COMPLIANCE SHEET

It is noted that filling in all data in the tables below is mandatory and all required information shall be provided by a declaration of agreement and / or a reference to the appropriate document wherever it is considered necessary.
Remark: In case of doubt due to differences between the English and the Greek version of this document, the Greek version's terms prevail.

Table A.1: Documents required by the Inquiry

No	Paragraph of the Inquiry concerning the required documents	Required document to be submitted with the Technical Offer	Statement of agreement or Submitted document with the Technical Offer	Location in the Technical Offer, where the required document is found. (Filled if its necessary)
1	13.2.B.2	Statement of the place and the manufacturing factory of the offered RTUs (Types No 1,2,3 and 4).		
2	13.2.B2 13.2.B3 13.2.B4	For the RTUs: 1. Detailed information of the manufacturing factory of the offered RTUs: • mailing address • Sales Data • personnel employed, brief description of the plant, etc. 2. ISO 9001 certification for the manufacturing factory covering the production field of the materials under purchase. 3. Declaration that the manufacturer undertakes the responsibility to take necessary actions in order to ensure the uninterrupted renewal of the ISO 9001 certificate of the manufacturing factory, throughout the duration of any Contract with HEDNO S.A.		
2	13.2.B2 13.2.B3 13.2.B4	For the Current Sensors: 1. Detailed information of the manufacturing factory of the offered RTUs: • mailing address • Sales Data • personnel employed, brief description of the plant, etc. 2. ISO 9001 certification for the manufacturing factory covering the production field of the materials under purchase. 3. Declaration that the manufacturer undertakes the responsibility to take necessary actions in order		

		to ensure the uninterrupted renewal of the ISO 9001 certificate of the manufacturing factory, throughout the duration of any Contract with HEDNO S.A.		
3	13.2.B.4	Statement of Compliance of the offered materials in accordance with the technical requirements of the ND-397/16.01.2019 Technical Description and the Supplement 1/26.06.2020.		
4	13.2.B.5	Statement of the type of the offered RTUs.		
5	13.2.B.5	Statement of the type of the offered Current Sensors.		
6	13.2.B.6 Part 1	Accreditations for the offered or similar type of RTU (sales lists, copies of contracts).		
7	13.2.B.6 Part 2	Accreditations for the offered or similar type of RTU (Letters of recommendation).		
8	13.2.B.6	Alternatively to No 6 & 7, the necessary information, in case of exemption from the submission of accreditation documents (ID & date of contract).		
9	13.2.B.7	Statement of compliance with the requirements of the guarantee as described in Chapter 18 of the Technical Description ND-397/ 16.01.2019 and the Supplement 1/26.06.2020.		
10	13.2.B.8	Certificates of successful execution of tests for the offered or similar RTUs, in accordance with §11.1 of the Technical Description ND-397/16.01.2019 and the Supplement 1/26.06.2020		
11	13.2.B.8	Alternatively to No 10, the necessary information, in case of exemption from the submission of accreditation documents (ID & date of contract).		
12	13.2.B.9	Completed the Table for the implementation of the REACH Regulation of the EU or a declaration that the offered materials do not fall under the provisions of the REACH Regulation.		
13	13.2.B.10	Information Brochures for the RTUs and Current Sensors.		
14	13.2.B.11	The Conformity Sheet filled in		

Table A.2: Test Certificates

Type & Manufacturer: ……

No	Required Test Certificate to be submitted with the Technical Offer	Paragraph of the Technical Description ND-397/ 16.01.2019 and the Supplement 1/26.06.2020 concerning the required elements of the Technical Bid	Number and issue date of the test certificate / trade name of the test laboratory which issued the test certificate	Section or Paragraph of the certificate containing the corresponding Test	Evidence that the laboratory which issued the certificate is recognized by an independent private or public accreditation body: • accreditation body • Number of Certification
1	*Steady state voltage withstand tests*	11.1 Table 6 No 1,2,3			
2	*DC impulse voltage withstand tests*	11.1 Table 6 No 4,5,6			
3	*Application of overvoltage to the terminals of all ports, as the device operates*	11.1 Table 6 No 7			
4	*Electrostatic discharge test (ESD) as the device operates*	11.1 Table 6 No 8			
5	*Test in electromagnetic radiation as the device operates*	11.1 Table 6 No 9			
6	*Cold test at continuous operation*	11.1 Table 6 No 10			
7	*Dry heat test at continuous operation*	11.1 Table 6 No 11			
8	*Cyclic humidity test*	11.1 Table 6 No 12			

Table A.3: Required Data by the Technical Description ND-397/16.01.2019 and the Supplement 1/26.06.2020.

No	Paragraph of the Technical Description ND-397/ 16.01.2019 and the Supplement 1/26.06.2020	Technical characteristic or required element	Specified Technical Value or Technical Requirement	Declaration of Agreement and/or Technical Characteristic of the offered material	Location in the Technical Offer, where the required element is found. (Filled if its necessary)
	1	**SCOPE**			
1.		Remote Terminal Unit for Telecontrolling Substation Equipment (RTU)	-		
	1	**DISTRIBUTION NETWORK CHARACTERISTICS**			
2.		The RTU is suitable for installation in a 3-phase balanced distribution network that is composed of 150/20KV (Yy0) transformers in primary substations and 20/0,4KV (Dy11) transformers in secondary substations of HEDNO and customers, connected through underground and overhead lines. The neutral node is solidly grounded at the sending end at the HV/MV substation (MV node of HV/MV substation), through a resistance limiting the single phase earth fault current to 1000A. The MV network has the following characteristics: • Nominal system voltage: 15 kV and 20 kV. • Maximum system voltage: 24 kV. • Rated frequency: 50 Hz. • Short circuit withstanding level (Symmetrical 3-phase fault level): 9,6kA (15kV) – 7,2kA (20kV). There are 1 or 2 MV/LV transformers of nominal power 630kVA or 1000kVA each, at the secondary substations. The LV network that departs from the transformers is three-phase 50Hz of rated voltage 230 / 400V with 4 conductors and a grounded neutral node, with grounding method either TT or TN-S.	As mentioned in relevant § of TD		
	2	**EQUIPMENT GENERAL CHARACTERISTICS**			
	2.1	**Telecontrolled equipment**			
3.		The RTU is suitable for remote and local control and/or supervision of the following equipment: • 1 or 2 MV LB clusters of 2,3 or 4 breakers each. Each cluster also includes 1 MV/LV transformer fuse-protected breaker, which is not to be	As mentioned in relevant § of TD		

