

## Annex 1.2: Schedule of Requirements Table

### LOT2 DISTRIBUTION: PLC Hybrid

LOT 2:		Total	
DISTRIBUTION: PLC Hybrid	1 phase	3 phase direct connection	
Total Meters	2353	78	
Total Concentrators	31		

### Smart Meters

REQUIRED SPECIFICATIONS		
Specifications	Smart meters, single-phase	Smart meters, three-phase direct connected
Accuracy class: for Active Energy for Reactive Energy	B 2	B 2
Reference current	min. 5 A	min. 5 A
Maximum current, Iref	min. 60 A	min. 80 A
Minimum current	0.05 Iref for active / 0.05 Iref for reactive	0.05 Iref for active / 0.05 Iref for reactive
Reference voltage, Un	230 V	3×230/400 V
Reference frequency	50 Hz (± 2 %)	50 Hz (± 2 %)
Inherent consumption (EN 50470-3 , IEC 62053/21-22-23, IEC 62053-61, without communications overhead) of current circuit, not more than of voltage circuit, not more than	1 VA 2 W / 10 VA	1 VA 2 W / 10 VA per phase
Inherent consumption of voltage circuit (IEC 62052-11, IEC 62053/21-22-23, IEC 62053-61, including communication overhead), not more than	5 W / 10 VA	3 W / 10 VA per phase
Internal clock accuracy (IEC 62052-21)	≤ 0.5 s / 24 h	≤ 0.5 s / 24 h
Insulation strength (IEC 61010-1-90)	4 kV, 50 Hz, 1 min	4 kV, 50 Hz, 1 min
Shock voltage (IEC 60060-1)	6 kV, 1.2/50 μs	6 kV, 1.2/50 μs
Electrostatic discharge (IEC 61000-4-2)	15 kV	15 kV
High frequency radiant field (IEC 61000-4-3)	≥ 30 V/m	≥ 30 V/m
High frequency interferences (IEC 6100-4-4)	4 kV	4 kV
Surge immunity test (IEC 6100-4-5)	6 kV	6 kV

IP rating	IP54	IP54
Mechanical class	min. M1	min. M1
MTL (Mean Total Lifetime)	not less 15 years	not less 15 years
MTBF (Mean Time Before Fail)	less than / year 0.5%	less than / year 0.5%
<b>CERTIFICATES</b>		
Specifications	<b>Smart meters, single-phase</b>	<b>Smart meters, three-phase direct connected</b>
MID certificate	Should be issued by European recognized lab	
PLC certificate	PLC PRIME 1.3.6 and 1.4	
Production certificate	According to MID (mode D)	
ISO	9001	
<b>FUNCTIONAL SPECIFICATIONS - METERING PARAMETERS</b>	<b>REQUIRED SPECIFICATIONS</b>	
Specifications	<b>Smart meters, single-phase</b>	<b>Smart meters, three-phase direct connected</b>
METERING DATA	<ul style="list-style-type: none"> <li>- Actual meter readings;</li> <li>- Periodic (billing) meter readings: Day, month;</li> <li>- Interval meter readings: 15', 30', 60'; day</li> <li>- Timestamp.</li> </ul>	
MULTI-RATE METERING	<ul style="list-style-type: none"> <li>- Up to 4 tariff registers, flexible adjustment of tariff intervals;</li> <li>- Min. 4 changeovers per day;</li> <li>- Tariff indicator is displayed on LCD and transmitted to an external system;</li> <li>- Active and passive tariff plans, configurable activation time of the passive tariff plan.</li> </ul>	
MEASURED VALUES	<ul style="list-style-type: none"> <li>- Active energy, class B, export/import;</li> <li>- Reactive energy, class 2, 4 quadrants;</li> <li>- Apparent energy;</li> <li>- Active/reactive power, apparent power;</li> <li>- Phase voltage/current, instantaneous value (True RMS, integration period 1 s);</li> <li>- Voltage angle values relative to the voltage in first phase and phase currents relative to relevant phase voltages.</li> </ul>	
METERING CALENDAR	<ul style="list-style-type: none"> <li>- Up to 4 seasons per year;</li> <li>- Up to 7 daily profiles per week;</li> <li>- Up to 30 special days per year;</li> <li>- Support of movable holidays.</li> </ul>	
DATA STORAGE	<ul style="list-style-type: none"> <li>- Non-volatile memory;</li> <li>- Not less than 3 interval profiles and 1 billing profile.</li> <li>- Storage capacity: <ul style="list-style-type: none"> <li>- 15 minutes interval profile: not less than 45 days for 6 parameters</li> <li>- Asynchronous profile (spontaneous events), last entries data.</li> </ul> </li> </ul>	
OPERATING MODES	<ul style="list-style-type: none"> <li>- Normal mode;</li> <li>- Energy saving mode - real time clock, opening sensors, and data displaying are active.</li> </ul>	
POWER QUALITY CONTROL	<ul style="list-style-type: none"> <li>- Quality indexes: <ul style="list-style-type: none"> <li>✓ average voltage;</li> <li>✓ voltage sags and swells;</li> <li>✓ outages;</li> <li>✓ network frequency;</li> <li>✓ THD for voltage/current harmonics;</li> </ul> </li> <li>- Remote or local configuring of parameters thresholds and control actions.</li> </ul>	
<b>FUNCTIONAL SPECIFICATIONS - MANAGEMENT AND CONTROL PARAMETERS</b>	<b>REQUIRED SPECIFICATIONS</b>	

