

ANNEX 1.1: TECHNICAL SPECIFICATIONS

LOT 1 – Smart meters

I. BACKGROUND:

Under the "Accelerating a Just Energy Transition in the Republic of Moldova" (JET) Programme, UNDP has been supporting the Government of Moldova, under the leadership of the Ministry of Energy, in piloting Advanced Metering Infrastructure (AMI) as a foundational measure for energy efficiency, rational consumption, evidence-based tariff reform, and alignment with EU energy legislation.

This support is anchored in two key national policy frameworks: the National Integrated Energy and Climate Plan (NECP) 2025–2030, which under Policy Measure PM_EE5 explicitly quantifies smart metering as a binding energy efficiency measure and directly references the UNDP pilot as the national implementation reference; and the National Programme for Digital Transformation of the Energy Sector 2026–2030, approved by the Government of Moldova in October 2025, which sets a binding target of 500,000 smart meters deployed by 2030, covering at least 40% of residential consumers. Both frameworks are further underpinned by Moldova's legal obligation under the Electricity Law No. 164/2025, which fully transposes EU Directive 2019/944/EU on the internal electricity market and establishes a national smart metering rollout target in the future.

Under the First Financing Arrangement (2024–2025), funded by the Government of Italy, UNDP implemented an initial Smart Metering Pilot Phase covering more than 40,000 electricity consumers across Moldova's two licensed Distribution System Operators (DSOs) — Premier Energy Distribution (south-central grid area) and RED Nord (northern grid area).

Building on this operational evidence base, the Pilot has been scaled up under additional Financing Arrangements with the Government of Italy (2025–2028), supporting the deployment of smart metering to an additional 65,000 consumers across both DSOs, applying the validated technical architecture and sampling methodology developed during the Pilot Phase. This scale-up is expected to reach at least 100,000 consumers by 2027, achieving 20% of the national target established under the National Programme for Digital Transformation of the Energy Sector 2026–2030.

II. SCOPE OF PROCUREMENT:

The objective of this procurement is to supply and deliver PRIME 1.4-compliant smart electricity meters and the testing/integration support required for their onboarding and verification within the AMI chain of the two distribution system operators (DSOs) in the Republic of Moldova: Premier Energy Distribution S.A. (PED) and RED Nord S.A.

Quantities:

1. Single-phase smart meters, PRIME 1.4: **60,730**
2. Three-phase direct connected smart meters/DC, PRIME 1.4: **4,217**
3. Three-phase indirect connected smart meters/TC, PRIME 1.4: **53**

The Moldova Reference Smart Meter Data Model and the Reference DLMS/COSEM AMI Smart Meter COSEM Profile for Communication Interfaces v2.0 (referred also to Spanish Companion Standard 2.0) are provided to all bidders as transparent project reference documents. At bid submission, bidders could provide the data-object, OBIS, event-code, access-right and security mapping already

implemented in the offered firmware and shall identify any gaps or adaptations required for the project.

The Moldova Reference Smart Meter Data Model consists of:

- MD Meter Communication Interfaces, Rev. 1.0;
- MD Project Object Model, Rev. 1.0; and
- MD Events, Errors, Alarms and AMR Profile Status Code, Rev. 1.0.

Full native implementation of every project-specific object is not required to be available at bid submission. The awarded Supplier shall complete all mandatory meter firmware, configuration, data-model, OBIS, event and security adaptations required for interoperability before FAT. Final DSO- and permanent HES/MDM-specific parameters, key provisioning and end-to-end mapping shall be completed and verified before or during SAT, as defined in the approved integration plan.

Standard DLMS/COSEM functional equivalents are acceptable where fully documented, mapped and demonstrated during FAT/SAT. No operational, reading, configuration, firmware-update or diagnostic function may depend on an undeclared proprietary object or undisclosed middleware.

Detailed data model, configuration and integration information will be handled during implementation with the awarded supplier, the beneficiaries and the selected permanent HES/MDM provider, as applicable.