		controlled by the RTU. • Underground MV 3-phase lines of (NAEKEBA 3X240 RM) or (NA2XS2Y 3X240/25+25AL) cables, connected at MV cubicles in straight-type terminations. • The LV section (-s) of the MV/LV transformer (-s), which comprise 1 (or 2) LV switchboard(-s) and the three-phase line(-s) (2X1X300mm^2 or 3X1X300mm^2 J1VV- R per phase) connecting the LV side (-s) of the transformer(-s) to the switchboard(-s). Substation auxiliary devices like water level measurement devices and pumps, IEDs like power or energy meters, etc.			
	2.2	**<u>Operating conditions</u>**			
4.		The supplied equipment shall be suitable for long-term trouble-free operation in the following environmental conditions:			
5.		Ambient air temperature:	-10°C to +55°C		
6.		Relative humidity:	5% to 93% non-condensing		
	2.3	**<u>Dimensioning – Space Configuration</u>**			
7.		The RTU consists of the following two compartments: • Controller compartment • Battery(-ies) compartment			
8.		One of the following two configurations is acceptable: • Both compartments shall be housed in a single external cabinet and not physically separated. Both compartments shall be easily accessed from the external cabinet's front door. • Each compartment is contained in its own external cabinet.			
9.		Controller compartment contains all sub-systems that make the RTU operational (controller, ADU, power supply, charger, terminal blocks, etc.).			
10.		An appropriate control panel is located on the Controller compartment's front door or inside it.	Per §6.3 of TD		
11.		The RTU external cabinet's dimensions and weight shall not exceed the following values. Extensions that protrude from the main body (e.g. hinges, glands) shall be considered. Max value for RTU's weight, excluding batteries & current sensors weight.			
12.		Width (mm)	≤670		
13.		Depth (mm)	≤450		
14.		Height (mm)	≤950		
15.		Weight (kg)	≤35		

16.		An external battery compartment's dimensions and weight shall not exceed the following values, but with batteries weight excluded.			
17.		Width (mm)	≤670		
18.		Depth (mm)	≤450		
19.		Height (mm)	≤950		
20.		Weight (kg)	≤35		
21.		The external cabinet's front door has appropriate document holder for the safe-keeping of the documents of wiring, installation manuals etc. accompanying the RTU.			
22.		The external cabinet of the RTU and Battery's compartment is wall-mounted, designed for the service conditions of §2.2 specified and fitted with robust locking mechanism capable of being padlocked by a padlock with a shank of 8mm with the door in the closed position.			
23.		The RTU's external cabinet provides port connections through appropriate cable glands (for data link, power supply) to accommodate the communication module.			
	3	**<u>Environmental protection</u>**			
24.		The external cabinet(-s) of §2.3 are rated per IEC 60529 and per IEC 62262:2002, concerning the protection provided against external mechanical impacts. Non-connected external connector ports and used or unused cable glands shall conform to at least the cabinet's IP rating.	At least IP4X per IEC 60529 & at least IK07 per IEC 62262:2002		
25.		The cabinets of par. 2.3 are made of one of the following materials or a combination of them:			
26.		1. Stainless steel per EN 10882-2	adequate for installation in C2 environments, per ISO 12944.		
27.		2. Hot-dip galvanized steel or iron following the various processes such as sawing, cutting, punching, drilling, bending, cutting, etc.	according to ISO 1461 or PPC/XK 11.02 and the specific thickness overlap referred to therein		
28.		3. Aluminum	anodized (minimum oxide thickness 10μm) or electrostatically painted with epoxy powder coating		
29.		4. Thermoplastic material conforming to the following requirement:			
30.		• Flammability rating	≥650°C per IEC 60695-2-11:2014		
31.		Any metallic parts (external hinges, screws, washers etc.) are made of stainless steel per EN 10882-2	adequate for installation in C2 environments, per ISO 12944.		
32.		A combination of the aforementioned			

		materials, does not lead to any electrochemical erosion of one or more of them			
33.		Condensation of water vapour on internal parts shall be avoided by appropriate means, e.g. via thermally insulating the case, and not by solutions employing forced heating or cooling elements.	Confirmation from manufacturer's brochure is required.		
34.		All internal parts of RTU are compatible to operating conditions of §2.2.			
35.		All vents are screened against vermin entry.			
36.		The connection between RTU and external Battery compartments conforms to the mentioned in points 24, 30 IP, IK and flammability ratings.			
	4	**ELECTRICAL CONNECTIONS**			
	4.1	**External connections**			
37.	(1)	The RTU's external cabinet has four (4) latched connectors (eight -8- for the extended RTU model), which are polarized to secure that each of them, may be connected with its own plug only			
38.	(1)	Each connector corresponds to a LB.			
39.	(1)	The signals that shall be fed through corresponding pins of each connector are shown in Table 1 of TD and the exact pin assignment shall be agreed with the Contractor.			
40.	(1)	Acceptable connector positions of placement are the front, the bottom and the sides of the RTU's external cabinet.			
41.	(1)	The connectors do not obstruct any RTU's door openings, while connected with their corresponding plugs.			
42.	(1)	Each cable supplied for the connection of the RTU to the LBs (carrying signals of Table 1 of TD) is already terminated on one end to an appropriate plug.			
43.	(1)	Each external cable's termination on its plug satisfies the IP rating of the RTU's external cabinet, ensuring the continuity of cable's electrical/mechanical insulation throughout its entire length.			
44.	(1)	Each plug's cable shall be flexible multi-conductor, flame retardant and number coded (LiYCY or equivalent per IEC 60502-1)	Of type Nx1,5mm^2, length ≥10m (15m for the extended RTU model), where N≥12 and equals the connector's number of pins		
45.	(2)	RTU's external cabinet has openings through the bottom secured with appropriate cable glands.			
46.	(2)	Appropriate number of analog and digital inputs and outputs, utilizing terminal blocks (see §4.2), are available in the Controller compartment for incoming cables (detailed signaling in §6.4).			
47.	(2)	The RTU's external cabinet has at least			

