponding power requirements indicating number and capacity of feeder at available voltage for each equipment system and control like soot blowers, electromatic impulse safety valves, furnace safeguard and supervisory system etc. xxvii) Complete list of tapping points provided on the equipment pipe lines/ducts etc. for all instruments and controls. The list shall also cover the sizes of ducts/pipelines wherever they incorporate tapping points and piping diagrams and plant arrangement drawing to group instruments and size instrument enclosure. xxviii) Compressed air (station and instrument) quality requirements stating the parameters such as pressure, quality and quantity for the various equipments and actuators/deviced furnished. xxix) Cooling water requirements equipments wise stating the parameters such as pressure quality and flow rate. xxx) Complete details data sheets and connection details edge preparation drawings etc. and sizing calculations for flow elements and calibration curves, wherever necessary. xxxi) List and final local instruments transmitter sensors etc. with make, type range accuracy dial size and control details. xxxii) Final list of local instruments, transmitter sensors etc. with make type range, accuracy dial size and control details. xxxiii) Complete bill of materials for impulse piping root valves; penumatic copper tubings, fittings and other accessories. xxxvi) Details and drawing for vibration pads. xxxvii) Recommended list of digital and analogue inputs to the EMPLOYER's data Logger computer. xxxviii) Recommended list of indicators and recorders to be provided by the Employer on the unit control board giving their range, accuracy, parameters measured, with this normal and maximum values. xxxix) Details of:		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-III SUB-SECTION:DM1	PAGE 5 OF 15

CLAUSE NO.	BIDDER'S NAME			
1.03.00	a) Size of flue gas duct opening in the chimney shell & level of the centre line in the duct entering the chimney shell.			
	b) Fixing arrangement with chimeny.			
	c) Duct supporting columns.			
	d) Ducting design criteria and details			
	xxxx) Details of locations, loading, embedments & inserts if any:-			
	a) Between power house and boiler house.			
	b) Between ID and FD fans.			
	c) Between ID fan and chimney			
	xxxxi) Details of locations, loading and fixing for ID fan maintenance column.			
	xxxxii) Details of location, and fixing for foundations of blow down tanks.			
xxxxiii) Any other drawings/details for foundation of blow down tanks.				
Contract drawing requirements The drawing listed below shall be submitted by the successful Bidder in six (6) copies together with a polyester reproducible. i) Drawings of proposed equipments showing the arrangement details and dimensions. ii) Drawings indicating the final loading data, locations and fixing details of the equipment on their foundations. iii) Final low diagrams for steam, feed water, blowdown drains, vents and lub oil system for equipments requiring forced lubrication indicating the size of piping valves, flow nozzles and supports, instrumentation and controls and test tapping points etc. iv) Piping drawings detailing the layout piping location, loading details, location of valves, flow nozzles and supports, instrumentation and controls and test tapping points etc. v) Final scheme diagrams clearly indicating all dampers, control valves, valve actuators, instruments, parameters, duct/pipe size, scope of the Bidder for the following. a) Air and flue gas flow b) MSW fuel handling and firing system c) Fuel gas system d) Fuel gas burner system				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-III SUB-SECTION:DM1	PAGE 6 OF 15

CLAUSE NO.	BIDDER'S NAME			
	e) Air heaters f) Flue gas conditioning tower g) Bag filter vi) Drawing showing layout o draft plant including FD & ID fans, their drives and control mechanisms. vii) Layout of grate, waste pit, MSW hopper, feeders, P.A. fans and seal air fans. viii) Final scheme diagram in respect of cooling water, service air and instrument air. ix) Arrangement and layout of soot blowing system x) Arrangement details of fuel gas firing equipments. xi) Arrangement details of high pressure chemical dosing system xii) Arrangement and layout of boiler integral piping xiii) Erection assembly drawings xiv) Drawings showing the scheme and arrangement of equipment for chemical cleaning and steam blowing of steam generator. xv) Arrangement and layout of platforms and galleries. xvi) Drawings showing arrangement of maintenance runway beams and trolleys. xvii) Electrical interconnecting diagrams xviii) Drawing showing the table terminal details of auxiliary motors. xix) Diagram indicating the loading on power house and bunker structure columns of the main building due to the interconnections between the boiler operating floor and the main building structures. xx) Drawing showing the recommended interconnection details between the furnace bottom and the bottom ash hopper			
2.00.00	ELEVATORS			
2.01.00	Performance and other data			
	i) Detailed data of foundations for equipments, loading data, locations . Data shall include breaking of load on guides, reactions of buffers on lift pits, reaction on support points in machine room, hoistway etc.			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-III SUB-SECTION:DM1	PAGE 7 OF 15

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC		
2.02.00	ii)	Details of block outs, embedments inserts etc.				
	iii)	Write-up explaining the sequence of operation of control circuits and elevator components when an operation button is pressed.				
	Contract Drawing Schedule					
	i)	General Arrangement and clearance drawings showing the general construction and dimensions of the equipment and complete structure.				
	ii)	Layout of the lift showing details of size and structure of lift well, plan of the machine room and lift pit.				
3.00.00	iii)	Electrical control diagrams and detailed circuit diagrams and physical arrangement /location diagrams of various electrical components of the controller in the machine room, in the hoistway, in the car, at the landing etc.				
	iv)	Erection assembly drawings				
	MOTOR					
	3.01.00	The following technical data drawings and test certificate submitted by successful bidder. The actual schedule of these data drawings and test reports shall be mutually agreed to between Employer and successful bidder before the issue of award of contract.				
	3.01.01	Drawing:				
3.01.02	a.	General arrangement and section drawings of motor indicating all the dimensions				
	b.	Terminal box details with shorting links etc. for stator leads space heater, RTd etc. (as applicable)				
	c.	Foundation details and fixing arrangements for all HT motors.				
	d.	Winding development diagrams for all T.T. motors				
	e.	Flow diagrams for lubricating oil and cooling system for all HT motor (as applicable)				
	f.	Motor sizing calculations				
	Characteristic Curves					
	a.	Torque Vs speed characteristics of motor superimposed with that of driven equipment at rated voltage and at min. permissible starting voltage for all motors and at 103% rated speed.				
	b.	Starting time Vs current at rated voltage and at min permissible starting voltage for all motors.				
	c.	Load Vs efficiency Load Vs power factor, Load Vs current, Load Vs slip characteristic curves for all motors.				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-III SUB-SECTION:DM1		PAGE 8 OF 15

CLAUSE NO.	BIDDER'S NAME			
	d.	Hot and cold thermal withstand curve for all motors.		
	e.	Heating and cooling time constant curves for H.T. Motors		
	f.	Type of insulation systems for HT Motors.		
3.01.03	Test Certificate			
	Type of reports carried out on similar motors			
3.01.04	Instruction manual for storage for prolonged duration, unpacking, handling at site, erection pre-commissioning test etc.			
3.01.05	Technical Data			
	The following data shall be submitted by the contractor for each type and rating of the motor for Employer's approval.			
3.01.05.1	Data for all motors			
	1.	Motor manufactures		
	2.	Equipment driven by motor		
	3.	Motor type		
	4.	Frame size		
	5.	Applicable standard to which motor confirms		
	6.	Rated output t 50 deg. C air ambient / 38 deg C cooling water temp.		
	7.	Maximum power input to the driven equipment at design duty point		
	8.	Type of mounting		
	9.	Class & type of insulation		
	10.	Temp. rise at rated output condition at 50°C. air ambient/38 deg C cooling water temp. (by resistance method)		
	11.	Type of enclosure, degree of protection & method of cooling.		
	12.	a)	Rated voltage and frequency with variation	
		b)	Combined voltage frequency variation	
		c)	Minimum permissible starting voltage	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-III SUB-SECTION:DM1
PAGE 9 OF 15				

CLAUSE NO.	BIDDER'S NAME			
	13.	i) Rated current ii) No load current		
	14.	Rated speed		
	15.	Efficiency at rated output (without -ve tolerance		
	16.	P. F. at rated output, at starting and at design duty points		
	17.	Rated torque		
	18.	Starting torque		
	19.	Pull out torque		
	20.	Starting current		
	21.	Locked rotor KVA		
	22.	Stator winding		
		a) resistance per phase		
		b) connection star/delta		
	23.	Direction of rotatoin from driving end		
	24.	Weight of motor		
	25.	Type & make of bearing		
	26.	Recommended lubricant for bearing		
	27.	GD ² value of motor		
	28.	GD ² value of load		
	29.	Winding details		
		a) no. of twine per coil		
		b) size of wire		
	30.	Starting time with drive attached		
		a) at rated voltage		
		b) at min permissible staring voltage		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-III SUB-SECTION:DM1
PAGE 10 OF 15				