Installation and site works, including the permanent HES/MDM platform, are excluded from this procurement and are addressed under separate arrangements. The selected HES/MDM provider will lead integration of the awarded meters and data concentrators into the permanent HES/MDM environment, while the awarded equipment suppliers shall provide the required open documentation, samples and technical support.

A permanent Head-End System and Meter Data Management (HES/MDM) platform for both DSOs has been procured under a separate process and is currently in its inception phase. Accordingly, bidders are not required to provide an operational HES/MDM, but only the testing and integration support necessary to onboard and verify the offered equipment subject to this tender as specified above.

III. TECHNICAL SPECIFICATION:

Scope of supply

Item	Single-phase direct connected meter	Three-phase direct connected meter	Three-phase indirect connected meter
Application	Residential and small commercial low-voltage metering.	Residential, small commercial low-voltage metering.	Commercial and transformer-station where current is measured through CT transformers.
Network segment	Meter-to-concentrator neighborhood area network over LV PLC.	Meter-to-concentrator neighborhood area network over LV PLC.	CT metering point connected to the AMI system through LV PLC, or through a local interface to a PRIME 1.4 data concentrator

Item	Single-phase direct connected meter	Three-phase direct connected meter	Three-phase indirect connected meter
Communication	Integrated certified PRIME 1.4 service-node PLC modem.	Integrated certified PRIME 1.4 service-node PLC modem.	Integrated certified PRIME 1.4 service-node PLC modem
Application layer	DLMS/COSEM over standard protocol stack with full OBIS mapping.	DLMS/COSEM over standard protocol stack with full OBIS mapping.	DLMS/COSEM over standard protocol stack with full OBIS mapping, including CT ratios, four-quadrant energy registers, event logs and transformer-ratio configuration.
Interoperability	Must operate with PRIME 1.4 certified base-node concentrators and HES, either directly as a PRIME service node or indirectly through the approved data-concentrator interface. End-to-end interoperability must be tested.	Must operate with PRIME 1.4 certified base-node concentrators and HES, either directly as a PRIME service node or indirectly through the approved data-concentrator interface. End-to-end interoperability must be tested.	Must operate with PRIME 1.4 certified base-node concentrators and HES, either directly as a PRIME service node or indirectly through the approved data-concentrator interface. End-to-end interoperability must be tested.

Standards and certificates

ID	Area	Minimum requirement
SM-01	PRIME PLC	PRIME Specification v1.4 current at bid closing for the exact offered meter model, hardware version, firmware version, PLC profile and band/channel configuration.
SM-02	PRIME certificate	PRIME Alliance certificate or test report summary from an accredited laboratory. The certificate must identify manufacturer, product, hardware, firmware, profile, laboratory, issue date, tested band/channel and any limitations. The offered meters shall be tested/certified according to PRIME Alliance PRIME v1.4 certification requirements for the exact offered model, hardware, firmware and PLC profile.
SM-03	Metrology	Active energy: The meters shall have valid MID certification with CE + M metrology marking, or legally valid Moldovan metrology approval, for the exact offered meter model, connection type and active-energy accuracy class. Reactive energy for transformer-connected meters only: Since reactive energy will be used for billing, the meters shall provide reactive energy accuracy Class 2 or better according to IEC 62053-23 or equivalent. Moldovan metrology

