

Annexure- 1, REV-00 to PI No. 240907300				
ITEM	QTY	DESCRIPTION	COMPLIANCE	REMARK
1	3	Numerical Multi-functional Generator Protection Relay (IEC61850 compliant), type 7UM62 of Siemens or REG of ABB make or equivalent, having following protection functions besides all other protection functions and standard features listed in the respective catalogue. (Details to be spelt out in the offer). In case any protection function specified below is not covered by the integrated generator protection relay, standalone numerical relay shall be provided for the same. (The relay shall be used with external accessories covered in Item 02 below).	Complied / Not complied	
		Generator Differential Protection function (87G) having operating time of 25 milli secs or lower at five times the current setting.	Complied / Not	
		Two stage Generator Backup Impedance protection function (21G), three pole along with suitable timer for coordination with line protections.	Complied / Not complied	
		Stator Earth Fault protection function covering 100% of winding (64G), operating on low frequency signal injection principle suitable for continuous monitoring of stator insulation even during machine shut down. The relay shall provide protection during standstill, during start-up and during normal running of the machine. All necessary external accessories shall be covered in Item 02 below. Settings : 20 to 500 ohms for alarm and 10 to 300 ohms for trip. Any other setting range shall be justified by supplier with supporting documents and shall be acceptable subject to approval by our systems group.	Complied / Not complied	
		Generator Field Failure protection function (40G) instantaneous and time delayed stages.	Complied / Not	
		Generator Under Voltage protection function (27G) for use with field failure function.	Complied / Not complied	
		Two stage Generator Negative Phase Sequence current protection, stage-1 for alarm and second I_2^2t characteristic stage for trip, matching with the machine withstand capability curve.	Complied / Not complied	
		Two stage Over Fluxing Protection function (99G) having inverse time characteristics suitable for Generator and Generator transformer over fluxing capability.	Complied / Not complied	
		Generator Pole Slipping Protection function (98G) and Directional Pole slip protection (32/98G).	Complied / Not	
		Stator Earth Fault protection covering 95% of winding with adjustable time delay.	Complied / Not	
		Generator Low Forward Power protection function suitable for 3-phase power measurement, having two time delayed stages for alarm and trip (37G). Settings 0.5% of 3-phase rated power. Any other setting range shall be justified by supplier with supporting documents and shall be acceptable subject to approval by our systems group.	Complied / Not complied	
		Generator Reverse Power protection function suitable for 3-phase power measurement, having two time delayed stages for alarm and trip (32G). Settings 0.5% of 3-phase rated power. Any other setting range shall be justified by supplier with supporting documents and shall be acceptable subject to approval by our systems group.	Complied / Not complied	

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		Generator definite time delayed over voltage protection function (59G) for alarm and trip.	Complied / Not	
		Generator definite time overcurrent and thermal overload protection function (51G / 49G).	Complied / Not	
		Two stage Generator Rotor Earth Fault protection for alarm and trip suitable for brushless machines operating on principle of continuously monitoring rotor insulation value even during machine shut down period. All necessary external accessories shall be covered in Item 02 below. Settings: 1 to 20 kilo ohms for both alarm stage and trip stage.	Complied / Not complied	
		The relay should be capable of monitoring the healthiness of injection circuit and raise an alarm in case of discontinuity in	Complied / Not	
		Generator Under Frequency Protection with alarm and two stage trippings (81G). Underfrequency protection shall have df/dt	Complied / Not	
		Generator over Frequency Protection with alarm and two stage trippings (81G).	Complied / Not	
		Generator Dead Machine (inadvertent energisation) protection function (50GDM) on two principles a/ based on U/V and O/C b/ based on CB status and O/C	Complied / Not complied	
		Generator CB Local breaker back-up protection (50LBBS) having separate current settings and suitable for external initiation through binary input.	Complied / Not complied	
		Stand-by earth fault protection (51N) from separate CT input of NGT secondary.	Complied / Not	
		Generator VT Fuse Fail function 60VTFF	Complied / Not	
		The disturbance record shall have adjustable pre-fault and during / post fault time settings. The record length shall be of the order of 5 to 10 seconds.(to be specified in the offer). It should be possible to save the record in a COMTRADE format for replaying by relay test kit. (Details to be spelt out in the offer)	Complied / Not complied	
		The number of event records which can be stored shall be of the order of 150 to 250 with 1 ms time resolution. (Details to be furnished in the offer).	Complied / Not complied	
		The generator protection relay shall at least have 20 user configurable outputs besides relay fail watchdog contact, 15 user configurable digital inputs and user configurable LEDs. (Details to be spelt out in the offer).	Complied / Not complied	
		Rating: 5A, 110V, 50HZ. Auxiliary Supply: 220V DC.	Complied / Not	
		The relay shall meet the General Technical Specification Requirements covered in Annexure-1A enclosed in totality .	Complied / Not complied	
		Device Reference- GR1/2; Refer SLD for Generator Circuit Metering and Protection (Drg. No. PE-DG-415-510-E001).	Complied / Not	

