RELIABILITY & H.V. EQUIPMENT DEPARTMENT

RAMs REQUIREMENTS FOR 161 KV LIQUID IMMERSED SHUNT REACTORS

1. RAMs REQUIREMENT

Reliability, Availability, Maintainability and Safety (RAMs) for 161 KV Liquid immersed shunt reactors

1.1. Reliability:

The Bidder 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 Shunt reactors components.

The Bidder shall provide expected values for the relevant parameters of the 161 kV Shunt reactors components and shall add their distribution whenever possible.

1.2. Failure Analysis:

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 The report should include the withdrawn conclusion and the corrective actions subsequently undertaken.

*** Major failure:** Failure of a Shunt reactor 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 Shunt reactor RAM Data

Bidder shall submit the following 161 kV shunt reactor RAM Data:

	Component	MTBF (Yrs)	EOL (Yrs)	MTTR (Hrs)	
1	Liquid immersed shunt reactor				**Where**: **MTBF**: Mean Time between Failures, For *Major Failure **EOL**: Expected Operating Life. **MTTR**: Mean Time To Repair, for Major Failures
2	Oil Air HV Bushing				
3	HV Bushing Current Transformers				
4	On Load Tap Changer				
5	Tap Changer Motor Drive				
6	OLTC Regulator				
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 Shunt reactors 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								
	Automatic OLTC Regulator								
	Tap-Changer Position Indicator								
	Pressure Relief Device								
	Buchholtz Relay								
	Protective Relay for OLTC								
	Winding								
	Other: _____								
Mean Time to Repair/Replace									

1.5. Unreliability Demonstration Procedure (UDP)/Reliability Test

NOGA-ISO could conduct an Unreliability Demonstration Procedure (UDP)/Reliability Test, according to NOGA-ISO's 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.