ID	Area	Minimum requirement
		approval, where required for billing use, shall be provided before commissioning.
SM-04	DLMS/COSEM	IEC 62056 series compatibility. The Bidder shall provide the protocol implementation conformance statement, active-firmware DLMS/COSEM object list, OBIS map, access-level matrix and event-code list, together with a mapping to the Reference DLMS/COSEM AMI Smart Meter COSEM Profile for Communication Interfaces v2.0 and the Moldova Reference Smart Meter Data Model.
SM-05	Electrical and EMC	The meters shall comply with IEC 62052-11 and the applicable parts of the IEC 62053 series, including IEC 62053-21, IEC 62053-22 and IEC 62053-23, or equivalent latest standards valid at the time of tender submission. EMC immunity and emission performance shall meet Class E2 requirements in accordance with the applicable IEC/EN 61000 series, together with all relevant national and local distribution grid requirements.
SM-06	Security	Minimum baseline: DLMS/COSEM Security Suite 0 using AES-GCM-128 authenticated encryption and AES-128 key wrapping, consistent with the Moldova Reference Smart Meter Data Model. Security Suite 1 implementation may be offered, provided that it is fully documented and compatible with the data concentrator. Secure authentication, role-based access, key management, signed firmware and auditable remote commands shall be supported.
SM-07	Data protection	Consumption data shall be treated as personal data, with controlled access, logging, export controls and retention rules according to Moldovan and applicable EU-aligned privacy requirements.

Electrical and metrological requirements

ID	Parameter	Single-phase direct connected	Three-phase direct connected	Three-phase indirect connected meter
SM-08	Active energy accuracy	Class B under MID or IEC Class 1	Class B under MID or IEC Class 1	Class C under MID, or IEC Class 0.5S.
SM-09	Reactive energy accuracy	Class 2 or better, 4-quadrant measurement.	Class 2 or better, 4-quadrant measurement.	Class 2 or better, 4-quadrant measurement.
SM-10	Reference/basic current	5 A	5 A	CT secondary 5 A nominal.
SM-11	Maximum current	Not less than 60 A.	Not less than 80 A.	CT input 5(10) A
SM-12	Minimum current / starting current	The meter shall comply with IEC 62053-21 Class 1 accuracy	The meter shall comply with IEC 62053-21 Class 1 accuracy	The meter shall ensure a starting current (I_{st}) $\leq 0.2\%$ of I_n and

ID	Parameter	Single-phase direct connected	Three-phase direct connected	Three-phase indirect connected meter
		requirements, with a starting current (I_{st}) $\leq 0.4\%$ of I_b and a minimum current (I_{min}) $\leq 5\%$ of I_b , meeting all accuracy limits defined by the standard across the entire operating range.	requirements, with a starting current (I_{st}) $\leq 0.4\%$ of I_b and a minimum current (I_{min}) $\leq 5\%$ of I_b , meeting all accuracy limits defined by the standard across the entire operating range.	maintaining the applicable accuracy limits down to a minimum current (I_{min}) $\leq 2\%$ of I_n .
SM-13	Reference voltage	230 V nominal.	3 x 230/400 V nominal.	3 x 230/400 V nominal.
SM-14	Frequency	50 Hz nominal, tolerance at least $\pm 2\%$.	50 Hz nominal, tolerance at least $\pm 2\%$.	50 Hz nominal, tolerance at least $\pm 2\%$.
SM-15	Power consumption	$\leq 5 \text{ W} / 10 \text{ VA}$	$\leq 3 \text{ W} / 10 \text{ VA}$ per phase	$\leq 3 \text{ W} / 10 \text{ VA}$ per phase
SM-16	Clock accuracy	$\leq 0.5 \text{ s/day}$ IEC 62052-21 compliant.	$\leq 0.5 \text{ s/day}$ IEC 62052-21 compliant.	$\leq 0.5 \text{ s/day}$ IEC 62052-21 compliant.
SM-17	Environmental rating	IP54	IP54	IP54
SM-18	Mechanical compatibility (LCD display is excluded).	Minimum M2.	Minimum M2.	Minimum M2.
SM-19	Service life	Design life not less than 15 years; firmware and cybersecurity support for at least 10 years after final acceptance.	Design life not less than 15 years; firmware and cybersecurity support for at least 10 years after final acceptance.	Design life not less than 15 years; firmware and cybersecurity support for at least 10 years after final acceptance.

PRIME 1.4 PLC communication requirements

ID	PRIME 1.4 item	Requirement
SM-20	PLC architecture	Meter shall operate as a PRIME 1.4 service node in a low-voltage PLC network managed by a PRIME-certified base-node concentrator/gateway.
SM-21	PHY, MAC and convergence layers	Implementation shall conform to PRIME 1.4 PHY, MAC and convergence layer requirements for the certified profile.