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ITEM	QTY	DESCRIPTION	COMPLIANCE	REMARK
		Vendor to confirm that offered relay meets the requirement of protection as per attached MAHAGENCO specification Volume-IV-B, Section-5.	Complied / Not complied	
2	3	External accessories for use with 100% Stator Earth Fault protection and Rotor Earth Fault protection covered in Item 1 above: on low frequency injection principle. It should be possible to connect Group-1 & Group-2 Generator Protection relays (covered in It-01 above) to a common set of accessories. Scheme of connection showing relays connected to common accessories shall be furnished with the offer.	Complied / Not complied	
		Each set of accessories comprises of following equipments :	Complied / Not	
		i) 1 no. 20Hz Band Pass Filter type 7XT34 of Siemens or eq. for 100% stator E/F protection.	Complied / Not	
		ii) 1 no. 20Hz Signal Generator type 7XT33 of Siemens or eq. for 100% stator E/F protection.	Complied / Not	
		iii) 1 no. Controlling unit type 7XT71 of Siemens or eq. for Rotor E/F protection.	Complied / Not	
		iv) 1 no. External resistor type 7XR6004 of Siemens or eq. for Rotor E/F protection.	Complied / Not	
		v) Any special cables (if required) for interconnection between generator protection relay and associated accessories shall be supplied.	Complied / Not complied	
		Vendor to note that connection between between NGT, Rotor brushes, accessories and relay is envisaged by normal 2.5 sq mm PVC control cables. In case any special cable is required to be used for ensuring the satisfactory operation of the protection, same shall be clearly spelt out in offer and to be supplied.	Complied / Not complied	
		Auxiliary Supply : 220V DC (for all accessories)	Complied / Not	
		The relay shall meet the General Technical Specification Requirements covered in Annexure-1A enclosed in totality.	Complied / Not complied	
3	9	Numerical, triple pole, Three winding Transformer protection relay (IEC61850 compliant) type 7UT633 of Siemens make or RET670 of ABB make or equivalent having the following protection functions, besides all other protection functions and standard features listed in the respective catalogue. (Details to be spelt out	Complied / Not complied	
		Transformer biased differential protection function (87T). Operating time of the differential protection shall be less than 30 msec at 5 times the current setting.	Complied / Not complied	
		Transformer over current protection (51T) on all three sides.	Complied / Not	
		The relay shall have 3 separate CT inputs to be used for Restricted E/F protection (64R) OR Standby E/F Protection (51NT) on all 3 sides. At least 2 High Impedance Restricted E/F Protections should be possible in the relay. (Metrosil & Stabilising resistors for high impedance Restricted Earth Fault Protection are covered	Complied / Not complied	

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		The relay shall have separate three phase voltage input for overvoltage and undervoltage protection of transformer.	Complied / Not	
		Thermal overload protection function (49).	Complied / Not	
		Breaker LBB protection function (50LBB) with separate current settings for LBB and suitable for external initiation.	Complied / Not	
		The disturbance record shall have adjustable pre-fault and during / post fault time settings. The record length shall be of the order of 5 to 10 seconds. to be specified in the offer. It should be possible to save the record for replaying by relay test kit. (Details to be spelt out in the offer)	Complied / Not complied	
		The number of event records which can be stored shall be of the order of 150 to 250 with 1 ms time resolution. (Details to be spelt out in the offer).	Complied / Not complied	
		The Transformer protection relay shall have at least 16 user configurable output contacts besides relay fail contact, 16 user configurable digital inputs and user configurable LEDs.	Complied / Not complied	
		Rating: 1A/ 5A, 50 Hz CT secondary. 110V, 50Hz VT secondary for overfluxing protection. Auxiliary Supply: 220V DC.	Complied / Not	
		The relay shall have built-in facility to program the CT ratio and amplitude error corrections in the relay without the use of any external auxiliary CTs.	Complied / Not complied	
		The relay shall meet the General Technical Specification Requirements covered in Annexure-1A enclosed in totality.	Complied / Not	
		Device Reference -87/64RGT, 87/51NUTA, 87/51NUTB, 87/51N/99ST. Refer SLD for Generator Circuit Metering and Protection (Drg. No. PE-DG-415-510-E001) and SLD of Station Transformer Metering and Protection (Drg No. PE-DG-415-510-E041).	Complied / Not complied	
		Vendor to confirm that offered relay meets the requirement of protection as per attached MAHAGENCO specification Volume-IV-B, Section-5.	Complied / Not complied	
4	2	Numerical, triple pole, five winding, Transformer Protection Relay (IEC61850 compliant) type 7UT635 of Siemens make or RET670 of ABB make for overall differential protection (87OA) , having all the protection functions and standard features listed in the respective catalogue.	Complied / Not complied	
		Transformer differential protection function (87T).	Complied / Not	
		Differential Protection deployed for a zone between EHV Swyd and 21KV Generator neutral & 21KV side of UT's.	Complied / Not	
		Transformer over current protection (50/51T).	Complied / Not	
		The relay shall have at least 2 separate CT inputs to be used for Restricted E/F protection (64R) OR Standby E/F Protection (51NT) on 2 sides. Both High and Low Impedance Restricted E/F Protections should be possible in the relay. (Metrosil & Stabilising resistors for high impedance Restricted Earth Fault Protection are covered separately)	Complied / Not complied	