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
3.05.02	31.	No load starting time			
	a)	at rated voltage			
	b)	at min permissible staring voltage			
	32.	Terminal box			
	a)	Location/Position			
	b)	Type of stator winding connection is star/delta			
	c)	No. of terminals brought out			
	d)	Size of cable gland			
	e)	Size of copper lug			
	f)	Max. size of recommended/accommodable cable			
	g)	Fault level withstand capacity (For breaker operated motors only)			
	33.	Space heater			
	a)	Quantity			
	b)	Location			
	c)	Rated voltage			
	d)	Rated wattage			
	e)	Terminal box location			
34.	Type of coupling between motor & driven equipment				
35.	Guaranteed running life in hours for bearings.				
Additional data to be furnished for motors of >125 kW only.					
1.	Max. power input to the driven equipment at design duty point.				
2.	Max. power input to the driven equipment at rated speed over entire operating range.				
3.	Max. power input to the driven equipment at 103% of rated speed over entire operating range.				
4.	Max. power input to the driven equipment in the event of tripping of operating fans/pumps, where parallel operation of fans/pumps are envisaged.				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-III SUB-SECTION:DM1	
				PAGE 11 OF 15	

CLAUSE NO.		BIDDER'S NAME		एन टी पी सी NTPC	
3.05.03.	5.	Temp. rise at rated output condition			
	i)	RTD method			
	ii)	Resistance method			
	6.	Method of cooling			
	7.	No. of permissible starts when motor is in cold condition			
	8.	No. of permissible starts when motor is in hot condition			
	9.	Heating time constant			
	a.	Stator			
	b.	Rotor			
	10.	Cooling time constant of stator and motor			
	a.	under standstill condition			
	b.	under running condition			
	11.	Max. permissible temp. of rotor			
	12.	Cold withstand time			
	a.	at rated voltage			
b.	at minimum permissible starting voltage				
13.	Hot withstand time				
a.	at rated voltage				
b.	at minimum permissible starting voltage				
14.	Minimum cooling time required to give one start incase of tripping followed by two hot starts				
3.05.03.	Additional data to be furnished for HT motors				
1.	Type of insulation system				
2.	Type of stator lead termination				
3.	RTD for winding				
a.	RTD's provided				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-III SUB-SECTION:DM1	
				PAGE 12 OF 15	

CLAUSE NO.	BIDDER'S NAME			
	b. Location of RTD terminal box c. Rating of terminal block d. Resistance at 20 deg.C e. Type of RTD f. Make. 4. RTD for bearings a. No of RTD terminal box b. Location of RTD terminal box c. Rating of terminal block d. Resistance at 20 deg. C e. Type of RTD f. Make 5. Heat exchanger a. Type b. Make c. Mounting arrangement d. Dial type thermometer with alarm contact - Make - Type - Range - No. of contact & rating 6. Water cooled heat exchangers a. Cooling water type b. Cooling water flow c. Make type & range of flow switch			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-III SUB-SECTION:DM1	PAGE 13 OF 15

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	d. Water leakage detector - Make - Type - Range - No. of contact & rating 7. Pedestal bearings a. Type of lubrication b. Oil pressure gauge/Oil pressure switch - Range and accuracy - No. of contacts & rating c. Whether oil flow indicator provided d. Motor driven pumps - No. of pumps - Motor KW rating - Voltage rating e. jacking Oil pump - Motor KW rating - Voltage rating f. Whether bearing insulation provided. 8. Surge withstand test particulars a. For main insulation i) Test voltage ii) Wave shape type (1.2/50m.sec.) b. For interturn insulation i) Test voltage			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-III SUB-SECTION:DM1	PAGE 14 OF 15

CLAUSE NO.	BIDDER'S NAME			
	ii) Wave shape type (.3/3 m.sec.) 9. High frequency over voltage test for coils a. Test voltage b. Test frequency			
4.00.00	INSTRUCTION MANUALS Contractor shall furnish twelve (12) copies of instruction manuals for all equipment which shall contain detailed step by step instruction for all operational and maintenance requirements. The manuals shall include among other information, the following aspects.			
4.01.01	Storage for prolonged duration			
4.01.02	Unpacking			
4.01.03	Erection			
4.01.04	Precommissioning tests			
4.01.05	Operating procedures			
4.01.06	Maintenance procedure and schedule.			
4.01.07	Precautions to be taken during operation and maintenance work.			
4.01.08	Outline dimension drawings showing relevant cross-sectional views and constructional features.			
4.01.09	Catalogue numbers of all components liable to be replaced during the life of the equipment.			
4.01.10	Rated voltage, current duty cycle and all other information which may be necessary for safe operation of equipment.			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL DATA SHEETS SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-III SUB-SECTION:DM1	PAGE 15 OF 15

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
9.00.00	9.01.00	STEAM GENERATOR AUXILIARIES Air heater (Secondary air / Primary air) i) Manufacturer ii) Type iii) No. of air heaters iv) Mounting v) Maximum handling capacity (Nm³/hr) a) Flue gas air b) Air vi) Handling capacity at 100% BMCR load a) Flue gas air b) Air vii) Flue gas temperature at air heater outlet xiv) Total effective heating surface xvi) Casing material xvii) Casing thickness xviii) Pressure drop at 100% BMCR a) Air side b) Gas side xxii) Gas velocity at 100% BMCR xxiii) Air Velocity at 100% BMCR (m/sec) 			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 1 OF 30	

CLAUSE NO.	BIDDER'S NAME					
9.01.01	xxiv)	Net free area for				
	a)	Gas flow (M²)	.....	.....	.....	.....
	b)	Air flow (M²)	.....	.....	.....	.....
	xxxix)	On load cleaning (if applicable)				
	xxxixii)	Off load cleaning	Water jet/Air Jet			
	Air heater performance data with LP 1, LP2, LP 3, LP 4, LP 5 and LP Design					
	i)	Air flow rate (kg/hr)				
	a)	Entering APH				
		- Primary	.....	.....	.....	.....
		- Secondary	.....	.....	.....	.....
	b)	Leaving APH				
		- Primary	.....	.....	.....	.....
		- Secondary	.....	.....	.....	.....
	ii)	Flue gas flow rate (kg/hr)				
	a)	Entering Primary APH	.....	.....	.....	.....
	b)	Leaving Primary APH	.....	.....	.....	.....
	iii)	Flue gas flow rate (kg/hr)				
	a)	Entering Secondary APH	.....	.....	.....	.....
b)	Leaving Secondary APH	.....	.....	.....	.....	
vi)	Gas side pressure loss (mmwc)					
a)	Primary APH	.....	.....	.....	.....	
a)	Secondary APH	.....	.....	.....	.....	
9.02.00	Steam Coil Air Pre-Heaters					
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 2 OF 30	

CLAUSE NO.	BIDDER'S NAME		एनडीपीसी NTPC
	i) Number of steam coil air preheaters 		
	ii) Type 		
	iii) Manufacturer 		
	iv) Mounting 		
	v) Shell side medium gas gas		
	vi) Tube side medium Steam Steam.....		
	vii) Quality of steam at entrance 		
	viii) Steam pressure (kg/cm²)(abs) 		
	ix) Steam temperature (deg.C) 		
	x) Design air flow (NM³/hr) 		
	xi) Normal air flow (NM³/hr) (MSW firing, Oil firing) 		
	xii) Air velocity (M/s (MSW firing, oil firing) 		
	xiii) Air inlet temperature (deg .C) 		
	xiv) Air outlet temperature (deg.C) 		
	xv) Quantity of steam correspondent to: 		
	a) Design air flow at 100% BMCR 		
	b) Normal air flow at 100% BMCR 		
	xvi) Pressure drop 		
	a) Air side (mmwg) MSW firing, oil firing) 		
	b) Steam side (mmwg) (MSW firing, oil firing) 		
	xvii) Drain 		
	a) Drain temperature 		
	b) Drain enthalpy (kcal/kg) 		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 3 OF 30

CLAUSE NO.	BIDDER'S NAME 
	xviii) Total surface area (M²) xix) Overall Heat transfer co-efficient (Kcal/hr/M²/deg.C) a) Air side b) Steam side xx) Number of tubes xxi) Construction features a) Type of coil b) Number of sections per heater c) Length, width and height of each coil section (maximum) d) Surface area of each section (M²) e) Disposition of coil sections and tube pitching f) Shell design pressure (Kg/cm²) (abs) g) Coil design pressure (Kg/cm²) (abs) h) Tube diameter (mm) i) Tube thickness (mm) j) Steam inlet nozzles size (mm) k) Design standard xxii) Corrosion allowance (mm) xxiii) Material a) Tubes
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 4 OF 30