		the openings shown in Table 2.			
	4.2	**<u>Internal cable terminations</u>**			
48.		The RTUs shall be delivered with the incoming wires from all the connectors already terminated to an appropriate terminal block. Unused (spare) pins of the connectors are connected to this terminal block inside the RTU, for future use.			
49.		The terminal blocks inside the RTU are clearly marked, documented and easily accessible. The terminal block's signal assignments shall be finalized in cooperation with the Contractor.			
50.		The RTUs shall be offered with the terminal block already wired to the Controller, for the basic configuration of three LBs (eight for the extended RTU model).			
51.		All terminal strips, that are to accommodate Input/Output signals from/to LB cluster and external auxiliary devices, are plug-in or screw type terminal strips of ≥2,5mm2 cross section, except from the terminal strip that shall accommodate the secondary windings of the CTs (if applicable) of par. 6.2.2.1 which shall be terminal strip of ≥4mm2 cross section (1.5 mm2 in the case of use of current sensors with built-in transducers or with a rated current ≤ 20mA in the secondary winding). This requirement does not apply to: • Ethernet cabling to Communication module • Control panel I/O cabling • Temperature sensing ports (dedicated analog inputs and relevant 24 VDC outputs of par.6.2.2.3 are excluded)			
52.		Cable routing is performed in a way that ensures an easy access to them and does not obstruct the door openings.			
	5	**<u>EARTHING</u>**			
53.		There is electrical continuity of all electrically conductive exposed parts. Especially, between the conductive parts of the door and the body of each cabinet shall be provided conductive grounding joint.			
54.		Earthing terminals are fitted to all metallic equipment.			
55.		The earthing terminal that is provided for connecting the RTU metal work and mounting frame to the substations's earthing system is suitable for accommodating a 16 mm^2 Cu conductor.			
	6	**<u>RTU FUNCTIONALITY</u>**			
	6.1	**<u>General requirements</u>**			
56.		The RTU is of a modular design, capable of monitoring and controlling 2 to 4 LBs (standard version) and monitoring			

		corresponding MV 3-phase underground lines and the LV lines from the transformer(-s), in terms of voltage and current measurements and detection of fault currents. The special version of this RTU (extended version) has the capability of monitoring and controlling up to 8 (eight) LBs at the substation.			
57.		Standard version RTUs shall be supplied for monitoring and control of 3 (three) LBs and designated as "Type 1" and "Type 2" for the control of 48VDC and 24VDC LBs, respectively. The extended version RTUs shall be supplied for monitoring and control of 8 (eight) LBs, and designated as "Type 3" and "Type 4" for the control of 48VDC and 24VDC LBs, respectively.			
58.		The contractor has ensured that the conversion of RTU from one type to another (e.g. from 3 into 4,3 into 2 or 8 into 7 controlled LBs) is a well-documented and technically accepted procedure. Related parts (e.g. Expansion modules, current or voltage sets, etc.) are included in the spare parts list (see chapter 14) along with detailed documentation about the technical characteristics and the conversion process.			
59.		The RTU monitors the status of the external equipment, e.g. communication module and the internal equipment, e.g. power supply, battery (-ies).			
60.		The RTU monitors the Controller itself, via an embedded watchdog service.			
61.		Logged events include internal faults (Controller, ADU), external device (LB, auxiliary devices) change of status, local/remote control assumption, communication with CCS failures, etc. These events, depending on user settings, shall be transmitted to the CCS: • at configurable regular time intervals, • at each interrogation from CCS or • immediately after their generation.			
62.		The RTU is designed for: • Implementation of SCADA functions • Electrical Measurements (current and voltage vectors and derived quantities cosφ, active and reactive power) • Monitoring the qualitative characteristics of the above-mentioned electrical quantities in the LV side of the transformer(-s) • Detection of fault currents in MV & LV lines.			
63.		The local or remote parameterization of the RTU involves the designation of the I/O status changes – the status of certain inputs or outputs - that lead to the automatic energization of certain	Utilizing IEC 61131-3 (PLC) or equivalent functionality.		

		RTU functions and outputs.			
	6.1.1	**<u>Monitoring requirements</u>**			
	6.1.1.1	**<u>LB monitoring</u>**			
64.		**For every LB** the RTU will monitor the following:			
65.		• The change of the state of the LB (open-close)			
66.		• The Ground switch position (on/off)			
67.		• Two (2) auxiliary digital signals			
	6.1.1.2	**<u>Analog data monitoring (ADU)</u>**			
68.		The RTU via the ADU performs MV and LV line current measurements (§6.2.2.1 of the TD).			
69.		The RTU via the ADU performs voltage measurements and monitors harmonics, voltage dip and swells, voltage interruptions, frequency and voltage unbalances at the LV side of the transformer (-s).	according to EN50160 & IEC 61000-4-30 class S		
70.		The RTU via the ADU performs power measurements at the LV side of the transformer (-s) using the current and voltage measurements. Power measurement, including the calculated active power, reactive power and energy, is performed in the four quadrants.	in accordance with IEC 61557-12 and IEC 62586-PQI-S or IEEE 1159 for the power quality.		
71.		The RTU via the ADU performs temperature measurements.	Per §6.1.1.3d of TD.		
	6.1.1.3	**<u>RTU monitoring function</u>**			
72.		Equipment's firmware performs extensive self-checking via monitoring the following functions. Relevant alarms and diagnostics shall be transmitted to the CCS.	Per §6.4.		
73.		• Presence of 230V AC external supply			
74.		• DC Output presence for LB switchgear control			
75.		• Internal Software or Hardware hang-ups or freezes (watchdog). In such an event, RTU shall perform a restart.			
76.		• Temperature threshold overrun by measurements from sensor inside controller compartment (which is included in the offered RTU) and from external sensor connected to the port of §6.2.2.3 (ADU).			
77.		• Κατάσταση συσσωρευτών (μέσω μέτρησης της στάθμης τάσης τους)			
78.		• Status of battery by measurement of its voltage	Per §9.3 of TD.		
79.		• Communication status with the CCS per §6.1.2.2d	Restart of communication module after successive (configurable) number of failures to communicate		

