

## Annex 1.1: Schedule of Requirements – LOT 1

### LOT 1 DISTRIBUTION: PLC Prime

LOT 1:	Total		
DISTRIBUTION: PLC Prime	1 phase	3 phase direct connection	3 phase TC Connection
Total Meters	28860	1643	346
Total Concentrators	246		

### Smart Meters

REQUIRED SPECIFICATIONS			
Specifications	Smart meters, single-phase	Smart meters, three-phase direct connected	Smart meters, three-phase transformer connected (TC)
Accuracy class: for Active Energy for Reactive Energy	B 2	B 2	C 2
Reference current	min. 5 A	min. 5 A	min. 5 A
Maximum current, Iref	min. 60 A	min. 80 A	min 5 A
Minimum current	0.05 Iref for active / 0.05 Iref for reactive	0.05 Iref for active / 0.05 Iref for reactive	0.01 Iref for active / 0.02 Iref for reactive
Reference voltage, Un	230 V	3×230/400 V	3×230/400 V
Reference frequency	50 Hz (± 2 %)	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	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	3 W / 10 VA per phase
Internal clock accuracy (IEC 62052-21)	≤ 0.5 s / 24 h	≤ 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	4 kV, 50 Hz, 1 min
Shock voltage (IEC 60060-1)	6 kV, 1.2/50 μs	6 kV, 1.2/50 μs	6 kV, 1.2/50 μs
Electrostatic discharge (IEC 61000-4-2)	15 kV	15 kV	15 kV
High frequency radiant field (IEC 61000-4-3)	≥ 30 V/m	≥ 30 V/m	≥ 30 V/m
High frequency interferences (IEC 6100-4-4)	4 kV	4 kV	4 kV
Surge immunity test (IEC 6100-4-5)	6 kV	6 kV	6 kV
IP rating	IP54	IP54	IP54
Mechanical class	min. M1	min. M1	min. M1
MTL (Mean Total Lifetime)	not less 15 years	not less 15 years	not less 15 years

MTBF (Mean Time Before Fail)	less than / year 0.5%	less than / year 0.5%	less than / year 0.5%
<b>CERTIFICATES</b>	<b>REQUIRED SPECIFICATIONS</b>		
Specifications	<b>Smart meters, single-phase</b>	<b>Smart meters, three-phase direct connected</b>	<b>Smart meters, three-phase transformer 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>	<b>Smart meters, three-phase transformer 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:</li> <li>- 15 minutes interval profile: not less than 45 days for 6 parameters</li> <li>- Asynchronous profile (spontaneous events), last entries data.</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 -</b>	<b>REQUIRED SPECIFICATIONS</b>		

MANAGEMENT AND CONTROL PARAMETERS			
Specifications	Smart meters, single-phase	Smart meters, three-phase direct connected	Smart meters, three-phase transformer 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>		
FUNCTIONAL SPECIFICATIONS - SECURITY		REQUIRED SPECIFICATIONS	
Specifications	Smart meters, single-phase	Smart meters, three-phase direct connected	Smart meters, three-phase transformer 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> <li>- Firmware protection.</li> </ul>		
<b>FUNCTIONAL SPECIFICATIONS - INTERFACES</b>	<b>REQUIRED SPECIFICATIONS</b>		
Specifications	<b>Smart meters, single-phase</b>	<b>Smart meters, three-phase direct connected</b>	<b>Smart meters, three-phase transformer 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>		
<b>RS485 SERIAL INTERFACE</b> ( <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>	<b>Smart meters, three-phase transformer connected</b>
POWER LINE COMMUNICATION (PLC)	<ul style="list-style-type: none"> <li>- OFDM PLC Module;</li> <li>- PRIME compliant with specification ITU-T G.9904</li> <li>- CENELEC and FCC bands</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>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	- Polycarbonate
<b>CERTIFICATES and EXPERIENCE</b>	
	<b>REQUIRED SPECIFICATIONS</b>
<b>PLC certificate</b>	- <del>G3</del> 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>
<b>COMMUNICATIONS</b>	<ul style="list-style-type: none"> <li>- LV PL communications: <ul style="list-style-type: none"> <li>✓ PLC PRIME standards compliant;</li> <li>✓ <del>Radio Frequency communications in 868 MHz band;</del></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.	- DC injects the PLC signal into all three phases simultaneously.

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</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 or serial 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>- Data model and description will be provided only to the awarded bidder</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>