ID	PRIME 1.4 item	Requirement
SM-22	Band/channel support	Bidder shall state supported CENELEC A, A+FCC, FCC or other locally permitted channels and any limitations. Multi-channel capability is preferred where permitted.
SM-23	Robust operation	Meter shall support robust modes and adaptive operation available in the certified PRIME 1.4 stack. Bidder shall state expected performance assumptions.
SM-24	Discovery and registration	Automatic discovery, registration, route/repeater operation and communication quality metrics shall be available through the concentrator/HES.
SM-25	Interoperability	Bidder shall support interoperability testing with at least one non-supplier PRIME 1.4 certified meter or concentrator during FAT.
SM-26	Backward compatibility	PRIME 1.4 operation is mandatory. Dual stack capability is desirable but not a disqualifying condition, provided end-to-end operation with an assigned PRIME 1.4 data concentrator and persistent HES/MDM is demonstrated during FAT/SAT.
SM-27	IPv6 readiness	Where supported by the PRIME 1.4 profile and HES architecture, bidder shall support IPv6-ready operation or provide a documented migration path.

Metering, data and functional requirements

ID	Function	Minimum requirement
SM-28	Energy registers	Import/export active energy. Reactive import/export or four-quadrant reactive energy where required. Apparent energy where supported.
SM-29	Instantaneous values	Voltage, current, active power, reactive power, apparent power, power factor and frequency. Three-phase meters shall provide per-phase and total values. The meter shall provide phase angle measurements to enable vector analysis: Including: Angle U(Ln) to U(L1) and Angle I(Ln) to U(L1), where n is each phase.
SM-30	Load profiles	Configurable interval profiles supporting at least 14 measurement channels at 15-minute intervals. Minimum 90 days storage at 15-minute intervals for the key billing channels, or the Bidder shall state the exact capacity and retention assumptions. Final capture objects, OBIS codes, status flags and profile configuration shall be aligned with the Moldova Reference Smart Meter Data Model before FAT.
SM-31	Billing profiles	Daily and monthly billing snapshots with timestamp, register status flags and clock status. With storage for 12 months.
SM-32	Tariffs	Minimum 4 tariffs; configurable tariff calendar; 10 seasons, holidays and daylight-saving changeover; remote tariff activation.

ID	Function	Minimum requirement
SM-33	Power quality and outage data	Voltage sags/swells, over/under-voltage, phase loss, outages/restorations and frequency events.
SM-34	Event logging	The meter shall support the event categories and event codes defined in the Moldova Reference Smart Meter Data Model, including power, communication, tamper/fraud, firmware/configuration, relay, security and general system events. A manufacturer-specific log structure is acceptable if all required events are fully documented and mapped. The meter shall provide a combined event-log capacity of at least 500 timestamped records under FIFO retention; the Bidder shall state the exact capacity and allocation. The final event-code and HES mapping shall be approved before FAT.
SM-35	Remote functions	Scheduled read, on-demand read, status query, clock synchronization, tariff update, configuration update, firmware update and relay control where relay is fitted.
SM-36	Local functions	Optical port access with role/password controls; push-button display navigation; local display of essential registers and status.
SM-37	Firmware	Digitally signed firmware, secure remote update, version inventory in HES, failed-update recovery and rollback or safe bootloader mechanism.