			with CCS		
80.		• The status of the RTU control (Local/Remote)			
81.		• Signaling voltage presence to the digital inputs			
82.		• ADU health status	Concerning any malfunction of ADU		
83.		• RTU's external door status (open/close)			
84.		• Data & Communication -security related activity			
85.		• RTU AC Power supply unit health status			
	6.1.1.4	**MV & LV line fault detection**			
86.		The RTU through the ADU shall monitor the MV lines connected to the controlled LBs and the LV line (-s) from the transformer (-s) to the LV switchboard (-s) for detection of power-line faults (short circuits either phase to phase or phase to ground) and other faults stated in par. 6.2.2.1 and par. 6.2.2.2	Per §6.4.		
87.		The current, voltage and time limits that distinguish a fault from normal operation are user-adjustable.			
88.		The ADU detects the inrush current by evaluating the ratio of second harmonic or by another scientifically proven method and not by applying a delay on the detection sensing time on power recovery.			
	6.1.2	**Control requirements**			
	6.1.2.1	**LB control**			
89.		**For every LB** the RTU shall control the status of the LB (opening-closing). The operation commands shall be given either locally or remotely from the CCS. Separate outputs shall be used for each command per LB.			
90.		The following local operation modes shall be included:			
91.		• Immediate LB operation only after the user presses the LB selecting switch and – without releasing it – subsequently presses the corresponding operation switch. In the case of a touchscreen, sequential pressing of these buttons is acceptable.			
92.		• Delayed LB operation. The time delay for the local LB operation shall be set from the control panel, from 0 to at least 60 sec in user adjustable steps.			
93.		LB max operation time shall be adjustable at least in the range from 3 to 10sec in user adjustable steps. The time adjustment shall be done by software remotely and locally.			
	6.1.2.2	**Additional required control signals**			

94.		• Time synchronization from the communication with the CCS. (See chapter 7)			
95.		• Battery load test command issued at least remotely. (See chapter 9).			
96.		• Commands for changing the settings of the RTU (See §6.3, 7.1, 8.3, 19.a, 19.b).			
97.		• Restarting communication module by temporarily cutting power to 12V output. This shall be issued from the Controller, after successive failures to communicate with CCS. The number of failures shall be configurable.			
	6.2	**<u>Additional requirements</u>**			
	6.2.1	**<u>Digital I/O</u>**			
98.		The inputs and outputs of Table 3 of TD are provided for external device monitor or control.			
99.		LB cluster signaling voltage shall be supplied by the RTU.			
100.		The inputs of Table 3 support external DC signaling voltages DC≤60V.			
	6.2.2	**<u>Analog inputs</u>**			
101.		All analog signal ports have reverse input protection (where applicable), at least 12-bit digital resolution and shall be electrically isolated up to at least 1,0kV rms AC between input and power circuit's ground.			
102.		Analog input characteristics, such as jitter correction and delta variation shall be locally or remotely configurable (this requirement does not apply to the RTD or thermistor or thermocouple sensor inputs of par. 6.2.2.3).			
	6.2.2.1	**<u>ADU current measurement and fault detection</u>**			
103.		The RTU shall provide per controlled LB three (3) (or 4 if an additional residual current sensor is used) current measurements (one on each MV line phase conductor) through the use of a set of respective current sensors and appropriate analog inputs.			
104.		The RTU shall provide current measurements at the LV side (-s) of the single transformer installed (standard RTU version) or the two transformers installed (extended RTU version).			
105.		For the MV line measurements, the standard version of the RTU has at least 9 inputs from corresponding current sensors, expandable to 12 (respectively 12 and 16 if an additional residual current sensor is used). The extended version has at least 24 inputs from corresponding current sensors (or 32 if an additional residual current sensor is used).			
106.		For the power quality line measurements at the LV side (-s) of the single			

		transformer installed (standard RTU version) or the two transformers installed (extended RTU version), the RTU has 3 and 6 inputs from corresponding current sensors, respectively.			
107.		Acceptable sensors in any case are: • Current transformers (CT) with 20mA to 5A secondary windings • Current transformers with embedded transducers powered by the RTU with output of at least one of the following standards: 0..20mA, 4..20mA, 0-10V DC or rated output in the range 0…20 V AC. The power supply of the transducers is included in the scope of this tender.			
108.		Sensors offered are compatible with the respective analog inputs of the RTU.			
109.		In case CTs with 20mA to 5A secondary windings are offered, the respective analog inputs (CT terminals) of the RTU shall employ appropriate insulated jumpers (bridges) for short circuiting of each CT terminal. These jumpers can be omitted only if the current sensors have suitable provision against the development of dangerous voltages at the ends of their windings, e.g. through the use of a diode.			
110.		The number of current sensor sets provided with each RTU equals the default number of LBs controlled and the LV 3-phase lines monitored, namely three (3) MV sets and one (1) LV set for the standard and eight (8) MV sets and two (2) LV sets for the extended RTU model.			
111.		The sensors are suitable for installation on MV cables (LV cables for the power quality and fault detection at the LV side of each transformer), rated at 50Hz and compliant with the requirements of the standards of the IEC61869 series, where applicable.			
112.		1-phase **MV-side** current sensors have the following characteristics:			
113.		• MV Cable type Split-Core CT			
114.		• Window	≥40mm		
115.		• Primary Nominal Current(In)	In the range 400-600A		
116.		• Precision Class	1 or better		
117.		• Overcurrent precision factor	FS2 or FS5 or better		
118.		• Signal Line Length (between RTU and CT)	At least 10m per CT (15m for the extended RTU model)		
119.		• Operating Temperature	-10 to 55 °C		
120.		• Residual Current Sensors have the following characteristics:			
121.		• MV Cable type Split-Core CT			
122.		• Window	≥150mm		
123.		• Primary Nominal Current(In)	In the range 10-40A		
124.		• Precision Class	1 or better		