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ITEM	QTY	DESCRIPTION	COMPLIANCE	REMARK
		Thermal overload protection function (49).	Complied / Not	
		Two stage Over fluxing protection, definite time stage-1 for alarm and stage-2 having inverse time characteristics suitable for transformer over fluxing capability for trip. (99T). <u>In case this function is available in above relay (It-03), it is not neccesarily required in this item.</u>	Complied / Not complied	
		The disturbance record shall have adjustable pre-fault and during / post fault time settings. The record length shall be of the order of 5 to 10 seconds, to be specified in the offer. It should be possible to save the record for replaying by relay test kit.	Complied / Not complied	
		The number of event records which can be stored shall be of the order of 150 to 250 with 1 ms time resolution.	Complied / Not	
		The Transformer protection relay shall have at least 16 user configurable output contacts besides relay fail contact, 16 user configurable digital inputs and user configurable LEDs. (Details to be spelt out in the offer).	Complied / Not complied	
		Rating : CT secondary : 1A/ 5A , 50HZ. Auxiliary Supply : 220V DC.	Complied / Not	
		The relay shall have built-in facility to programme the CT ratio and amplitude error corrections in the relay without the use of any external auxiliary CTs (Refer SLD enclosed).	Complied / Not complied	
		The relay shall meet the General Technical Specification Requirements covered in Annexure-1A enclosed in totality.	Complied / Not	
		Device Reference -87OA/51NGT/50/51GT/99GT Refer SLD for Generator Circuit Metering and Protection (Drg. No. PE-DG-415-510-E001).	Complied / Not complied	
		Vendor to confirm that offered relay meets the requirement of protection as per attached MAHAGENCO specification Volume-IV-B, Section-5.	Complied / Not complied	
5	2	Numerical relay (IEC61850 compliant) for Generator interturn fault protection relay operating from NGT Secondary Voltage compared with Open Delta Unbalance Voltage of Generator PT secondary (Refer SLD enclosed).	Complied / Not complied	
		Voltage setting available in the relay shall be of the order of 4-20 V. (Setting range to be specified in the offer)	Complied / Not	
		The disturbance record shall have adjustable pre-fault and during / post fault time settings. Detail of record length shall be specified in the offer. It should be possible to save the record for replaying by relay test kit.	Complied / Not complied	
		The number of event records to be stored with 1 ms time resolution. (Details of number of events to be spelt out in the offer).	Complied / Not	
		The protection relay shall have at least 7 user configurable output contacts besides relay fail contact, 5 user configurable digital inputs and user configurable LEDs. (Details to be spelt out in the offer).	Complied / Not complied	
		Rating: 110V (phase to phase), 50HZ. Auxiliary Supply : 220V DC.	Complied / Not	
		The relay shall meet the General Technical Specification Requirements covered in Annexure-1A enclosed in totality.	Complied / Not	