CLAUSE NO.	BIDDER'S NAME			एनडीपीसी NTPC
9.03.00	b)	Casing	.....	
	c)	Fins	.....	
	d)	Nozzles	.....	
	e)	Baffles	.....	
	f)	Impingement plates	.....	
	g)	Flanges	.....	
	h)	Headers	.....	
	i)	Support plates	.....	
	j)	Gaskets	.....	
	xxiv)	Accessories (state whether provided/not provided)	.....	
	a)	Local instruments	.....	
	b)	Isolating valves	.....	
	c)	Regulating valves	.....	
	d)	Condensate collection tank	.....	
	e)	Inter connected piping	.....	
	f)	Instrument tapping points	.....	
	xxv)	Metal weights	.....	
	xxvi)	Upto what percentage of steam generator load the SCAPH is in operation	.....	
	xxvii)	Reference drawing	.....	
		Draft Plant	Forced draft fans	Induced draft fans
i)	Manufacturer	.....		
ii)	Type	.....		
iii)	Number of fans per boiler	.....		
iv)	No. of blades/fan	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 5 OF 30

CLAUSE NO.	BIDDER'S NAME			
	v) Capacity a) Flow rate at 100% BMCR (M³/sec), design and corresponding temperature (degC) and density (kg/m³) b) Flow rate at design point (M³/sec), and corresponding temperature (deg.C) and density (kg/m³) c) Flow rate at 100% TMCR (M³/sec), design and corresponding temperature (degC) and density (kg/m³) d) Flow rate at 80% TMCR (M³/sec), design and corresponding temperature (degC) and density (kg/m³) e) Max. flow rate the fan can handle (M³/sec) and corresponding temperature (degC) and density (kg/m³) f) Min. flow rate the fan can handle (M³/sec) and corresponding temperature (degC) and density (kg/m³) vi) Static pressure a) Pressure at 100% BMCR (mmwc) design firing b) Pressure at design point (mmwc) c) Pressure at 100% TMCR design	Flow..... Temperature Density..... Flow..... Temperature Density..... Flow..... Temperature Density..... Flow..... Temperature Density..... Flow..... Temperature Density..... Flow..... Temperature Density..... 		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 6 OF 30

CLAUSE NO.	BIDDER'S NAME		
	firing (mmwc) d) Pressure at 80% TMCR design firing (mmwc) e) Shut off pressure (mmwc) f) Min. safe pressure (mmwc) vii) Design margin over and above design point for test block condition Forced draft fans Induced draft fans a) Flow rate (%) b) Pressure (%) viii) Synchronous speed of electric motor (rpm) ix) Normal Fan speed (rpm) x) Critical speeds a) First critical speed (rpm) b) Second critical speed (rpm) xi) Fan efficiency and Motor efficiency a) Design point b) LP 1 c) LP 2 d) LP 3 e) LP 4 f) LP 5 xiii) Direction of rotation facing fan coupling (clockwise or		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)
		PAGE 7 OF 30	

CLAUSE NO.	एनडीपीसी NTPC BIDDER'S NAME
	anticlockwise) xiv) Impeller a) Impeller diameter (mm) b) Shaft diameter (mm) c) Design tip speed of blades (M/sec) d) Moment of Inertia of shaft and impeller xv) Overall dimensions of fan & motor xvi) Size of motor (KW) xvii) Power Consumption at 100% BMCR (KW), design firing xviii) Power Consumption at 100% TMCR (KW), design firing at motor terminal xix) Power Consumption at 80% TMCR (KW), design firing at motor terminal xx) Bearing and other mechanical losses at BMCR (KW) xxi) Total weight of fan and motor (tonnes) xxii) Moment of Inertia of fan and motor xxiii) Type of coupling xxiv) Lubrication system for fan (forced/ring lubrication) xxv) Lubrication system for motors (forced/ring lubrication) xxvi) Features of construction
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 8 OF 30

CLAUSE NO.	BIDDER'S NAME			
	a) Blades with renewable wearing noses b) Mode of adjustment of gas flow control c) Range of control d) Type of casing e) Type of diffuser f) Blade angle variation xxvii) Material of construction and thickness a) Casing b) Casing side plates c) Casing Liner d) Impeller blade e) Inlet cone f) Outlet diffuser g) Impeller hub/shroud h) Impeller wear plate (if any) i) Coupling j) Base plate and foundation bolts k) Inlet vane xxviii) Bearings a) No. and make b) Type of Bearings c) Bearing liner material d) Method of lubrication			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 9 OF 30

CLAUSE NO.	BIDDER'S NAME			
	e) Grade of lube oil f) Thermometers provided (Yes/No) g) Thermocouples provided (Yes/No) h) Method of cooling the bearings (if not forced lubrication) xxix) Shaft sealing arrangement xxx) Hydraulic servo drive a) Number, make and type b) Type of oil seals c) Material of cylinder piston and feed back system d) Number of pumps e) Number type and material of cooler f) Pressure switches provided (Yes/No) (Yes/No) g) Thermometers provided (Yes/No) (Yes/No) h) Relief valves provided xxxi) Lube oil system a) Number and type of pumps b) Number and type of oil cooler c) Relief valves provided (Yes/No) (Yes/No) d) Pressure switches provided (Yes/No) (Yes/No) e) Thermometers provided (Yes/No) (Yes/No) f) Electric heater in the			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 10 OF 30

CLAUSE NO.	BIDDER'S NAME			
9.04.00	oil tank		(Yes/No)	(Yes/No)
	xxxii)	Accessories		
	a)	Coupling guard provided	(Yes/No)	(Yes/No)
	b)	Base plate and found- dation bolts provided	(Yes/No)	(Yes/No)
	c)	Forced lubrication unit with pumps, filters, cooler, connected piping etc. provided	(Yes/No)	(Yes/No)
	d)	Hydraulic control unit with pumps, filters, cooler, connected piping etc. provided	(Yes/No)	(Yes/No)
	e)	Local instruments provided	(Yes/No)	(Yes/No)
	f)	Provision of vibration sensor made	(Yes/No)	(Yes/No)
	g)	RTD's for fan and motor bearings provided	(Yes/No)	(Yes/No)
	xxxiii)	Minimum load of fan at which it can operate in parallel without any knocking and bumping	.....	
	xxxiv)	Reference drawing numbers	.....	
	Note: In case of ID fans the maximum blade tip velocity and maximum allowable blade tip velocity and speed of the fan at various operating boiler loads shall be furnished alongwith the Bid.			
	Soot Blowers			
	i)	Manufacturer of	.....	
a)	Blowers	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 11 OF 30

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	b)	Control equipment	.....	
	ii)	Type	.....	
	iii)	Location (Outdoor)	.....	
	iv)	Mounting (Horizontal)	.....	
	v)	Cleaning medium	.....	
	vi)	Parameters of cleaning medium	.....	
	a)	Pressure (Kg/cm ²) (abs)	.....	
	b)	Temperature (deg.C)	.....	
	vii)	Source of cleaning medium	.....	
	viii)	Number of groups of soot blowers	.....	
	ix)	Total operating time per group	.....	
	x)	Furnace & Superheater blowers	Furnace	Super heater
	a)	Type and make	.....	
	b)	Number of soot blowers	.....	
	c)	Duration of operation (min)	.....	
	d)	Operating Pressure (Kg/cm ²) (abs)	.....	
	e)	Steam Consumption rate per blower (Kg/hr)	.....	
	f)	Total time required for one complete cycle of soot blowing operation (min)	.....	
	g)	Length of travel (mm)	.....	
	h)	Blowing radius/angle	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)
				PAGE 12 OF 30

CLAUSE NO.	BIDDER'S NAME			एनडीपीसी NTPC
	i) Effective area blown by one soot blower (m ²)			
	j) Type of Electric Drive	Dual/Single Electric Drive		
	xi) Reheater & Economiser	Reheater	Economiser	
	a) Type and make			
	b) Number of soot blowers			
	c) Duration of operation (min)			
	d) Operating Pressure (Kg/cm ²) (abs)			
	e) Steam Consumption rate per blower (Kg/hr)			
	f) Total time required for one complete cycle of soot blowing operation (min)			
	g) Length of travel (mm)			
	h) Blowing radius/angle			
	i) Effective area blown by one soot blower (m ²)			
	j) Type of Electric Drive	Dual/Single Electric Drive		
	xii) Material			
	a) Lance / Swivel tube in high temperature area			
	b) Lance / Swivel tube in intermediate tempe- rature area			
	c) Lance / Swivel tube in low temperature area			
	d) Nozzle			
	e) Gland packing			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 13 OF 30