125.		• Overcurrent precision factor	FS2 or FS5 or better		
126.		• Signal Line Length (between RTU and CT)	At least 10m per CT (15m for the extended RTU model)		
127.		• Operating Temperature	-10 to 55 °C		
128.		1-phase **LV-side** current sensors shall have the following characteristics:			
129.		• LV Cable type Split-Core CT			
130.		• Window	≥80mm		
131.		• Primary Nominal Current(In)	In the range 900-1000A		
132.		• Precision Class	1 or better		
133.		• Overcurrent precision factor	FS2 or FS5 or better		
134.		• Signal Line Length (between RTU and CT)	At least 10m per CT (15m for the extended RTU model)		
135.		• Operating Temperature	-10 to 55 °C		
136.		Faults (current or voltage) in conjunction with the voltage measurements of paragraph 6.2.2.2 (where applicable) are detected according to ANSI standard detection curves:			
137.		• ANSI 50/51 for phase overcurrent fault detection at the MV side and at the LV side of the transformer			
138.		• ANSI 50N / 51N for phase to earth overcurrent fault detection at the MV side and at the LV side of the transformer			
139.		• ANSI 47 or ANSI 46BC for broken conductor check at the LV side of the transformer			
140.		• ANSI 27/59 for phase undervoltage/overvoltage at the LV side of the transformer			
141.		The RTU supports directional overcurrent detection at the MV side, to be applied in the future at substations where LBs employ suitable measurement VTs. The detection, using 3 single-phase inputs of paragraph 6.2.2.2, shall be based on standard ANSI curves:			
142.		• ANSI 67 for directional phase overcurrent fault detection			
143.		• ANSI 67N for directional phase to earth overcurrent fault detection			
144.		For each detection scheme at least 2 groups of settings are provided.			
145.		Each group's settings are fully adjustable regarding current and voltage deviation settings and operating time.			
146.		Faults of permanent and transient type shall be discriminated and if selected during the parameterization, they shall be transmitted to CCS			
	6.2.2.2	**ADU Voltage measurement**			
147.		The RTU has at least the following analog inputs, which shall be used to identify current and voltage faults, for voltage quality measurements and power measurements (par. 6.1.1.2):			

		• Three (3) 1-phase voltage inputs for LV power quality measurements and fault detection, expandable to six (6) for the standard version of the RTU • Six (6) 1-phase voltage inputs for LV power quality measurements and fault detection, expandable to nine (9) for the extended version of the RTU, all supporting 100V - 230V AC for the connection to the LV side of the transformer(-s) of the substation or to the output of MV voltage sensors respectively, that may be present in LBs' cubicles. The expandability of the voltage inputs is required if future controlled LBs employ measuring VTs thus providing a reference voltage for the detection at the MV side of directional phase overcurrent faults (according to ANSI 67 & 67N), broken conductor (according to ANSI 46 or 46BC) and undervoltage/ overvoltage (according to ANSI 27/59).			
148.		The configuration of the analog inputs, as a part of the parameterization process, involves at least the following:			
149.		• Type of input signal (voltage, current, range, etc.)			
150.		• Phase correction of -180° : +180°			
151.		• Magnitude correction			
	6.2.2.3	**<u>ADU Spare inputs</u>**			
152.		The RTU has one (two for the extended RTU model) RTD or thermistor or thermocouple sensor input, in order to measure temperatures such as ambient air, or transformer oil temperatures. This (-ese) port(-s) is(are) different from the port used for temperature sensing inside of controller compartment. Alternatively, the replacement of any of these temperature sensing ports with dedicated analog input(-s) (supporting 4…20mA DC standard) is also acceptable. In this case, a special 24VDC output per such analog input shall be provided in the RTU, in respect to the requirements of par.9.1, for the supply of the current loop.			
153.		The configuration involves, through the selection of user-identified set-points, the automatic energization of certain outputs, utilizing IEC 61131-3 (PLC) or equivalent functionality.			
	6.2.3	**<u>Local Communication</u>**			
154.		The RTU has an Ethernet port (Communication port) suitable for its communication with the communication module.	Per §8.1 of TD.		
155.		The Communication port is used at the same time for protocol communication with the SCADA system and for remote			