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ITEM	QTY	DESCRIPTION	COMPLIANCE	REMARK
		Device Reference -64GIT Refer SLD for Generator Circuit Metering and Protection (Drg. No. PE-DG-415-510-E001).	Complied / Not complied	
		Vendor to confirm that offered relay meets the requirement of protection as per attached MAHAGENCO specification Volume-IV-B, Section-5.	Complied / Not complied	
6	3	Numerical three phase High Impedence Cable Differential Protection relay (IEC61850 compliant) tuned to 50Hz frequency. This protection is required for differential protection of overhead connection between GT HV & EHV Switchyard.	Complied / Not complied	
		Setting available shall be 5-20% of rated current in steps of 0.1%. (Setting range to be specified in the offer)	Complied / Not	
		The disturbance record shall have adjustable pre-fault and during / post fault time settings. Detail of record length shall be specified in the offer. It should be possible to save the record for replaying by relay test kit.	Complied / Not complied	
		The number of event records to be stored with 1 ms time resolution. (Details of number of events to be spelt out in the	Complied / Not	
		The protection relay shall have at least 7 user configurable output contacts besides relay fail contact, 5 user configurable digital inputs and user configurable LEDs. (Details to be spelt out in the offer).	Complied / Not complied	
		Rating: 110V (phase to phase), 50HZ. Auxiliary Supply : 220V DC.	Complied / Not	
		The relay shall meet the General Technical Specification Requirements covered in Annexure-1A enclosed in totality.	Complied / Not	
		Device Reference-87HV; Refer SLD for Generator Circuit Metering and Protection (Drg. No. PE-DG-415-510-E001).	Complied / Not	
		Vendor to confirm that offered relay meets the requirement of protection as per attached MAHAGENCO specification Volume-IV-B, Section-5.	Complied / Not complied	
7	7	Numerical LBB protection relay (IEC61850 compliant) with 3 single phase O/C units having facility to accept single phase and three phase external initiation inputs and provided with all other protection functions and standard features listed in the respective catalogue.	Complied / Not complied	
		The disturbance record shall have adjustable pre-fault and during / post fault time settings. Details of the record length to be confirmed in the offer. It should be possible to save the record in a COMTRADE format for replaying by relay test kit.	Complied / Not complied	
		The event records shall be with 1 ms time resolution. (Details of number of events to be spelt out in the offer).	Complied / Not	
		The protection relay shall have at least 7 user configurable output contacts besides relay fail contact, 5 user configurable digital inputs and user configurable LEDs. (Details to be spelt out in the offer).	Complied / Not complied	
		Rating: 1A, 50HZ CT secondary. Auxiliary Supply : 220V DC.	Complied / Not	
		The relay shall meet the General Technical Specification Requirements covered in Annexure-1A enclosed in totality.	Complied / Not	

Annexure- 1, REV-00 to PI No. 240907300				
ITEM	QTY	DESCRIPTION	COMPLIANCE	REMARK
		Device Reference -50Z1, 50Z2; Refer SLD for Generator Circuit Metering and Protection (Drg. No. PE-DG-415-510-E001).	Complied / Not	
		Vendor to confirm that offered relay meets the requirement of protection as per attached MAHAGENCO specification Volume-IV-B, Section-5.	Complied / Not complied	
8	13	Numerical, three over current protection (50/51) and earth fault protection relay (IEC61850 compliant) alongwith all other protection functions and standard features listed in the respective catalogue.	Complied / Not complied	
		The relay shall accept at least 4 CT inputs, 3 for overcurrent functions (50/51) and one for earth fault (50N/51N).	Complied / Not	
		Offered relay shall also have facility to use for directional overcurrent and earth fault protection (67/67N).	Complied / Not	
		Earth fault element shall be suitable for high impedance Restricted Earth Fault protection with sensitive setting of 5% of rated current.	Complied / Not	
		Metrosil & Stabilising resistors for high impedance Restricted earth fault protection are covered separately in Item below.	Complied / Not	
		The disturbance record shall have adjustable pre-fault and during / post fault time settings. Detail of record length shall be specified in the offer. It should be possible to save the record for replaying by relay test kit.	Complied / Not complied	
		The number of event records to be stored with 1 ms time resolution. (Details of number of events to be spelt out in the	Complied / Not	
		The protection relay shall have at least 8 user configurable output contacts besides relay fail contact, 7 user configurable digital inputs and user configurable LEDs. (Details to be spelt out in the offer).	Complied / Not complied	
		Rating: 1A, 50HZ. Auxiliary Supply: 220V DC.	Complied / Not	
		It should be possible to synchronise the clock of the relay with SNTP.		
		The relay shall meet the General Technical Specification Requirements covered in Annexure-1A enclosed in totality.	Complied / Not	
		Device Reference -50/51/64RUTA, 50/51/64RUTB, 50/51/64RSTHV, 64RSTLV1, 64RSTLV2. Refer SLD for Generator Circuit Metering and Protection (Drg. No. PE-DG-415-510-E001) and SLD of Station Transformer Metering and Protection (Drg No. PE-DG-415-510-E041).	Complied / Not complied	
		Vendor to confirm that offered relay meets the requirement of protection as per attached MAHAGENCO specification Volume-IV-B, Section-5.	Complied / Not complied	
9	11	Metrosil Resistor for use with high impedance restricted earth fault / differential protection relays rated for 1A CT Secondary.	Complied / Not	
		Calculation/selection of Metrosil done shall be submitted for approval by BHEL before despatch.	Complied / Not	
10	11	Stabilising resistor alongwith mounting arrangement of value 0-5000 ohms for use with high impedance restricted earth fault / differential protection.	Complied / Not complied	