Specifications	Smart meters, single-phase	Smart meters, three-phase direct connected
DLMS/COSEM SUPPORT	<ul style="list-style-type: none"> <li>- IEC 62056 compliant;</li> <li>- Object Identification System compliant;</li> <li>- Standard data models;</li> <li>- Standard communications protocols.</li> </ul>	
DATA TRANSMISSION	<ul style="list-style-type: none"> <li>- On demand;</li> <li>- By Schedule;</li> <li>- Remote HES request;</li> <li>- Local request (via optical port).</li> <li>- Internal interface for transformer connected meters (which is an integrated part of the data concentrator)</li> </ul>	
SOFTWARE UPGRADE	<ul style="list-style-type: none"> <li>- Remote (via communication channel);</li> <li>- Local (via RS-485 or optical port)</li> </ul>	
FRAUD AND THEFT PROTECTION	<ul style="list-style-type: none"> <li>- Non-stop monitoring, including sleep mode time;</li> <li>- Meter cover opening sensor;</li> <li>- Terminal block cover sensor;</li> <li>- Reverse meter connection control;</li> <li>- Strong magnetic field detection;</li> <li>- Events registering in relevant logs;</li> </ul>	
BUILT IN CLOCK	<ul style="list-style-type: none"> <li>- Real-time clock with 0.5 s accuracy per day;</li> <li>- IEC 62052-21 standard compliant;</li> <li>- External synchronization with HES</li> </ul>	
EVENTS AND ALARMS HANDLING	<ul style="list-style-type: none"> <li>- Continuous control of current state of meter functional nodes and alarms/events;</li> <li>- Standard set of events processing including: registration in special logs and registers, event report sending, states displaying;</li> <li>- Different types of event logs;</li> <li>- Asynchronous sending of Event;</li> <li>- Notification can be configured for specific events.</li> </ul>	
METER SELF CONTROL	<ul style="list-style-type: none"> <li>- Built-in test for continuous self-control;</li> <li>- Quick response on severe error</li> </ul>	
POWER LOAD CONTROL	<ul style="list-style-type: none"> <li>- Basic relay (80 A) – for direct connected meters only</li> <li>- Control modes: <ul style="list-style-type: none"> <li>✓ remote (by command)</li> <li>✓ local (by condition)</li> <li>✓ manual - by push button</li> </ul> </li> <li>- Basic relay status displayed on the meter LCD</li> </ul>	
METER PARAMETRIZATION	<ul style="list-style-type: none"> <li>- Remote (via communication channel) or local (via optical port);</li> <li>- Access rights assignment from HES;</li> </ul>	
THRESHOLDS MANAGEMENT	<ul style="list-style-type: none"> <li>- Threshold for active power, active power demand, current/voltage (per phase), differential current (direct connected meters only);</li> <li>- Remote or local configuring of parameters thresholds;</li> <li>- Possibility to disconnect consumer from the network, when a threshold is crossed.</li> </ul>	
BACK-UP POWER SUPPLY	<ul style="list-style-type: none"> <li>- Supports clock/meter operation when the power is off;</li> <li>- Battery, lifetime - not less than 10 years.</li> </ul>	
<b>FUNCTIONAL SPECIFICATIONS - SECURITY</b>	<b>REQUIRED SPECIFICATIONS</b>	
Specifications	Smart meters, single-phase	Smart meters, three-phase direct connected
INFORMATION SECURITY	<ul style="list-style-type: none"> <li>- Communication encryption (AES-GCM-128 security suite);</li> <li>- Data access according to access rights stated;</li> </ul>	

