

VI – Annexes

Part 2 – Annex 2

Annex 2: Table of performance requirements

As per the provisions of GCC Sub-Clause 4.1 [*Contractor's General Obligations*], the Contractor is to design, execute and complete Works which shall be fit for the purposes for which the Works are intended as defined in the Contract, and as per GCC Sub-Clause 10.1 [*General Requirements*] the Contractor shall be responsible for ensuring that the Works remain fit for such purposes during the Operation Service Period.

The Employer has accordingly defined the following Key Performance Indicators (KPI) which reflect the main performance requirements to be achieved by the facility designed, executed and operated by the Contractor. Those are split in between two categories as follows:

- **Inputs-based KPI¹**, i.e. indicators which will measure the facility consumption of inputs, and
- **Outputs-based KPI²**, i.e. indicators which will measure the outputs of the facility.

The two tables below reflect these two categories of KPIs, and define for each of them:

- KPI Name
- KPI Description
- The KPI maximum or minimum value to be achieved by the Contractor, as the case may be
- Any tolerance on KPI achievement
- The KPI measurement/testing methodology

The first Table below reflects inputs-based KPIs which have the greatest impact on the operating expenditure of the facility, and for which the Contractor guarantees values through his Bid and then under the Contract, by specifying guaranteed KPI values in the far right column.

The second Table below reflects other KPIs which will apply throughout the Contract execution, and with which the Contractor shall comply.

Measurement point methodology should be detailed in Section VII – Employer's Requirements and should aim at defining measurement point(s) which is(are) easily verifiable, regularly checked and calibrated, tamper-proof so as to mitigate as much as possible any dispute stemming from measurement readings, owing to their critical impact on payment under the Contract.

The Bidder hereby guarantees that his Bid ensures compliance with these Key Performance Indicators values. Failure to reach those will impact the Contractor's payment under Appendix 1 [*Schedule of Payments*] to the Contract Agreement, and will make the Contractor liable to pay damages to the Employer in accordance with the provisions of Appendix 3 [*Performance Damages*] to the Contract Agreement, GCC Sub-Clause 10.7 [*Failure to Reach Production Outputs*].

¹ Inputs-based KPI assist in determining how efficient is the facility in its operation and in reaching the contracted outputs. In other words, this does measure how many inputs are necessary for the facility to deliver its contracted outputs, since the global performance of the facility is not only measured by what it delivers, but also how it delivers the same.

² Outputs-based KPI assist in determining whether what the facility produces/delivers complies with the Employer's Requirements.

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For the purpose of calculating performance damages, the Contractor is fully aware that the life span expectancy of the facility is as follows:

Life span expectancy of the facility to be designed, built and operated by the Contractor under the Contract	15 years
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	Unit	Year 1	Year 2
Annual inlet sludge flow with %18 DS	t/year	166.000	166.000
Annual inlet sludge flow with %90 DS	t/year	8.334	8.334

1. Inputs-based KPI

No.	KPI Name	KPI Description	KPI Minimum Value (if any)	KPI Maximum Value (if any)	KPI Measurement / Testing Methodology
1	Electricity Consumption	[The electricity power consumption of the entire facility, per ton of the inlet sludge of the Hurma WTE Facility shall be less or equal to the guaranteed value.]	N/A	[kWh/ton]	The amount of electricity consumption is measured using an electricity meter. This test will be executed both term before the commissioning certificate and the contract completion certificate. For each terms the duration of this test shall be two weeks, with a total testing duration of six weeks.
2	Natural Gas Consumption	[The natural gas consumption of the entire facility, per ton of the inlet sludge of the Hurma WTE Facility shall be less or equal to the guaranteed value.]	N/A	[Nm ³ /ton]	The amount of natural gas consumption is measured using a natural gas meter. This test will be executed both term before the commissioning certificate and the contract completion certificate. For each terms the duration of this test shall be two weeks, with a total testing duration of six weeks.