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	f)	Travelling carriage	.....	
	g)	Bearings in high temperature area	.....	
	h)	Bearings in intermediate temperature area	.....	
	i)	Bearings in low temperature area	.....	
	j)	Feed tube	.....	
	k)	Blowing head	.....	
	l)	Chain	.....	
	m)	Compression hangers	.....	
	n)	Bolts	.....	
	xiii)	Accessories provided		
	a)	Blowing head	Yes/No	
	b)	Pressure reducing valve	Yes/No	
	c)	Relief valve	Yes/No	
	d)	Orifices	Yes/No	
	e)	Travelling carriage	Yes/No	
	f)	Clamps (if required)	Yes/No	
	g)	Limit switches	Yes/No	
	h)	Gear boxes	Yes/No	
	i)	Speed reducer	Yes/No	
	j)	Supporting frame	Yes/No	
	xiv)	Location drawing of soot blowers	.....	
	xv)	Description of panels & system equipment offered	.....	
	xvi)	Reference drawing Nos	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 14 OF 30

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
9.05.00	xvii)	Provision kept for installation of additional soot blowers in future (write-up and drawings furnished)		.....	
	Note : Bidder furnished all the above soot blowers data depending on the type of boiler and arrangement of heat transfer surfaces in different format also (As applicable) down vessel				
	Atmospheric Flash Tank				
	i)	Design code		.....	
	ii)	Operating pressure (Kg/cm2) (abs)		.....	
	iii)	Design pressure (Kg/cm2) (abs)		.....	
	iv)	Operating Temperature (deg. C)		.....	
	v)	Design Temperature (deg. C)		.....	
	vi)	Vent pipe diameter (m)		.....	
	vii)	Vent pipe length (m)		.....	
	viii)	Tank Volume (m3)		.....	
	ix)	Hydraulic test pressure		.....	
	x)	Hammer test pressure		.....	
	xi)	Shell thickness (mm)		.....	
	xii)	Corrosion allowance		.....	
	xiii)	Shell diameter (mm)		.....	
	xiv)	Shell height (mm)		.....	
	xv)	Weight when empty (Kg)		.....	
	xvi)	Material			
		a)	Shell and head		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	
					PAGE 15 OF 30

CLAUSE NO.	BIDDER'S NAME				
	b) Nozzle necks c) Nozzle flanges d) Manhole nozzle e) Manhole flange and wearplate f) Supports and structural attachments xvii) List of all drains connected to atmospheric flash tank. xviii) Reference drawing Nos. 				
9.06.00	Not used				
9.06.10	Primary, Seal Air and Gas Recirculation fans (if applicable)				
		Primary Air Fan	Seal Air Fan	Gas Recirculation Fan	
	i) Manufacturer	.....			
	ii) Type	.....			
	iii) Nos. of fans / Boiler	.....			
	iv) Mounting	.....			
	v) Arrangement	.....			
	vi) Capacity	.....			
	a) Flow rate at 100% BMCR design firing (M³/sec.) and associated temp. (deg.C) and density (Kg/m³)	Flow			
		Temp.			
		Density			
	b) Flow rate at 100% TMCR design firing (M³/sec.) and associated temp. (deg.C) and density (Kg/m³)	Flow			
		Temp.			
		Density			

KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 16 OF 30
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CLAUSE NO.	BIDDER'S NAME		
	c) Flow rate at design point (M³/sec.) and associated temp. (deg.C) and density (Kg/m³) d) Max. flow rate the fan can handle (M³/sec.) and associated temp. (deg.C) and density (Kg/m³) e) Max. flow rate the fan can handle (M³/sec.) and associated temp. (deg.C) and density (Kg/m³)	Flow Temp. Density Flow Temp. Density Flow Temp. Density	
	vii) Static pressure a) Pressure at 100% BMCR design MSW firing (mmwc) b) Pressure at 100% TMCR design MSW firing (mmwc) c) Pressure at design point (mmwc) d) Shut off pressure (mmwc) e) Minimum safe pressure (mmwc)	..... ..... ..... ..... .....	
	viii) Design margin over and above the design Point for test block condition a) Capacity % b) Head%	..... .....	
	ix) Source of air supply	.....	
	x) Normal speed of fan	.....	
	xi) Synchronous speed of motor	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 17 OF 30

CLAUSE NO.	BIDDER'S NAME		
	xii) Critical speed a) First critical speed (rpm) b) Second critical speed (rpm) xiii) Design tip speed of blades (M/sec) xiv) Fan efficiency and aux power consumption a) At LP design b) At LP 1 c) At LP 2 d) At LP 3 e) At LP 4 and 5 xvi) Starting torque (Kg/m) xvii) Direction of rotation facing fan coupling (clock wise or anticlockwise) xviii) Impeller diameter (mm) xix) Shaft diameter (mm) xx) Moment of inertia of shaft and impeller xxi) Ovearall dimensions xxii) Size of motor (KW) xxiii) Total weight of fan and motor (tonnes) xxiv) Method of lubrication a) For fans b) For motors xxv) Blades with renewal wearing noses Yes/No		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 18 OF 30

CLAUSE NO.	BIDDER'S NAME			
	xxvi)	Mode of air flow control adjustment	.....	
	xxvii)	Material construction	.....	
	a)	Casing	.....	
	b)	Impeller blades	.....	
	c)	Inlet cone	.....	
	d)	Outlet diffuser	.....	
	e)	Impeller hub shroud	.....	
	f)	Shaft	.....	
	g)	Shaft sleeve	.....	
	h)	Coupling	.....	
	i)	Base plate and foundation bolts	.....	
	j)	Inlet vane	.....	
	k)	Renewable wearing nose	.....	
	xxviii)	Bearings		
	a)	Make	.....	
	b)	Number and type	.....	
	c)	Bearing linear material	.....	
	d)	Type of cooling	.....	
	e)	Type of lubrication	.....	
	f)	Grade of lube oil	.....	
	g)	Thermometers provided	Yes/No	
	h)	Thermocouples provided	Yes/No	
	xxix)	Shaft sealing arrangement	.....	
	xxx)	Hydraulic servo drive	.....	
	a)	Nos. make and type	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 19 OF 30

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	b) Type of oil seals c) Material of cylinder piston and feed back system d) Number of pumps e) Number, type and material of cooler f) Pressure switches provided Yes/No g) Thermometer provided Yes/No h) Relief valves provided Yes/No xxxi) Lube oil system a) No. of pumps per fan b) No. of pumps standby c) Type of pumps d) No. of oil coolers per fan e) No. of oil coolers standby f) Relief valves provided Yes/No g) Pressure switches provided Yes/No h) Thermometers provided Yes/No i) Electric heater with oil tank Yes/No j) Heater rating (kW) Yes/No xxxii) Whether the following accessories are provided (state Yes/No) a) Coupling guards Yes/No b) Base plate and foundation bolts Yes/No c) Forced lubrication unit with pumps, filters,			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 20 OF 30

CLAUSE NO.	BIDDER'S NAME			
		coolers, connected piping, instrumentation etc.		Yes/No
	d)	Hydraulic control unit with pumps, filters, coolers, connected piping etc.		Yes/No
	e)	Local instruments		Yes/No
	f)	Provision for vibration sensor and monitoring equipment		Yes/No
	g)	RTD's for fan and motor bearings		Yes/No
	xxxiii)	Reference drawing Nos.	.....	
9.06.11	Not used			
9.07.03	Oil Burners			
	i)	Manufacturer	.....	
	ii)	Type	.....	
	iii)	Design Data	.....	
	a)	Number of oil burners	.....	
	c)	Atomising medium	.....	
	i)	Oil pressure range at burners (kg/cm2)	.....	
	j)	Turned down ratio	.....	
	l)	Combustion air temperature	.....	
	m)	Capacity of each burner (kg/hr & max. heat input per burner (Kcal/kg)	.....	
	v)	Material of construction		
	a)	Oil burner mixing plate/ spray plate	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)
PAGE 21 OF 30				