		configuration of RTUs operational parameters and protocol configuration (ModBus and IEC 60870-5-104).			
156.		An additional port (IED port) is available on the RTU for future IED integration.	Interface Ethernet 100 Base-TX or RS-485		
157.		The IED port utilizes Modbus based on Ethernet 100 Base-TX or RS-485 standard interfaces (Modbus TCP or RTU, respectively).			
158.		The RTU accommodates a port (Setup/Diagnostics port) for the communication with a portable PC on-site.	USB and/or Ethernet interfaces.		
159.		The use of Setup/Diagnostics port is for troubleshooting, local RTU's parameter configuration, logged event list downloading, maintenance and firmware update purposes.			
160.		The Communication Port, the IED Port and the Setup/Diagnostics Port are standard electrically isolated ports.			
	6.2.4	**Local Distribution Automation Functions**			
161.		The RTU's firmware includes the functionality of programming Automation Functions, e.g. between compatible equipment in adjacent substations.			
162.		The RTU is fully compliant with IEC-61850, which is embedded in the RTU's firmware (GOOSE messaging can be excluded) without the need for additional license purchasing.			
163.		Programming per RTU (or group of RTUs) of simple or complex functions is executed by the configuration tool of §7.1.			
	6.3	**Control Panel**			
164.		The control panel resides either on the controller's external enclosure's front door (thereby meeting the IP, IK and flammability requirements of the enclosure) or inside the Controller's compartment as a part of the Controller itself.	Control panel on the RTU's external enclosure: At least IP4X per IEC 60529 and IK07 per IEC 62262:2002 (In case of thermoplastic casing flammability rating ≥650°C per IEC 60695-2-11:2014)		
165.		The control panel is equipped with appropriate control buttons and indicators (LEDs) or a built-in touch-screen or a combination of them.			
166.		The RTU LOCAL/REMOTE function is operated by a switch and its status is indicated by a LED.			
167.		The control panel is able to operate in the environmental conditions of §2.2 (detailed documentation is required to prove this argument).			
168.		The control panel is equipped with:			

169.		• A switch for LOCAL / REMOTE operation of the RTU.			
170.		• LEDs to indicate the control status of the RTU (LOCAL, REMOTE), the control status of the LB cluster(s) (LOCAL, REMOTE), the health status of the RTU, of the battery(-ies), the positions of the LBs and earth switches (§0) and the presence of the supply voltages (mains 230V, LB operating and signalling).			
171.		• Buttons (or other means) for LB operation.			
172.		• Button (or other means) for "restarting" the RTU and all the subsystems, including the communication module. Alternatively, this is allowed to be placed inside the controller's compartment.	Per §9.4 of TD.		
173.		• Ports mentioned in §6.2.3 (it is also acceptable that these are inside the controller's compartment, clearly marked).			
174.		In LOCAL position the RTU shall not execute incoming commands from CCS.			
	7	**Configuration - Memory**			
	7.1	**Configuration**			
175.		The RTU is configurable locally and remotely.			
176.		The parameters that are listed in Table 5 of TD are configurable.			
177.		A configuration tool, based on PC and fully compatible with concurrent Microsoft® Windows versions, is provided for configuration of the RTU. This tool shall be connected locally or remotely to update the RTU's firmware and download or upload the configuration into the RTU. This procedure shall be able to be performed in parallel with the SCADA protocol communication. Locally the PC where the maintenance tool is installed is connected to the RTU through the Setup/Diagnostics port (See §6.2.3).			
178.		In case of licensed software for the configuration tool, six (6) licenses shall be offered with the RTU.			
179.		A webserver is integrated into the RTU and shall provide facilities for maintenance, settings - including data & communication security settings (see §8.2) - and historical logs management.			
180.		The Webserver shall be accessible locally and remotely, by means of a standard laptop PC, through the Setup/Diagnostics port (See §6.2.3).			
181.		In the environment of the webserver and the configuration tool, markings, messages, commands shall be in English with the ability to use Greek.			

	7.2	**<u>Memory</u>**			
182.		The RTU provides storage of at least 5.000 time-tagged events in an internal non-volatile memory. These events will be all the state changes and alarms (internal and external), the switchgear operations, changes to operating parameters and settings and ADU logged data.			
183.		The RTU employs an internal time stamping method (Event Log) for these events and alarms as well as an internal battery or super-capacitor backed-up real-time clock (expected battery life > 10 years).			
184.		All events are written to the Event Log in chronological order. Time resolution is no more than 1 msec.			
185.		Log files are produced in non-proprietary wide-spread formats. They shall be available for download remotely from CCS.			
186.		Synchronization of the RTU's internal clock with that of the CCS shall be done in regular configurable time intervals with appropriate messages issued by the CCS either via the SCADA protocol or SNTP.			
187.		The local user shall have access to the time settings and the alarm and event list through a portable PC (using Diagnostics port, see §6.2.3)			
	8	**<u>Communication</u>**			
	8.1	**<u>Means of Communication</u>**			
188.		The equipment (RTU) communicates with the Central Control System (CCS) of a SCADA via GPRS or DSL connections using the IEC 60870-5-104 protocol.			
189.		The RTU provides the necessary DC operating power for this communication module (par. 9.4) and also has an Ethernet port that shall be used for the communication with this module (§6.2.3).			
190.		RTU shall try to establish communication with CCS under the following conditions:			
191.		• CCS interrogates RTU			
192.		• At configurable time intervals.			
193.		• In case of an alarm condition.			
194.		The tender documentation includes a description of the procedure that the RTU follows in order to detect loss of communication with the CCS and subsequently restart the communication module.			
	8.2	**<u>Data and Communication Security</u>**			
195.		The RTU employs secure access based on RBAC, compatible with a full centralized RBAC management.			
196.		At least the following functions and data			