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		Calculation/selection of resistor done shall be submitted for approval by BHEL before despatch.	Complied / Not	
		Mounting details are to be furnished along with the offer.	Complied / Not	
11	4	KEMA Certified Managed type 1 GBPS Ethernet switch, IEC61850 compliant with minimum eight copper (RJ45 port) channels and 4 Fiber optic ports for connection of IED (suiting the offered relays and the system architecture given by the vendor) into the Ethernet LAN. Auxiliary supply : 220V DC.	Complied / Not complied	
		Offered Ethernet Switches shall be suitable for Din rail mounting inside the panels. Suitable brackets for panel mounting shall also be supplied along with ethernet switches.	Complied / Not complied	
		Type number of Ethernet switches alongwith KEMA certified test reports shall also be furnished. Descriptive leaflets for mounting dimensions and connection diagram shall also be furnished.	Complied / Not complied	
12	1 Set	Evaluation Unit, comprising of the following:	Complied / Not	
		A) Laptop PC of reputed brand (to be finalised during detail engineering) with latest configuration for communicating with all numerical relays covered in this project through front RS232 / equivalent port. The Laptop PC shall be supplied pre-loaded with Licensed Latest Windows Operating System Software and Licensed Relay Parameterisation Software.	Complied / Not complied	
		B) Industrial Grade PC with 21" TFT monitor and with latest configuration for communicating with all numerical relays looped through rear RJ45/FO port. The PC shall be suitable for continuous operation and supplied pre-loaded with Licensed Latest Windows Operating System Software and Licensed Relay Parameterisation Software. Licensed Windows OS / Recovery CDs and Relay Parameterisation Software CDs shall be supplied.	Complied / Not complied	
		C) Relay Parameterisation Software CD is required for various functions like uploading / downloading the settings, retrieving and analysing the disturbance records and events from the relay.	Complied / Not complied	
		D) 2 Nos. Communication Cables of each type of about 3 meter length to connect the numerical relay front RS232 / equivalent port with the Laptop PC for Relay Parameterisation Software.	Complied / Not complied	
		E) Necessary communication cables required for communication between relays and PC shall be considered in the supplier's scope. Distance between installed relays and Evaluation Unit PC will be around 100 M.	Complied / Not complied	
		System architecture showing all interfacing items and interconnections between various numerical relays, Ethernet switches and evaluation unit shall be furnished with the offer.	Complied / Not complied	
		Vendor to confirm that data from all protection relays will be simultaneously available on Local PC and DDCMIS on IEC-61850 protocol as per system architecture furnished.	Complied / Not complied	
		The Evaluation Unit shall be complete in all respects. Any additional interfacing hardware or software, cables, connectors etc. necessary for completion of the system, whether specifically mentioned or not in the BOM, shall be supplied without any additional price implication.	Complied / Not complied	

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ITEM	QTY	DESCRIPTION	COMPLIANCE	REMARK
		Vendor to submit GTP of each item for approval before dispatch of equipment.	Complied / Not	
NOTE		1) Refer Annexure-1A for General Technical Specification of all Relays.	Complied / Not	
		2) Refer Annexure-1B for Qualifying Requirements.	Complied / Not	
		3) Point wise compliance to each clause of the specification in Annexure-1, Annexure-1A & Annexure-1B shall be furnished failing which the offer may not be considered.	Complied / Not complied	
		4) All items shall be procured from one source from the point of view of uniformity and communication compatibility .	Complied / Not	
		5) Ten copies of bound manuals comprising commissioning manuals, descriptive leaflets, wiring diagram and guaranteed technical particulars of each item shall be furnished before dispatch of equipment.	Complied / Not complied	
		6) Six copies of routine test certificates shall be furnished project wise for all relays before dispatch of equipment.	Complied / Not complied.	
		7) Any special hardware, screened cable, special lugs etc. mandatory for wiring of the relays shall be supplied in adequate quantity alongwith the relays.	Complied / Not complied	
Enclosed		1) MAHAGENCO specification Volume-IV-B, Section-5.		
		2) Single Line Diagram for Generator Circuit Metering and Protection, Drg. No. PE-DG-415-510-E001		
		3) Single Line Diagram for Station Transformer Metering and Protection, Drg. No. PE-DG-415-510-E041		