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC		
9.07.04	b)	Guard pipe	.....			
	c)	Diffuser	.....			
	d)	Concentric tubes	.....			
	e)	Clamp	.....			
	f)	Gaskets	.....			
	g)	Flexible tubing	.....			
	h)	Burner body	.....			
	i)	Burner tip	.....			
	vi)	Whether the following accessories are provided				
	a)	Limit switches	Yes/No			
	b)	Clamps	Yes/No			
	c)	Gaskets	Yes/No			
	d)	Flexible hose	Yes/No			
	e)	Insertion/retract facility	Yes/No			
	f)	Steam/air cooling	Yes/No			
	g)	Position indications	Yes/No			
	vii)	Codes and standards applicable	.....			
	viii)	Reference Drawing Nos.	.....			
9.08.00	Fuel oil igniters					
	i)	Manufacturer	.....			
	ii)	Type	.....			
	iii)	Number of ignitor	.....			
	iv)	Retractable or stationary	.....			
	v)	Reference drawing Nos.	.....			
9.08.00		Fan Design Data				
		(These data shall be furnished for the LP 1 to LP 5 points and design point)				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 22 OF 30

CLAUSE NO.	BIDDER'S NAME										
9.08.01	F.D. Fans										
	i)	Pressure drop summary (MMWC)									
	a)	Wind box	.....	.....	.....	.....	.....	.....	.....	.....	.....
	b)	Hor air duct	.....	.....	.....	.....	.....	.....	.....	.....	.....
	c)	Air heater	.....	.....	.....	.....	.....	.....	.....	.....	.....
	d)	SCAPH	.....	.....	.....	.....	.....	.....	.....	.....	.....
	e)	Air flow device	.....	.....	.....	.....	.....	.....	.....	.....	.....
	f)	Cold air duct	.....	.....	.....	.....	.....	.....	.....	.....	.....
	g)	Silencer	.....	.....	.....	.....	.....	.....	.....	.....	.....
	h)	Total	.....	.....	.....	.....	.....	.....	.....	.....	.....
	ii)	Volume handled by fan									
	a)	Air leaving APH	.....	.....	.....	.....	.....	.....	.....	.....	.....
	b)	APH leakage (M³/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	c)	Air temperature (deg C)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	d)	Volume handled per fan as calculated (M³/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	e)	Volume handled per fan as designed (M³/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	iii)	Parameters of fan									
a)	Volume (M³/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....	
b)	Head (mmwc)	.....	.....	.....	.....	.....	.....	.....	.....	.....	
c)	Air inlet temperature (deg C)	.....	.....	.....	.....	.....	.....	.....	.....	.....	
d)	Density of air (kg/m³)	.....	.....	.....	.....	.....	.....	.....	.....	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9				PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)			PAGE 23 OF 30	

CLAUSE NO.	BIDDER'S NAME										
9.08.02	e)	Fan inlet pressure (mmwc)	.....	.....	.....	.....	.....	.....	.....	.....	
	iv)	Fan shaft power (kw)	.....	.....	.....	.....	.....	.....	.....	.....	
	P.A. Fans										
	i)	Pressure drop summary (MMWC)									
	a)	Fuel Piping	.....	.....	.....	.....	.....	.....	.....	.....	.....
	b)	Pulveriser	.....	.....	.....	.....	.....	.....	.....	.....	.....
	c)	Hot air duct	.....	.....	.....	.....	.....	.....	.....	.....	.....
	d)	Air heater	.....	.....	.....	.....	.....	.....	.....	.....	.....
	e)	Venturi	.....	.....	.....	.....	.....	.....	.....	.....	.....
	f)	Cold air duct	.....	.....	.....	.....	.....	.....	.....	.....	.....
	g)	Silencer	.....	.....	.....	.....	.....	.....	.....	.....	.....
	h)	SCAPH	.....	.....	.....	.....	.....	.....	.....	.....	.....
	i)	Control dampers	.....	.....	.....	.....	.....	.....	.....	.....	.....
	j)	Total	.....	.....	.....	.....	.....	.....	.....	.....	.....
	ii)	Volume handled by fan									
	a)	Air leaving APH (M3/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	b)	APH leakage (M³/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	c)	Temperaturing Air (M³/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	d)	Air through each fan (M³/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	e)	Air inlet temperature (deg. C)	.....	.....	.....	.....	.....	.....	.....	.....	.....
f)	Volume of air handled by each fan (M³/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....	
iii)	Paramters of fan										
a)	Volume (M3/sec)	.....	.....	.....	.....	.....	.....	.....	.....	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9				PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)			PAGE 24 OF 30	

CLAUSE NO.	BIDDER'S NAME 
9.08.03	b) Head (mmwc) c) Air inlet temperature (deg C) d) Density of air (kg/m³) e) Fan inlet pressure (mmwc) iv) Fan shaft power (kw) I.D. Fans i) Constant pressure drops : (MMWC) a) Furnace b) Static head c) Others (mention) d) Total ii) Variable pressure drops (mmwc) a) SH/RH/Economiser b) Air heater c) Ducts and dampers d) Electrostatic Precipitator e) Total iii) Volume handled by fan a) Gas entering APH (M3/sec) b) Air heater leakage (M3/sec) c) Gas flow rate at fan inlet d) Gas volumetric flow fan inlet (deg. C)

CLAUSE NO.	BIDDER'S NAME						
9.09.00	e)	Gas volumetric flow as designed (M3/sec)	.....	.....	.....	.....	.....
	f)	Gas volumetric flow as designed (M3/sec)	.....	.....	.....	.....	.....
	iv)	Fan parameters					
	a)	Volume (M3/sec)	.....	.....	.....	.....	.....
	b)	Head (mmwc)	.....	.....	.....	.....	.....
	c)	Gas temperature at I.D. inlet (deg C)	.....	.....	.....	.....	.....
	d)	Density (kg/m3)	.....	.....	.....	.....	.....
	v)	Fan shaft power (kw)	.....	.....	.....	.....	.....
	Gas Recirculation Fan						
	i)	Pressure drop (mmwc)	.....	.....	.....	.....	.....
	ii)	Volume handled by fan	.....	.....	.....	.....	.....
	iii)	Fan parameters					
	a)	Volume (M³/sec.)	.....	.....	.....	.....	.....
	b)	Head (mmwc)	.....	.....	.....	.....	.....
	c)	Gas temperature at I.D. inlet (deg.C)	.....	.....	.....	.....	.....
	d)	Density (kg/m³)	.....	.....	.....	.....	.....
9.10.00	Ducting design data						
9.11.00	GENERAL						
9.11.01	i)	Material specification					
	a)	Air ducts	.....	.....	.....	.....	.....
	b)	Gas ducts	.....	.....	.....	.....	.....
	ii)	Plate thickness (mm)					
	a)	Air ducts	.....	.....	.....	.....	.....
	b)	Gas ducts	.....	.....	.....	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9			PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 26 OF 30

CLAUSE NO.	BIDDER'S NAME						एनटीपीसी NTPC		
9.11.02	iii)	Stiffners spacing (mm)							
	a)	Air ducts	.....	.....	.....	.....	.....	.....	
	b)	Gas ducts	.....	.....	.....	.....	.....	.....	
	iv)	Duct design Pressure (mmwc)							
	a)	Air ducts	.....	.....	.....	.....	.....	.....	
	b)	GAs ducts	.....	.....	.....	.....	.....	.....	
	v)	Maximum operating pressure (mmwc)							
	a)	Air ducts	.....	.....	.....	.....	.....	.....	
	b)	Gas ducts	.....	.....	.....	.....	.....	.....	
	vi)	Design code used for duct design	A copy of code to be enclosed						
	Air ducting design data (Sized in accordance with criteria specified in clause 1.05.14, sub-section-A 02, Part B, Section VI.)		Cross Sect- tion (M2)	Length (M)	Weight (Kg)	Max. pres- sure (mmwc)	Max. flow (m3/ sec)	Max. Velocity (m/sec)	
	i)	F.D. Fan to APH	.....	.....	.....	.....	.....	.....	
	ii)	APH to wind box	.....	.....	.....	.....	.....	.....	
	iii)	Hot side inter connecting duct (secondary)	.....	.....	.....	.....	.....	.....	
	iv)	Cold side interconnecting duct (secondary)	.....	.....	.....	.....	.....	.....	
	v)	P.A. fan to APH	.....	.....	.....	.....	.....	.....	
	vi)	Hot primary air duct to mills (before tempering)	.....	.....	.....	.....	.....	.....	
vii)	Cold primary air duct before tempering	.....	.....	.....	.....	.....	.....		
viii)	Hot primary air to mills (after tempering)	.....	.....	.....	.....	.....	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9			PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 27 OF 30	

