RELIABILITY & H.V. EQUIPMENT DEPARTMENT

RAMs REQUIREMENTS FOR 161 KV POWER TRANSFORMERS

1. RAMs REQUIREMENT

Reliability, Availability, Maintainability and Safety (RAMs) for 161 kV Power transformers

1.1. **Reliability:**

The Manufacturer shall present the reliability tasks and methods which are used to improve the design for reliability and evaluate the MTTF/MTBF for (*) **Major Failures** only, of the 161 kV POWER TRANSFORMERS components.

The Manufacturer shall provide expected values for the relevant parameters of the 161 kV POWER TRANSFORMERS components and shall add their distribution whenever possible.

1.2. **Failure Analysis:**

From his Failure Reporting Analysis and Corrective Action System (FRACAS), Manufacturer shall present a failure report and the analysis of the failures which occurred during the service life of similar 161 kV POWER TRANSFORMERS components manufactured by him. The report should include the withdrawn conclusion and the corrective actions subsequently undertaken.

*** Major failure:** Failure of a Transformer which causes the cessation of one or more of its fundamental functions.

A major failure will result in an immediate change in the system's operating conditions,
e.g. the backup protective equipment will be required to remove the fault, or will result in mandatory removal from service within 30 minutes for unscheduled maintenance

1.3. **161 kV Power transformer RAM Data**

Bidder shall submit the following 161 kV Power transformer RAM Data:

	Component	MTBF (Yrs)	EOL (Yrs)	MTTR (Hrs)	
1	Three Phase Power Transformer				
2	Oil Air HV Bushing				
3	HV Bushing Current Transformers				**Where**:
4	On Load Tap Changer				**MTBF**: Mean Time between Failures, For *Major Failure
5	Tap Changer Motor Drive				**EOL**: Expected Operating Life.
6	Voltage Control System				**MTTR**: Mean Time To Repair, for Major Failures
7	Tap-Changer Position Indicator				
8	Pressure Relief Valve				
9	Buchholtz Relay				
10	Protective Relay for OLTC				
11	Winding				

1.4. Field data

The manufacturer will fill in the following table:

Field RAM Data		Current year-8	Current year-7	Current year-6	Current year-5	Current year-4	Current year-3	Current year-2	Current year -1
Total number of installed Power Transformers 300 kV ≥ U_m ≥ 170 kV Voltage [kV/kV] Power [MVA]									
Total No. of Major Failures									
Specific part which undergo Major Failure	Oil Air Bushing								
	Bushing Current Transformers								
	On Load Tap Changer								
	Tap Changer Motor Drive								
	Voltage Control System								
	Tap-Changer Position Indicator								
	Pressure Relief Device								
	Buchholtz Relay								
	Protective Relay for OLTC								
	Winding								
	Other: _____								
Mean Time to Repair/Replace									

2. Unreliability Demonstration Procedure (UDP)/Reliability Test

NOGA-ISO could conduct an Unreliability Demonstration Procedure (UDP)/Reliability Test, according to NOGA-ISO Judgement. The manufacturer may request NOGA-ISO to see example for a UDP . The final UDP could be change according to each individual case and circumstances, as to be decided by NOGA-ISO.