Interfaces, display and physical features

ID	Item	Requirement
SM-38	Optical port	IEC 62056-21 compliant or equivalent for local service; password/role protected with multiple access levels.
SM-39	Display	Display technology shall be STN/FSTN. The display shall be legible in normal ambient light from at least 2.5 m. Compliance with the legibility, contrast, and viewing angle requirements shall be verified in accordance with IEC 62052-11 (General requirements for metering equipment).
SM-40	Test outputs	LED or equivalent test outputs for active energy and, where applicable, reactive energy.
SM-41	Push button	At least one sealed or accessible button for screen scrolling and essential data view.
SM-42	Relay / remote disconnect for DC meters	Remote connect/disconnect is required. If fitted, relay shall be bi-stable or equivalent, rated for the offered maximum current, and tested for at least 10,000 operations under stated load conditions. According to UNE 20317:2005
SM-43	Tamper sensors	Cover opening, terminal cover opening, reverse energy/connection anomaly and strong magnetic field detection shall be provided.
SM-44	Backup supply	The device shall feature an integrated Real-Time Clock (RTC) and continuous tamper and critical event

ID	Item	Requirement
		monitoring subsystems that remain fully operational during primary power outages, utilizing either a battery or a supercapacitor backup power source with a rated lifetime of at least 15 years. The backup power solution shall sustain the RTC for a minimum of 5 continuous years without an external power supply, maintain structural and operational integrity without relying on a dedicated circuit fuse, and provide health or degradation metering data to monitor its remaining operational lifespan.
SM-45	Overall dimensions and cabinet compatibility	The Bidder shall state the exact maximum overall dimensions (W x H x D), including the terminal cover, mounting bracket and all external protrusions, and shall provide dimensioned drawings. The standard DSO reference envelope is: single-phase DC meter: 130 x 200 x 100 mm; three-phase DC and CT-connected meters: 180 x 280 x 120 mm. Minor deviations from these dimensions may be accepted only where the Bidder demonstrates, through the supplied sample, that the meter fits representative existing cabinets of both DSOs without structural modification, without affecting installation or operation, and without additional cost to the Beneficiaries.
SM-46	Fixing dimensions	Reference fixing dimensions: single-phase meter - lower fixing-hole distance L = 80-120 mm and fixing height H = 120-150 mm; three-phase meter - L = 150 ± 10 mm and H = 200 ± 20 mm. Integrated adjustable fixing arrangements, slotted holes or a standard mounting bracket supplied with the meter are acceptable. Alternative fixing dimensions may be accepted only through the physical cabinet fit test.
SM-47	Mounting and fastening method	Surface mounting by screws or self-tapping screws is required; the diameter of each fixing hole shall be ≥ 5 mm. Meters designed exclusively for DIN-rail mounting are not accepted. Any standard bracket or adapter required for installation shall be supplied as part of the meter, without separate costs, and shall not require structural modification of the cabinet.
SM-48	Terminal block and conductor capacity	The terminals shall accept copper or aluminum conductors of ≥ 25 mm² for single-phase meters (I_{max} ≥ 60 A) and ≥ 35 mm² for three-phase direct connected meters (I_{max} ≥ 80 A). For CT-connected meters, current circuits shall accept ≥ 6 mm² and voltage circuits ≥ 4 mm². A double screw clamp is required; an equivalent clamping system is acceptable if the tenderer demonstrates the same electrical, thermal and mechanical performance. The dimensions of the terminals, creepage distances and clearances must be in accordance with IEC 62052-11.

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ID	Item	Requirement
SM-49	Terminal cover and sealing	The meter shall be supplied with an extended, transparent or clearly translucent terminal cover. The terminal cover and the metrological enclosure shall be independently sealable and tamper-evident so that access is not possible without visible damage to the relevant seal. The Bidder shall describe the exact sealing arrangement; equivalent effective designs are accepted and the number of sealing points shall not, by itself, restrict eligibility.
SM-50	Connection diagrams	Single-phase direct connected, three-phase direct connected and three-phase CT-connected meters shall support the functional connection arrangements shown in Appendix A, Figures A1-A3. Internal measuring architecture and terminal numbering may differ from the figures, provided that the external connection is functionally equivalent, fully documented and permanently marked on the meter or inside the terminal cover. For CT-connected meters, the transformer ratio shall be configurable and readable through DLMS/COSEM.
SM-51	Nameplate marking	Marking shall comply with IEC 62052-11 and the applicable metrology approval and shall include at least: manufacturer, meter type, serial number, year of manufacture, rated voltage, Ib/lmax or In for CT-connected meters, rated frequency, meter constant, active and reactive energy accuracy classes where applicable, protection class and IP degree. Where MID is used, the CE marking, supplementary metrology marking M, year and notified-body identification number shall be shown. Where Moldovan metrology approval is used, the applicable national marking shall be accepted.
SM-52	Mechanical documentation with the offer	The Bidder shall submit dimensioned drawings in millimeters for each offered meter showing the overall dimensions with the terminal cover fitted, position and diameter of fixing holes, terminal-block layout and numbering, connection diagram, accepted conductor material and cross-section range, tightening torque and meter mass. The Bidder shall state whether compliance is demonstrated through the standard DSO reference envelope or through the alternative physical cabinet fit-test path.