CLAUSE NO.		BIDDER'S NAME					एनडीपीसी NTPC	
9.11.03		Gas ducting design data (Sized in accordance with criteria specified in clause 1.05.14, sub-section-A 02, Part B, Section VI.)						
		i)	APH outlet to Bag filter	.....	.....	.....	.....	.....
		a)	Primary side	.....	.....	.....	.....	.....
		b)	Secondary side	.....	.....	.....	.....	.....
		ii)	Bag filter to I.D. fan inlet	.....	.....	.....	.....	.....
		iii)	I.D. fan outlet to chimney flue inlet	.....	.....	.....	.....	.....
9.11.04		Following documents to be submitted for chimney inlet transition ducting						
		a)	detailed arrangement drawings				Yes/No	
		b)	calculation for determining friction losses				Yes/No	
9.12.00		THERMAL INSULATION						
9.12.01		Insulating material						
		i)	Type of insulating material (s)	.....	.....	.....	.....	.....
		ii)	Manufacturer's name	.....	.....	.....	.....	.....
		iii)	Maximum hot face temp. (deg. C) the insulating material can withstand	.....	.....	.....	.....	.....
		iv)	Bulk Density of insulating material (Kg./m ³)	.....	.....	.....	.....	.....
		v)	Thermal conductivity (Kcal/hr.m. deg C) at mean temperature of	.....	.....	.....	.....	.....
		a)	50 deg C	.....	.....	.....	.....	.....
		b)	100 deg. C	.....	.....	.....	.....	.....
		c)	150 deg C	.....	.....	.....	.....	.....
		d)	200 deg C	.....	.....	.....	.....	.....
		e)	250 deg C	.....	.....	.....	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9			PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 28 OF 30

CLAUSE NO.	BIDDER'S NAME						
9.12.02	f)	300 deg C	.....	.....	.....	.....	.....
	vi)	Resistance to micro organism (Yes/No)	.....	.....	.....	.....	.....
	vii)	Incombustibility (Yes/No)	.....	.....	.....	.....	.....
	Steam Generating Plant & Auxiliaries Insulation & casing		Block Resin Bonded Mineral Wool	pour-able insulation	Segmented Cement Blocked calclum silicate lagg-ing	Flat Alum Sheet (specify iniumcasing details) ribbed	Outer Sheet (specify iniumcasing details) mm/Qty)
			(mm/Qty)	(mm/Qty)	(mm/Qty)	(mm/Qty)	(mm/Qty)
	i)	Furnace Extended side backpass walls					
	ii)	Enclosure					
	a)	Roof					
			- Horizontal				
			- Vertical				
b)	Extended side						
		- Horizontal					
		- Vertical					
c)	Bottom						
		- Horizontal					
		- Vertical					
iii)	Duct Work						
a)	Economiser to air heater						
b)	Air heater to electro-static precipitator						
c)	Electrostatic precipitator to ID fan & stack						
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)		PAGE 29 OF 30

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	d) Hot air after air pre-heater to wind box and mills iv) Equipment a) Air heaters b) ID fans v) Pressure parts a) Drum & headers b) Water wall platens c) Water wall platen supply tubes d) SH header e) Economiser outlet f) Soot blower piping g) Spray water & misc. piping h) Boiler Startup Recirculation pumps and associated piping vi) Any other (Give details)			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 30 OF 30

CLAUSE NO.	एनडीपीसी NTPC BIDDER'S NAME		
10.00.00	ELEVATORS Goods Elevator Passenger Elevator		
10.01.00	Technical Information i) Detailed description of equipments ii) Write up on interlocks and safety devices provided iii) Schedule of motors iv) General arrangement of elevators v) Electrical control scheme vi) Foundation details and loading		
10.02.00	Design Data i) Manufacturer ii) Capacity (kg) iii) Speed (M/sec) iv) Acceleration & deceleration (m/sec²) v) Method of control vi) Mode of operation vii) Car finish viii) Location of machine room ix) Levelling limits of car from landing floor (mm) x) Elevator Car a) Travel (mm) b) Entrance size (mm x mm)		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 1 OF 9

CLAUSE NO.	 BIDDER'S NAME		
	c) Platform length (mm) d) Platform width (mm) xi) Elevator Pit a) Depth (mm) b) Inside length (mm) c) Inside width (mm) d) Entrance height (mm) e) Entrance width (mm) xii) Hoist way a) Height (M) b) Inside length (mm) c) Inside width (mm) d) Entrance height (mm) e) Entrance width (mm) xiii) Machine room a) Total clearance height (M) b) Room height (M) c) Height from top floor to underside of supporting member (M) xiv) Total weight of elevator with elevator shaft structures (tonnes) xv) Total weight of elevator structures (tonnes) xvi) Electric Brake a) Manufacturer b) Type c) Operating coil (A.C.		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 2 OF 9

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
11.00.00		or DC)			
	d)	Size			
	e)	Brake drum diameter (mm)			
	f)	Brake drum face width (mm)			
	g)	Brake drum & liner material			
	xvii)Traction Sheave				
	a)	Diameter (mm)			
	b)	Material			
	xviii) Ropes				
	a)	Diameter (mm)			
	b)	Wire material			
	c)	Construction			
	d)	Core material			
	e)	Guaranteed minimum breaking strength of rope (kg/cm ²)			
	xix) Emergency battery and charger ratings				
	EQUIPMENT DIMENSIONS AND WEIGHTS				
			Dimensions	Weight (Tonnes)	
	i)	Supporting structure			
	ii)	Galleries and stairways			
	iii)	Interconnecting platforms			
iv)	Steam Drum/header				
v)	Manholes/inspection				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	
				PAGE 3 OF 9	

CLAUSE NO.	BIDDER'S NAME 
	windows etc. vi) Water walls vii) Super heater viii) Hanger ix) Desuperheater x) Economiser including heat exchanger xi) Valves & fittings xii) a) - Air preheaters - Primary - Secondary b) Steam coil air preheater - Primary - Secondary xiii) Fabricated components for main steam generator under sheet casing xiv) Covering & insulation material for steam generator and other equipment xv) Steam generator xvi) Fabricated components for insulation of steam generator equipment xvii) Skin casing xviii) Internal gas lines xix) Fuel oil preheating unit(not applicable)
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 4 OF 9

CLAUSE NO.	BIDDER'S NAME			
12.00.00	xxi) Fuel gas burners	.....	.....	
	xxii) Igniter/scanner air system	.....	.....	
	xxvi) Hot air ducts	.....	.....	
	xxvii) Fuel ducts	.....	.....	
	xxviii) Other ducting	.....	.....	
	xxix) Soot blowers	.....	.....	
	xxx) Soot blowing equipment	.....	.....	
	xxxv) FD fans with drives	.....	.....	
	xxxvi) ID fans with drives	.....	.....	
	xxxvii) PA fans with drives	.....	.....	
	xxxviii) Other fan with drives	.....	.....	
	xxxxi) Fan duct	.....	.....	
	xxxxii) Platforms and rails	.....	.....	
	xxxxiii) Supporting structure for flue gas system	.....	.....	
	xxxxiv) Dampers/vanes	.....	.....	
	xxxxv) Fabricated components for insulation of flue gas system	.....	.....	
	xxxxvi) Others	.....	.....	
	xxxxvii) Total weight	.....	.....	
	Technical information with respect to geometrically similar MSW fired Grate & steam generator manufactured and installed by the bidder which are in successful operation.			
	1. Name of station			
2) MSW throughput				
3) Steam Generator Rating				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 5 OF 9

CLAUSE NO.	 BIDDER'S NAME		
	i) Superheater outlet steam flow (tph) ii) Superheater outlet steam pressure (Kg/cm²) (abs) iii) Superheater outlet temperature (°C) viii) Feed water temperature (°C) at ECO inlet ix) Steam generator efficiency-Design/tested x) Heat liberated by fuel per unit furnace volume (Kcal/m³/hr) xi) Furnace cooling factor (Kcal/m³/hr) xii) Grate heat release rate (Kcal/m²/hr) xiii) Plan area heat release rate (Kcal/m²/hr) 4) MSW characteristics (Enclose in similar format as in Tech. spec). 5) Total no. of Grate line 8) Furnace exit gas temperature 9) Excess air to ECO outlet (%) 10) SH spray flow - design - tested 13) Operational problems found if any, with respect to spray slagging fouling, tube failures etc.		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9	PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	PAGE 6 OF 9