	- Firmware protection.	
<b>FUNCTIONAL SPECIFICATIONS - INTERFACES</b>	<b>REQUIRED SPECIFICATIONS</b>	
Specifications	<b>Smart meters, single-phase</b>	<b>Smart meters, three-phase direct connected</b>
OPTICAL PORT	<ul style="list-style-type: none"> <li>- IEC 62056-21 Compliant;</li> <li>- Data rates - up to 19200 bps;</li> <li>- Password protected;</li> <li>- Multiple access levels.</li> </ul>	
BUILT-IN DISPLAY	<ul style="list-style-type: none"> <li>- LCD with min 8 lines;</li> <li>- Configurable decimal places (up to 3 digits);</li> <li>- Manual and automatic scrolling;</li> <li>- Backlight.</li> </ul>	
TEST OUTPUTS	<ul style="list-style-type: none"> <li>- 2 led outputs;</li> <li>- Active and reactive energy;</li> </ul>	
PUSH BUTTON	<ul style="list-style-type: none"> <li>- Scroll meter screens;</li> <li>- View data on LCD, when the power is off.</li> </ul>	
RS485 SERIAL INTERFACE ( <b>optional</b> , mandatory <b>for Lot 3-only</b> )	<ul style="list-style-type: none"> <li>- EIA/TIA-485A standard;</li> <li>- Baud rate - up to 38400 bps</li> </ul>	
<b>FUNCTIONAL SPECIFICATIONS - REMOTE COMMUNICATION</b>	<b>REQUIRED SPECIFICATIONS</b>	
Specifications	<b>Smart meters, single-phase</b>	<b>Smart meters, three-phase direct connected</b>
POWER LINE Hybrid COMMUNICATION (PLC+RF)	<ul style="list-style-type: none"> <li>- OFDM PLC Module;</li> <li>- PLC PRIME Hybrid (PLC+RF)</li> <li>- CENELEC and FCC bands for PLC</li> <li>- IEEE 802.15.4 for RF channels</li> <li>- Auto-discovery;</li> <li>- Repeating.</li> </ul>	
REMOTE DISCONNECTION	<ul style="list-style-type: none"> <li>- Bi-stable switching module for local or remote disconnection/reconnection;</li> <li>- Min. 10 000 mechanical disconnections/reconnections under maximum load.</li> </ul>	