3	Ammonia (if required)	[The ammonia consumption for fed to FBI per volume of flue gas shall be less or equal to the guaranteed value.]	N/A	[g/Nm ³ gas]	Mass flow meter in chemical feeder and airflow rate in flue gas. This test will be executed both term before the commissioning certificate and the contract completion certificate. For each terms the duration of this test shall be two weeks, with a total testing duration of six weeks.
4	Activated Carbon (if required)	[The activated carbon consumption for fed to dry reactor of the emission control unit per volume of flue gas shall be less or equal to the guaranteed value.]	N/A	[g/Nm ³ gas]	Mass flow meter in chemical feeder and air flow rate in flue gas. This test will be executed both term before the commissioning certificate and the contract completion certificate. For each terms the duration of this test shall be two weeks, with a total testing duration of six weeks.
5	Chemical agent includes sodium and/or calcium ingredients (if require, it can be change according to Bidder's technical proposal)	[The Chemical agent consumption for fed to dry reactor of the emission control unit per volume of flue gas shall be less or equal to the guaranteed value.]	N/A	[g/Nm ³ gas]	Mass flow meter in chemical feeder and air flow rate in flue gas. This test will be executed both term before the commissioning certificate and the contract completion certificate.

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					For each terms the duration of this test shall be two weeks, with a total testing duration of six weeks.
8	[Chemical Type]to be completed by the Bidder if required.	[The chemical consumption of this reagent, per xxx of xxx , shall be less or equal to the guaranteed value.]	N/A	[kg/ton for solids, l/ton for liquids]	The amount of xxxx consumption is measured using xxxx meter. This test will be executed both term before the commissioning certificate and the contract completion certificate. For each terms the duration of this test shall be two weeks, with a total testing duration of six weeks.
9	Water	The water consumption in m3 per ton of the inlet sludge of the Hurma WTE Facility shall be less or equal to the guaranteed value.	N/A	[m ³ /ton]	The amount of water consumption is measured using water meter. This test will be executed both term before the commissioning certificate and the contract completion certificate. For each terms the duration of this test shall be two weeks, with a total testing duration of six weeks.
10	Sand Consumption	The sand consumption for fed to FBI	N/A	[kg/ton]	Moisture, Density, Chemical composition and sieve analysis Mass flow meter in sand feeder

2. Outputs-based KPI

No.	KPI Name	KPI Description	KPI Minimum or Maximum Value	KPI Tolerance (if any)	KPI Measurement / Testing Methodology	Comment
1	Hurma WTE Facility Capacity for dewatered sludge feeding	Total capacity for feeding of the dewatered sludge (minimum 18% dryness)	Minimum 500 ton/d	N/A	Online measurement the amount of the inlet sludge is measured using weighbridge of the inlet silo/ bunker and/or according to Contractor's design mass flow meter through the inlet sludge transferring system.	
2	Hurma WTE Facility Capacity for %90 dried sludge feeding	Total capacity for feeding of the dried sludge (minimum 90% dryness)	Minimum 25 ton/d	N/A	Online measurement the amount of the inlet sludge is measured using weighbridge of the inlet silo/ bunker and/or according to Contractor's design mass flow meter through the inlet sludge transferring system.	
3	Moisture Content of Predried Sludge	Dryness of the predried sludge coming out of the predrier	Minimum 36%	N/A	Daily and Monthly grab samples measurements. Measurement of Dryness of pre-dried sludge / Gravimetric	
4	FBI Temperature	Measurement of FBI combustion temperature	Min. 850 °C Max. 900 °C	N/A	Online thermal temperature measurement inside the FBI furnace	

5	FBI_ Efficiency	Determination of FBI combustion efficiency	Min. 98%	N/A	Thermodynamic Calculation Method (4.1.2. Thermodynamic Calculation Method for Fluidized Bed Incinerator” of Section VII – Employer's Requirements IV – Performance Requirements.) by using temperature, weight and moisture measurements, and proximate and ultimate analysis	
6	Total Bottom Ash Production	Total dry residue disposed from the incineration system	Max. 124 kg ash/hour	N/A	Daily and monthly grab samples measurement. Direct weight measurement in the inlet and outlet of FBIs	Max. 124 kg ash/h has been calculated according to 30% ash is assumed.
7	Electricity production	Electricity produced by the steam turbine per amount of hourly inlet sludge fed to FBI	Min. 1 MWh	N/A	Online measurement readings from the totalizer of electric gauge and sludge mass fed to FBI	
8	Downtime	The turn down hours of the facility	Max. 760 h /year	N/A	Hours measured during downtime period	This downtime period covers whole Hurma WTE Facility and/or any section of the facility.
9	TSP	Total suspended particulate in stack emission	Max. 10 mg/Nm ³ flue gas	N/A	Monthly grab samples and online daily measurement.	