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
		14) Modifications carried out if any, write details & reasons	.....		
		15) Start up time achieved (minutes)	.....		
		- Cold	.....		
		- Warm	.....		
		- Hot	.....		
		16) Furnace sketch including dimension, arrangement and pressure parts disposition etc.	.....		
13.00.00		Special Tools Tackles:			
		One complete set of all special tools & tackles for maintenance for each Steam Generator as identified in Clause 2.24.00 of Sub-Section-II A01, section VI-part A		Yes/No	
		Bidder to furnish the list in detail and it should necessarily include the following:			
13.01.00		Special tools & tackls for each mill as required for erection,testing, maintenance of equipment system including those required for inst.& control (Refer Clause 2.24.01(a) of sectionVI Part-A, Sub-Section- II A01)			
13.02.00		Set of Maintenance tools: (Refer clause 2.24.01(b)1 & 2 of sectionVI Part-A, Sub-Section- II A01)			
		(1) General Maintenance Tools		Yes/No	
		(i) Pulling cable, eyebolts, cable slings, chaining falls, snubbing lines or cables.		Yes/No	
		(ii) Bar and sledge hammers		Yes/No	
		(iii) Brass and lead hammers		Yes/No	
		(iv) Power type jacks and jacking screws		Yes/No	
		(v) Feeler gauges and shims		Yes/No	
		(vi) Dial indicators		Yes/No	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR)	
				PAGE 7 OF 9	

CLAUSE NO.	एनटीपीसी NTPC BIDDER'S NAME
13.03.00	(vii) Wire brushes & scrappers Yes/No (viii) Bearing and coupling pullers Yes/No (ix) Spanners and wrenches of various sizes Yes/No (2) Special Maintenance Tools (i) Tube expanders for heat exchangers Yes/No (ii) Lapping plates, grinding stones and ring cap for the valves Yes/No (iv) Spanners and wrenches specific to the equipment Yes/No (v) One intrascope suitable for inspection of all Steam Generator pressure parts. Yes/No (vi) Four (4) nos. of pneumatic emergency soot blower retract drives per boiler with matching crank tools suitable for retracting each type of soot blower being provided along with connecting pipe, fittings etc Yes/No 1.Quantity 2.Type & Make 3.Technical details Power operated gondola(s)/furnace maintenance cradle/cradles (Refer clause 2.24.02 of sectionVI Part-A, Sub-Section- II A01) 1. No. of Sets .....ONE..... 2. Type & make 3. Major Parameters
	KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9 PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 8 OF 9
	13.04.00 Quick erect scaffolding conforming to Tech. Spec. (Refer clause 2.24.04 of sectionVI Part-A, Sub-Section- II A01) Yes/No 1. No. of Sets 2. Type & make

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
	3. Material of Construction	.....		
	4. No. of mandays required for erection Considering work force deployed for 24 hrs. in 3 shifts a day	.....		
	5. Locking Arrangement	Yes/No		
	6. Other Details	.....		
13.05.00	Instrument for Tube Thickness Measurement conforming to Tech. Spec. (Refer Clause 2.24.06 of section VI Part-A, Sub-Section- II A01)	Yes/No		
	1. Quantity	.....		
	2. Type & Make	.....		
	3. Technical details	.....		
14.00.00	MAX.INDIVIDUAL FLOWS(T/HR.) AND PARAMETERS OF MAIN STEAM, AND AUXILIARY STEAM PIPELINE DRAINS TO BE SUPPLIED TO FLASH TANKS IN TG SCOPE:			
	1. Main Steam drains	.....	.....	.....
	2. Aux. Steam drains	.....	.....	.....
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2600-001-9		PART-G CHAPTER-II SUB-SECTION:DM1 (MECHANICAL- STEAM GENERATOR) PAGE 9 OF 9

CLAUSE NO.	BIDDER'S NAME			
	SUB SECTION – DM2			
	TECHNICAL INFORMATION / DATA TO BE SUBMITTED ALONGWITH THE BID			
1.00.00	GENERAL TECHNICAL INFORMATION / DATA			
	DRAWINGS FOR BAG FILTER			
1.01.00	Performance Data for BAG FILTER			
	i)	Characteristic/Correction Curves	.....	
	a)	Gas flow rate vs efficiency	.....	
	b)	Gas temperature vs efficiency	.....	
	c)	Inlet dust concentration vs efficiency	.....	
	d)	Combined effect of gas temperature and dust concentration vs efficiency	.....	
	h)	Gas flow rate vs pressure drop across BAG FILTER	.....	
	i)	Efficiency vs varying value of moisture in flue gas	.....	
1.02.00	Supplementary Data for BAG FILTER			
	i)	A complete list of all the equipment requiring the following shall be furnished indicating parameters continuous requirements and the maximum requirement together with schematic diagrams		
	a)	Cooling water	.....	
	b)	Service air	.....	
	c)	Instrument air	.....	
	ii)	Schedule of power consumption	.....	
	iii)	Complete schedule of motors giving voltage, phase, KW rating (calculated and installed capacity). service factor etc.	.....	
	iv)	Recommended mode of erection sequence and other relevant		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)	PAGE 1 OF 11

CLAUSE NO.	BIDDER'S NAME			
	particulars in Bag Filter of installation of :	.....		
	a) Structural Steel	.....		
	b) Rotating Equipment	.....		
	c) Static Equipment	.....		
	d) Others	.....		
	v) Detailed recommended procedures for welding and erection	.....		
	vi) A comparison and history of all electrostatic precipitators in service of similar design and size to that proposed including descriptions of operating difficulties.	.....		
	vii) A complete list of local instruments, sensing devices and control equipment covered in the proposal with type, make, accuracy, range, details, dial size etc. in the Bidder's scope.	.....		
	viii) List of special maintenance tools included in the proposal	.....		
	ix) List of insert panels, control cabinets and local control panels included in the proposal with GA drawings, mounting and output details	.....		
	x) List of field mounted junction boxes included in the proposal.	.....		
	xi) List and details of instruments & control items supplied loose for mounting on control panels, including details like type. make, cutout & drawings etc.	.....		
	xii) Temperature sensors calibration standards	.....		
	xiii) List of annunciations giving suggested set values of parameters	.....		
	xiv) List of inputs provided for Data Acquisition System	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)	PAGE 2 OF 11

CLAUSE NO.	BIDDER'S NAME			
1.03.00	xv)	Particulars of prefabricated & other special cables included in Bidder's scope	.....	
	xvi)	Write up on BAG FILTER internals including bag filter, bag holder,	.....	
	xviii)	Write up on interlocks and protections	.....	
	xix)	Write up on type hopper dust level indicators	.....	
	xx)	Detailed hopper sizing calculation	.....	
	xxi)	Write up on dedusting mechanism	.....	
	xxiii)	Detailed calculations for working out of BAG FILTER inlet gas flow, gas temperature, inlet dust burden and BAG FILTER efficiency.	.....	
	xxiv)	Heat loss calculation from the hopper and hopper heater sizing calculations	.....	
	xxv)	Details of PC, keyboards, printer etc. for BAG FILTER management system	.....	
	xxvi)	Details of manufacturing and erection tolerances for BAG FILTER internals.	.....	
	Drawings			
	i)	General arrangement drawing (Plan and elevation) with appropriate dimensions	.....	
	ii)	Layout of BAG FILTER structural steel columns. These shall indicate the size of members and main dimensions, with design loadings and all lifting facilitate for purposes of maintenance.	.....	
iii)	Arrangement of platforms, walkways and galleries	.....		
iv)	Schematic diagram indicating terminal points and instrumentation & controls included in Bidder's scope and suggestive scheme for flue gas system indicating, pipe duct size (OD's and ID's) operating parameters, maximum fluid			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)	PAGE 3 OF 11

CLAUSE NO.	BIDDER'S NAME			
	velocities, insulation thickness and material specification etc. v) Location plan - Details of location and arrangement scheme of columns embedments and fixing details, size of pedestals, levels blockouts & anchor bolts. and channels indicating scope of supply by equipment supplier vi) Loading on foundations : Axial load, bending moments and shear forces transmitted to foundations of following loading combinations separately. a) Dead load b) Live load c) Wind load d) Seismic load vii) Complete bracing arrangements for BAG FILTER supporting structures and combinations of (+v) and (-v) forces for the seismic or wind (which ever is governing) viii) Percentage of live load considered for calculating wind and seismic forces ix) Recommended size and general arrangement of BAG FILTER control room in plan and sections along with its location plan. x) Schedule of heat load for air conditioning xi) Gas distribution system (if applicable) xv) Hopper details clearly indicating location of level mentions electrical heaters, pake holes, baffles, etc. xvii) Weather proof enclosure and lifting beam arrangement xviii) Schematic diagram controls and diagrams			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)	PAGE 4 OF 11