		shall be controlled through RBAC:			
197.		• Configuration files			
198.		• Software update			
199.		• User management			
200.		• Executing program or shell command			
201.		• I/O on local maintenance access			
202.		Local and remote access connection shall be secured for maintenance (locally and remotely) with HTTPS, SFTP or FTPS, IPSEC and SSH protocols			
203.		The RTU service application supports individual user passwords and enforces a high complexity of passwords. The RTU shall lock the access after several password errors (configurable).			
204.		The RTU does not contain, by default, active default, guest and anonymous accounts.			
205.		All remote access to root accounts on the RTU is, by default, disabled. All Vendor-owned accounts, where feasible, are removed.			
206.		The list of all accounts on the RTU shall be provided by the Supplier.			
207.		The RTU provides a local audit trail for all security events that occur. Security events shall be logged locally in a dedicated security log or/and on a server.			
208.		Log files are produced in non-proprietary wide-spread formats.			
209.		The RTU supports local and remote firmware updates, through the use of a configuration tool or a webserver (per.§7.1), utilizing the security protocols HTTPS, SFTP or FTPS, IPSEC και SSH.			
	8.3	**Communication with existing central control systems**			
210.		Communication with the 2 SCADA systems (EFACEC SCATEX+ - 60780-5-104, Telegyr TG8000 - IEC 60780-5-101 through the protocol converter of §8.4)			
211.		Every RTU is assigned with a unique combination of the Application/ASDU Address and the Link/Device Address			
212.		After a selectable time interval, SCADA interrogates each RTU. The RTU responds to these requests and transmits alarms when generated.			
213.		Each data type is individually configurable to be sent or not to the SCADA.			
	8.4	**Protocol Converter (Gateway) – Requirements:**			
214.		1. Conversion of the IEC 60870-5-104 RTU protocol to IEC 60870-5-101 of Telegyr TG8000 SCADA system.			
215.		2. Each protocol converter (Gateway) is able to communicate with and manage the data from at least 40 RTUs.			
216.		3. The Gateway has at least 2 LAN ports available to communicate with			

		the RTUs using a GPRS Router or a DSL internet VPN connection.			
217.		4. The protocol converter (Gateway) is configurable with PC based software. The software package is provided by the Supplier with the Gateways. The configuration shal be saved in the PC as a portable file and can be downloaded and uploaded from Gateway by the user.			
218.		5. Functions: a. Communication frame monitoring for master and slave protocol. b. Modem operation status monitoring. c. Internal database monitoring. d. Internal database event display. e. Internal database and communication protocols setting. f. Interrogate, upon start, of secondary substation status in case of gateway power down or restart. During this procedure the Gateway shall broadcast to SCADA system all entities as invalid, until the interrogation procedure is complete.			
	8.5	**<u>Routers</u>**			
219.		The following are stated in the bidder's offer:			
220.		• A verification of acceptance of routers with nominal power consumption of 10 W without affecting the battery autonomy or the operating temperature range.			
221.		• Availability of 12VDC power supply and a separate resettable 1.5A fuse, for the router (see §9.1, 9.4).			
222.		• LAN port interface specifications.			
223.		• The minimum TCP IP Network characteristics, if required, such as the bandwidth, throughput, latency, jitter and error rates.			
224.		• Any other parameters requirements necessary for the compatibility of the communication infrastructure.			
	9	**<u>Power supply</u>**			
	9.1	**<u>General</u>**			
225.		The RTU is suitable for electrical supply by the substation's low voltage (230V/50Hz).			
226.		The RTU is surge protected against voltage spikes as per T2 & T3 classification of IEC 61643-11 and protected against neutral cutout.			
227.		The RTU has adequate power supply in order to provide power to separate circuits for:			
228.		• charging of the batteries			
229.		• control voltage for the LBs			
230.		• signaling voltage, for wet digital			

		inputs			
231.		• 24VDC supply for 4-20mA analog input(-s) of par. 6.2.2.3	If applicable		
232.		• operational voltage for the communication module and			
233.		• the local controller itself.			
234.		Each abovementioned circuit has its own overcurrent protection, which may involve self-resetting devices (employing for example PTC thermistors) in line with a mandatory hand-resettable device. This device, which is commercially available and not be of a proprietary design, is either a thermal magnetic circuit breaker or a changeable fuse.			
235.		All DC circuits are protected against reverse polarity input.			
236.		The power supply circuitry is equipped with over-power and over-temperature protection.			
237.		The simultaneous charging of the batteries and the control operation of the LBs do not have an effect on the RTU operation.	Confirmation from a manufacturer's brochure or certificate is required.		
238.		The Power supply's status shall be monitored and in case of malfunction, relevant alarm shall be sent to CCS.			
	9.2	**<u>LB control output</u>**			
239.		The RTU is suitable for supplying sufficient current (DC) for one LB operation at a time.	~ 12A (~ 5-10ms from 0A to peak during the LB's solenoid operation) followed by constant current ~6A (~2-8sec duration, depending on the manufacturer). These figures stand for both 24V & 48VDC LB clusters.		
240.		The contractor has ensured that:			
241.		• either the conversion of one type to another (48 to 24V and vice versa) is a well-documented and technically accepted procedure. Related parts (e.g. Power Supply, etc.) shall be included in the spare parts list (see chapter 14) along with detailed documentation about the technical characteristics and the conversion process. • or the RTU inherently supports both voltages, set locally by e.g. a dip switch or via the parameterization process (locally, via the control panel only).			
	9.3	**<u>Electrical Supply Backup system</u>**			
242.		In case of 230VAC network power failure, there is suitable battery supply for the RTU's continuous supply.			