## Data Concentrators

<b>TECHNICAL SPECIFICATIONS</b>	
<b>REQUIRED SPECIFICATIONS</b>	
Nominal voltage	- 230/400V±20%
Supply voltage	- 85-460 V
Frequency	- 50 Hz ± 2%
Clock accuracy (at 25°C), not more than (IEC 62052-21)	- 0.5 s /24 h
The variation of the time-keeping accuracy with the temperature from – 40 °C to +70°C, not more than	- ± 0,1 s/°C/24 h
Maximum active consumed power	- 12 W

Average total consumed power	- 30 VA
Operation temperature range	- -20°C ... +75°C
Storage and transportation temperature	- -40°C ... +85°C
Difference between temperature of internal parts and environment	- 30°C (ambient temperature less than 55°C)
Maximum humidity	- Up to 95 %
Impulse voltage (IEC 62052-11) - between power circuits and neutral and their combinations); - between all phases, neutral and earth	- 12kV, 1,2/50 μs, 40 Ohm - 6 kV, 1,2/50 μs, 500 Ohm
High frequency radiant field (IEC 61000-4-3)	- 10 V/m
Electrostatic discharge (EN 61000-4-2)	- 15 kV
High frequency interferences (IEC 61000-4-4)	- 4 kV
Surge immunity (IEC 61000-4-5)	- 6 kV
Voltage fluctuations, not more than	- 1 s
IP rating, not less than	- IP54
Insulation protection	- Class 2
Protection against mechanical impacts	- IK 02
Mean time between failures (at fault probability of 0.8)	- 24 000 hours
Mean lifetime, not less than	- 15 years
<b>DESIGN</b>	
<b>REQUIRED SPECIFICATIONS</b>	
Connection diagram	- Printed on the nameplate
Enclosure material	- Reinforced polymer
<b>CERTIFICATES and EXPERIENCE</b>	
<b>REQUIRED SPECIFICATIONS</b>	
PLC Prime certificates	- PRIME Alliance certificate by authorized lab
<b>FUNCTIONAL SPECIFICATIONS</b>	
<b>REQUIRED SPECIFICATIONS</b>	