CLAUSE NO.	BIDDER'S NAME			
1.04.00	EQUIPMENT DATA			
1.04.01	General			
	i)	Manufacturer	.....	
	ii)	Manufacturer's model number	.....	
	a)	Width (across gas flow) (m)	.....	
	b)	Flange to Flange length (in direction of gas flow) (m)	.....	
	c)	Height between bottom of hoppers to support level (m)	.....	
	d)	Height between support level to top of monorail steel (m)	.....	
	e)	Height between top insulator compartments to top of monorail steel (m)	.....	
	iv)	Number of Bags	.....	
	v)	Number of pass per boiler	.....	
	vi)	Number of gas streams per boiler	.....	
	x)	Power consumption per set of Bag filter'	.....	
	xii)	Guaranteed collection efficiency (%)	.....	
	xiv)	Guaranteed pressure drop across Bag filter of one steam Generator (mm wc)	.....	
	xv)	Guaranteed air in leakage rate (M ³ /sec)	.....	
	xvii)	Total active collection area (M ²)	.....	
	xix)	Gas velocity through Bag filter (M/sec)	.....	
	xx)	Aspect ratio	.....	
	xxii)	Proposed standard for conducting the performance tests	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)	PAGE 5 OF 11

CLAUSE NO.	BIDDER'S NAME			
1.04.05	Bag filter casing			
	i)	Material	.....	
	ii)	Plate thickness	.....	
	iii)	Design pressure (mm wg)	.....	
	iv)	Design temperature (deg C)	.....	
	v)	Max. temperature with stand capacity and duration	.....	
	vi)	Number of inspection doors	.....	
	vii)	Dimensions of access openings of inspection doors (mmx mm)	.....	
1.08.00	Dust Hoppers			
	i)	No. per field gas stream	.....	
	ii)	No per BAG FILTER of one boiler	.....	
	iii)	Material	.....	
	iv)	Plate thickness (mm)	.....	
	v)	Side angle (degrees)	.....	
	vi)	Valley angle (degrees)	.....	
	vii)	Storage capacity of each hopper (hours)	.....	
	viii)	Volumetric storage capacity of each hopper (m ³)	.....	
	ix)	No. and height of gas screens per hopper	.....	
	x)	No. of access doors per hopper	.....	
	xi)	Access door dimensions (mm x mm)	.....	
	xii)	Height of the hopper bottom flange above the ground level (metres)	.....	
	xiii)	Size of hopper outlet flanges (mm)	.....	
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9		CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER) PAGE 6 OF 11

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
	xiv)	Hopper heating			
	a)	Control temperature (deg C)			
	b)	Hopper heating power per hopper (KW)			
	c)	Hopper heating power per m ² (KW)			
	xv)	Hopper heater data			
	a)	Name of the manufacturer			
	b)	No. of modules per hopper			
	c)	Voltage level			
	d)	Maximum watt density (W/SQM)			
	e)	Total heating load per heater			
	f)	Estimated life of heating module			
	g)	No. of heater element multiple paths in each module			
	h)	Maximum exposure temp rating of module			
	i)	Moisture resistance			
i)	Prior to operation				
ii)	After 2 years of operation				
xvi)	Hopper dust level detectors				
a)	Number per hopper				
b)	Type				
xvii)	Ash collection rate (Kg/hr)		at different operating load points		
a)	First row				
b)	Second row				
1.18.00	For all the rows (as applicable)				
1.18.01	DUST EMISSION MONITOR				
	Manufacturer's name				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE			TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9		CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)
					PAGE 7 OF 11

CLAUSE NO.	BIDDER'S NAME			
	(Shall be as per approved QA make)	.....		
1.18.02	Model Name Number	.....		
1.18.03	Type	.....		
1.18.04	Quantity / Boiler	.....		
1.18.05	Range	.....		
1.18.06	Calibrated accuracy	.....		
1.18.07	Power supply	.....		
1.18.08	Automatic Zero/Span adjustment with manual override provided	Yes/No		
1.18.09	All accessories required for completeness of the system as per specification	Yes/No		
1.18.10	Automatic compensation for variation in line voltage, detector sensitivity, lamp ageing, ambient illumination provided	Yes/No		
1.18.11	Automatic shutter operation during purge air/power supply failure is provided	Yes/No		
1.18.12	Alignment indicator provided	Yes/No.....		
1.18.13	Converter			
	a) Opacity indicator with selection of measurement ranges provided	Yes/No		
	b) Output signal and number of outputs	.....		
	c) Remote calibration control provided	Yes/No		
	d) Status indication provided	Yes/No.....		
	e) Number of alarms	.....		
	f) Provision for alarm with adjustable time delay	Yes/No		
1.18.14	Equipment cabinet size (WXHDXD in mm)	.....		
1.18.15	Equipment Cabinet protection class (IP)	.....		
1.18.16	Performance			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)	PAGE 8 OF 11

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC	
		a) Mean interval between maintenance	.....		
		b) Auto Calibration interval	.....		
		c) Calibration drift in 24 hrs	.....		
		d) Zero drift in 24 hrs	.....		
		e) Calibration error within	.....		
		f) Maximum continuous operating temperature	.....		
		g) Maximum temperature withstand capability / duration	.....		
1.18.17	Technical literature furnished at	Page No.	Sec No.		
1.18.18	Recommended installation drawing furnished at	Page No.	Sec. No.		
1.20.00	INSULATION AND CLADDING				
	i) Area to be insulated per four gas streams of precipitators (m²)	.....			
	a) Casing	.....			
	b) Hoppers	.....			
	c) Roof	.....			
	d) Nozzles	.....			
	e) Any other	.....			
	f) Total	.....			
	ii) Material	.....			
	iii) Insulating material standard	.....			
	iv) Thickness (mm)	.....			
	v) Density (Kg/M³)	.....			
	vi) Thermal conductivity (Kcal/m/hr/deg.C) at mean temperature of	.....			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9		CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)	
PAGE 9 OF 11					

CLAUSE NO.		BIDDER'S NAME		एनटीपीसी NTPC		
1.21.00	a)	50 deg C	.....			
	b)	100 deg C	.....			
	c)	150 deg C	.....			
	d)	200 deg C	.....			
	e)	250 deg C	.....			
	f)	300 deg C	.....			
	g)	350 deg C	.....			
	h)	400 deg C	.....			
	vii)	Resistive to micro organism (Yes/No)	.....			
	viii)	Incombustibility (Yes/No)	.....			
	ix)	Material of skin casing	.....			
	x)	Thickness of skin casing	.....			
	EQUIPMENT WEIGHT (TOTAL)		.....			
	i)	Structural Steel	.....			
	ii)	Casing including gas distribution system	.....			
	iii)	Hoppers (empty)	.....			
	iv)	Hoppers (full)	.....			
	x)	Platforms, Walkways stairways	.....			
	xiii)	Control and Instrumentation	.....			
	xiv)	Others	.....			
	xv)	Total estimated weight (Per boiler)	.....			
	a)	Excluding dust	.....			
	b)	Including dust	.....			
	KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9		CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)	
	PAGE 10 OF 11					

CLAUSE NO.	BIDDER'S NAME			एनटीपीसी NTPC
1.22.00	DATA FOR REFERENCE PLANTS (USE ONE SEPARATE SHEET FOR EACH REFERENCE PLANT)			
1.22.01	WtE Plant details	.....		
	a) Unit rating (MW)	.....		
	b) Commissioning Date	.....		
1.22.02	Precipitator Design			
	i) Design flue gas flow (m3/sec)	.....		
	ii) Design flue gas temperature (deg C)	.....		
	iii) No. of BAG FILTERs per boiler	.....		
	iv) No. of gas stream per boiler	.....		
	v) Total collecting plate area (m ²)	.....		
	vi) Gas velocity at design flow	.....		
	xvi) Aspect ratio	.....		
	xvii) Installed power (KW)	.....		
1.22.03	Design fuel	.....		
	i) Ash Content (%)	.....		
	ii) Moisture Content (%)	.....		
	iii) Gross Calorific value (Kcal. Kg)	.....		
	iv) Sulphur content (%)	.....		
1.22.04	Efficiency			
	i) Guaranteed efficiency (%)	.....		
	ii) Acceptance test efficiency (%)	.....		
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART G BID DOC. NO.: CS-2600-001-9	CHAPTER-II SUB-SECTION:DM2 (MECHANICAL-BAG FILTER)	PAGE 11 OF 11

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			एनटीपीसी NTPC
1.00.00	Continuous Water Requirement for WTE plant to be filled by bidder in below mentioned format			
	System	Water Quality(DM/Raw/Clarified)	Water Quantity(cum/hr)	
	1.Power Cycle Make Up			
	2.Auxiliary Cooling water make-up			
	3.HVAC make-up water			
	4.FGD Process water			
	5.SNCR consumptive water			
	6.Service water			
	7. Potable water			
	8. Water for quenching ash			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION VI, PART-G BID DOC. NO.: CS-2600-001-9	SUB-SECTION-DM-03 WATER SYSTEM	PAGE 1 OF 1