243.		Means for the recharging of the battery(-ies) are included in the RTU and employ temperature-compensated battery charging method. The charger is able to keep the battery(-ies) constantly fully charged with minimal loss of its(their) life (float charge mode).			
244.		The charger satisfies the requirements of both, the battery and the load.			
245.		Over-charge protection is implemented in the charger..			
246.		Batteries shall not be recharged when battery temperature exceeds 50°C ± 3°C.			
247.		Recharge time for the battery(-ies), from "protective low-cutoff" to 80% or more of full battery charge capacity, shall not exceed ten (10) hours.			
248.		The RTU only uses batteries of the following type: nominal voltage of 12V, deep cycle and sealed prismatic lead-calcium based AGM/VRLA (Absorbed Glass Valve Regulated Lead Acid). The production date of the batteries is clearly marked on their casing and is not more than 6 months earlier than the date of delivery of their respective RTUs.			
249.		Batteries delivered, are certified by the manufacturer to operate over a wide temperature range. They have a design life expectancy of at least 5 years at 20°C operating temperature.	from –10 °C to +55 °C. Confirmation from a manufacturer's brochure or certificate is required.		
250.		Batteries delivered, shall be pre-installed into the respective compartment, but with their terminals not connected.			
251.		The batteries comply with IEC 60896 Part 21 & 22 and have adequate capacity: • to supply the operation of the RTU and communication system for at least 24 hours without charging (i.e. with AC supply OFF). • to perform at least 8 cycles of operations (1 cycle = open & close or vice versa) on the LB cluster that is controlled by the RTU during the above time interval. (Documentation of discharge charts and capacity/temperature is required).	A detailed calculation or confirmation from manufacturer's brochure or certificate is required.		
252.		Automatic battery cut-off circuit (protective low-cutoff) is provided in the RTU. It operates when the battery DC voltage drops below the safety limit (deep discharge), which may damage the batteries. Appropriate alarm shall be generated and transmitted (several minutes before the cut-off) to the CCS.			
253.		The battery system incorporates a temperature compensated battery load test facility, which on-demand (locally or remotely) or at preset time intervals: • draws power needed for RTU's and external devices' operation for a preset time duration from the battery(-ies) and			

		• monitors the battery's(-ies') voltage drop during this time.			
254.		Apart from the load test, the voltage across the battery terminals is monitored at configurable time intervals.			
255.		The battery types provided shall have such external dimensions and electrical characteristics, as of batteries commercially available and not be of a proprietary design.			
	9.4	**<u>Communication module</u>**			
256.		A 12 VDC power supply is provided for the communication module. It is monitored and controlled locally or remotely.	Per §8.5 of TD.		
257.		In case of a configurable number of successive communication failures with the CCS, RTU shall cut the power to this output for a few seconds and then resupply the module.			
258.		Restarting the RTU (locally or remotely) involves cutting the communication module power supply.			
	10	**<u>Extended version of RTU</u>**			
259.		A special version of the RTU shall be offered with the capability of monitoring and controlling up to 8 (eight) LBs at the substation (extended version). The extended version RTUs that will be supplied shall be fully configured for monitoring and control of 8 (eight) LBs.			
260.		It is permissible to separate the extended version of RTU into two sections (e.g. via master-slave mode), each of which shall be located in its own outer casing with its own control panel and shall control and monitor 4 LBs with the corresponding MV lines and LV side, under the following conditions:			
261.		• the two sections shall be displayed and managed in the CCS functionally unified as a unit			
262.		• the maximum dimensions of the table of par. 2.3 and of paragraph 268 and the maximum weight of paragraph 267, for the whole of the two sections are applied.			
263.		• there is one connection with the communication unit for these two sections			
264.		• the connection between the two sections, which is included in the scope of supply, must be in accordance with the IP, IK and flammability requirements of par. 3.			
265.		All requirements of this Questionnaire apply also for the extended RTU model, unless otherwise explicitly stated.			
266.		The extended version RTU external cabinet's weight and height do not exceed the following value:	Max value for RTU, excluding batteries weight.		
267.		• Weight (kg)	≤55		

268.		• Height	≤120		
269.		One external battery compartment is allowed. Its weight shall not exceed the following value:	Maximum value of external battery compartment with batteries weight included..		
270.		• Weight (kg)	≤55		
271.		The extended version RTU minimum number of LB open-close cycles under battery supply only exceeds or equals the following value:	For battery capacity calculation.		
272.		• Minimum number of LB open-close cycles	12		
	12	**PORTABLE PCS**			
273.		• Rugged type	Operating conditions: -10 to +55 oC		

274.		• Screen:
		  • Size: at least 14", maximum 15”
		  • Resolution : Full HD or better
		  • Brightness: at least 220 Nits.
		Optional touch screen as long as it does not affect the brightness specifications			

275.		• Features:
		  • Processor: i5 or better
		  • HDMI port: 1 (with adapter if needed)
		  • HDD: SSD, 256GB minimum
		  • Memory: 8GB minimum
		  • Battery life: 8 hours (as stated by the manufacturer on official brochures or website)
		  • USB 3.0 ports: 2
		  • Weight: 3000gr maximum
		  • RS-232 port or USB to Serial adaptor compatible with the offered equipment (RTU, simulators, gateway etc.)			

276.		• Keyboard:
		  • Illuminated
		  • Greek characters
		  • Detachable keyboard as option, is accepted, if it does not affect the weight specifications			

277.		• Operating system: Microsoft Windows®			
	13	**FUNCTION SIMULATING DEVICES**			
278.		Portable LB and MV line fault simulator equipment accompanied by the necessary usage licenses is provided with the offered RTUs.			
279.		The simulators input to the RTU, all the digital indications of the status of the LBs (§6.1.1.1) and the MV line measurements (§6.1.1.2) by injection of voltage and current directly into the analog inputs and simultaneously simulate the outputs to the LBs (§6.1.2.1).			
280.		The simulators bear additional inputs and outputs in order to meet the requirements of paragraph §6.2.1.			

281.		The simulation equipment shall execute all commands available for the LBs and shall provide feedback to the controller of the status of the LBs.			
	19	**NAMEPLATES AND MARKING**			
282.		The RTU shall have a name plate, mentioning the nominal values, with sufficient resistance to environmental conditions, visible when the RTU is in normal operating position, with engraved or indelible characters.			
283.		The RTU's nameplate includes at least the following data: • Name or trademark and address and phone of the manufacturer. • Date of manufacture, product type and serial number • Contract number • Rated input voltage (V) • Rated continuous current (A) • Rated frequency (Hz) • Rated batteries type, max capacity (Ah or Wh) and voltage (V) • Weight (batteries included) (kg)			
	20	**PACKING**			
284.		The equipment shall be packaged according to the specifications of the TD. Each RTU and set of current sensors shall be accompanied, in its individual packaging, by a brochure which will indicate what the documentation include.	Όπως αναγράφεται στην αντίστοιχη § της Τ.Π.		