			Shall not be more than Regulations of Emmission Control		Isokinetic sampling and gravimetric method, EPA Method 5 (2000), EPA Method 17 (2000) In compliance with Current Turkish and EU Standard	
10	NO ₂	NOx in stack emision (NO+NO ₂ < 6 ton/h)	Max. 400 mg/Nm ³ flue gas Shall not be more than Regulations of Emmission Control	N/A	Monthly grab samples and online daily measurement. EPA Method CTM-022 (1998) In compliance with Current Turkish and EU Standard	
11	SO ₂	SO ₂ in stack emmision (grab sample) Shall not be more than Regulations of Emmission Control	Max. 50 mg/Nm ³ flue gas	N/A	Monthly grab samples and online daily measurement. ISO 7935 (1999), EPA Method CTM-30 In compliance with Current Turkish and EU Standard	
12	CO	Carbon monoxide in stack emmision (grab sample) Shall not be more than Regulations of Emmission Control	Max. 50 mg/Nm ³ flue gas	N/A	Monthly grab samples and online daily measurement. ISO 12039 (2001), EPA Method CTM-30 In compliance with Current Turkish and EU Standard	
13	HCl	HCl in stack emmision (grab sample) Shall not be more than Regulations of Emmission Control	Max. 10 mg/Nm ³ flue gas	N/A	Monthly grab samples and online daily measurement. EPA Method 26	

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					In compliance with Current Turkish and EU Standard	
14	Dioxin/Furan (PCDD/F)	PCDD/F in stack emission (grab sample) Shall not be more than Regulations of Emission Control	Max. 0.1 ng/Nm ³ flue gas	N/A	Monthly grab samples EPA Method 23/23A (2018) In compliance with Current Turkish and EU Standard	
15	Mercury (Hg)	Mercury in stack emission (grab sample) Shall not be more than Regulations of Emission Control	Max. 0.05 mg/Nm ³ flue gas	N/A	Monthly grab samples EPA Method 29 In compliance with Current Turkish and EU Standard	
16	Cadmium (Cd) and its compounds	Cadmium suspended particulate in stack emission (grab sample) Shall not be more than Regulations of Emission Control	Max. 0.05 mg/Nm ³ flue gas	N/A	Monthly grab samples. EPA Method 29 In compliance with Current Turkish and EU Standard	
18	Total organic carbon	TOC in stack emission (grab sample)	Max. 10 mg/Nm ³	N/A	Monthly grab samples. In compliance with Current Turkish and EU Standard	
19	HF	HF in stack emission (grab sample)	Max. 1 mg/Nm ³	N/A	Monthly grab samples. In compliance with Current Turkish and EU Standard	
20	Thallium and its compounds	Thallium and its compounds in stack emission (grab sample)	Max. 0.05mg/Nm ³	N/A	Quarterly grab samples. In compliance with Current Turkish and EU Standard	

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21	Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V	Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V in stack emission (grab sample)	Max. 0.5mg/Nm ³	N/A	Quarterly grab samples. In compliance with Current Turkish and EU Standard	
22	Noise Level	Noise level from the facility/equipment shall not be more than Turkish Environmental Law and Regulations on Management of Assessment for Environmental Noise (Çevresel Gürültünün Değerlendirilmesi Yönetimi ve Yönetmeliği, T.C. Resmi Gazete 27601, 04.06.2010)		N/A	In compliance with Turkish Environmental Law and Regulations on Management of Assessment for Environmental Noise (Çevresel Gürültünün Değerlendirilmesi Yönetimi ve Yönetmeliği, T.C. Resmi Gazete 27601, 04.06.2010)	