NETWORK MANAGEMENT	<ul style="list-style-type: none"> <li>- Full 2-way communication: <ul style="list-style-type: none"> <li>✓ Transmitting metering data and alerts to the HES;</li> <li>✓ Transmitting commands from the HES to the Smart Meters;</li> </ul> </li> <li>- Automatic detection, registration and support of end-point devices within the network.</li> <li>- Support of up to 1,000 end-point devices.</li> <li>- Ability to work when there are power outages ("last gasp" function)</li> <li>- Ability to notify when there is a power outage.</li> </ul>
COMMUNICATIONS	<ul style="list-style-type: none"> <li>- LV PL communications: <ul style="list-style-type: none"> <li>✓ PLC PRIME standards compliant;</li> <li>✓ CENELEC band and FCC band</li> <li>✓ .EMC standards compliance</li> <li>✓ Auto-discovery</li> <li>✓ Repeating</li> </ul> </li> </ul>
PLC SIGNAL INJECTION.	<ul style="list-style-type: none"> <li>- DC injects the PLC signal into all three phases simultaneously.</li> </ul>
INTERFACES	<ul style="list-style-type: none"> <li>- Ethernet interface: <ul style="list-style-type: none"> <li>✓ For LAN and WAN communication, 10/100 BASE-T Ethernet IEEE 802.3 standard compliance.</li> </ul> </li> <li>- USB interface: <ul style="list-style-type: none"> <li>✓ USB 2.0 Full Speed standard compliant, can be used for local communication.</li> </ul> </li> <li>- RS-485 interface <ul style="list-style-type: none"> <li>✓ TIA/EIA-485 standard compliant used for communication with external devices.</li> </ul> </li> </ul>
BALANCE METERING	<ul style="list-style-type: none"> <li>- Transformer connected smart meter is an integral part of the DC; or</li> <li>- Balance Meter is a separate transformer connected meter</li> <li>- Allows balance measurements to supervise and monitor the energy supply quality.</li> </ul>
BACKUP POWER SUPPLY	<p>To ensure BC availability all the time:</p> <ul style="list-style-type: none"> <li>- Possibility to connect the external power supply (UPS), from 12 to 24V DC.</li> </ul>
BUILT-IN CLOCK	<ul style="list-style-type: none"> <li>- RTC accuracy 0,5 s /24 h. according to (IEC 62052-21).</li> <li>- Network Time Protocol (NTP) for clock synchronization.</li> <li>- Support in backup supply mode.</li> <li>- Automatic changeover for daylight saving time.</li> </ul>
DLMS/COSEM SUPPORT	<ul style="list-style-type: none"> <li>- The DC communicates with the meters using the DLMS protocol according to the COSEM Profile and OBIS Code DLMS</li> <li>- Based on interoperability concept allows support of meters from different manufacturers which follow the same communication standards</li> </ul>
DATA STORAGE	<ul style="list-style-type: none"> <li>- Data storage in non-volatile memory</li> <li>- Long term data storage.</li> <li>- All data is written in non-volatile memory immediately after receiving.</li> </ul>
INFORMATION SECURITY	<ul style="list-style-type: none"> <li>- Provides secure data transmission based on DLMS/COSEM encryption and authentication</li> <li>- Communication encryption protection (AES-128 bit key).</li> <li>- HTTP secure protocol.</li> <li>- Support of VPN-tunneling (IPSec protocol).</li> <li>- Data access according to access rights stated.</li> <li>- Firmware protection.</li> </ul>
INDICATION LEDS	<ul style="list-style-type: none"> <li>- LEDs to reflect status of available interfaces:</li> <li>- LV, Ethernet, RS-485. Placed on DC front</li> <li>- Power supply and UPS LEDs.</li> </ul>
FRAUD PROTECTION	<ul style="list-style-type: none"> <li>- DC case and terminal block opening sensors.</li> <li>- Continuous monitoring of opening sensors, including backup supply mode.</li> <li>- Sealing: Two protective seals for DC and its terminal block.</li> <li>- Secure design: terminal block should not be opened without removing DC cover.</li> </ul>

EVENTS & ALARMS HANDLING	<ul style="list-style-type: none"> <li>- Continuous control of DC current state in real time mode: managed devices registration/unregistration, power failures, tamper attempts, communication events, firmware update etc.</li> <li>- Events processing, storage and reporting: registration in different event logs, event report sending, state presentation by LEDs.</li> <li>- Immediate notification to HES in case of alarms.</li> <li>- Timestamps.</li> </ul>
ADDRESSING MODE	<ul style="list-style-type: none"> <li>- Unicast, broadcast and multicast modes of transmission.</li> </ul>
DATA COLLECTION	<ul style="list-style-type: none"> <li>- On request.</li> <li>- By preliminary set schedule.</li> <li>- On event occurred.</li> </ul>
PARAMETERIZATION	<ul style="list-style-type: none"> <li>- Remotely or locally via Ethernet interface</li> <li>- DHCP support.</li> <li>- Web-interface as a parameterization tool.</li> </ul>
SOFTWARE UPGRADE	<ul style="list-style-type: none"> <li>- Managed meters remote update via HES platform;</li> <li>- Remote DC firmware update by Web browser (also local) or HES application;</li> <li>- DC automatic update from the stated URL at scheduled time;</li> </ul>

### TECHNICAL SPECIFICATIONS - HES SOFTWARE

#### REQUIRED SPECIFICATIONS

SOFTWARE LICENCES	<ul style="list-style-type: none"> <li>- HES software licenses will be offered for piloting, free of charge with full functionality;</li> <li>- The Bidder will provide the necessary hardware and operating system specifications for the HES software installation;</li> <li>- The HES platform must have sufficient licenses to cover the meters delivered by the Bidder;</li> <li>- Licenses must be valid for a period of 12 months from the time of commissioning.</li> </ul>
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