Cybersecurity and privacy controls

ID	Control	Requirement
SM-53	Device identity	Unique serial number and unique logical device identity. Shared default credentials are not permitted in production.

ID	Control	Requirement
SM-54	Authentication and access	Role-based access for local and remote operations, with separate roles for reading, configuration, firmware, relay and administration.
SM-55	Encryption and security suite	DLMS/COSEM Security Suite 0 with AES-GCM-128 authenticated encryption and AES-128 key wrapping shall be supported as the minimum project baseline. Security Suite 1 or a stronger standard-compliant implementation is acceptable where compatible with the final system architecture. The Bidder shall identify the exact suite, authentication mechanisms and supported association roles.
SM-56	Key management	Documented key generation, injection, storage, rotation, revocation and recovery process; keys protected during manufacturing and field operation.
SM-57	Remote disconnect control	All relay actions shall be logged with user, timestamp and reason. Mass disconnect shall require two-person approval or equivalent workflow in HES.
SM-58	Firmware security	Signed firmware packages, protected bootloader or equivalent, version verification and auditable update campaigns.
SM-59	Audit and logs	Security-relevant operations shall be logged and exportable to the utility security monitoring process.
SM-60	Vulnerability process	Supplier shall provide vulnerability disclosure contact, patch SLA and lifecycle support statement.
SM-61	Privacy	Consumption data shall be protected as personal data; access shall be logged; export shall be in open documented format; retention and masking shall be configurable where required.

Smart Meter and Data Concentrator Interoperability

ID	Control	Requirement
SM-62	Application-layer standards	The application layer shall comply with DLMS/COSEM (IEC 62056). All required data objects, profiles and registers shall be standard-compliant, documented and accessible without undisclosed proprietary translations. The implementation shall be capable of mapping to both the Reference DLMS/COSEM AMI Smart Meter COSEM Profile for Communication Interfaces v2.0 and the Moldova Reference Smart Meter Data Model.
SM-63	Cross-vendor interoperability	PRIME 1.4 meters from one supplier shall register, authenticate and exchange the required billing, load-profile, event and status data through a PRIME 1.4 data concentrator from another supplier and subsequently integrate with the selected permanent HES/MDM. Normal configuration, documented mapping and agreed firmware adaptation are permitted. Hardware modification, undisclosed proprietary lock-in or

ID	Control	Requirement
		mandatory proprietary middleware imposed on the Beneficiaries is not permitted.
SM-64	Moldova Reference Data Model	The Moldova Reference Smart Meter Data Model is the target project application profile and is made available to all bidders on identical, free-of-charge and non-discriminatory terms. At bid submission, the Bidder shall provide an as-is compliance/gap matrix. Full native compliance at bid submission is not mandatory. Standard DLMS/COSEM functional equivalents are acceptable where fully documented, mapped and demonstrated. The awarded Supplier shall implement all mandatory project functions before FAT.
SM-65	Security-protocol alignment	The Bidder shall document the exact DLMS/COSEM security suite, association model, authentication mechanisms, key types and invocation-counter handling implemented in the offered firmware. Security Suite 0 is the minimum baseline. High-Level Security (HLS) shall be supported for management and other privileged operations where required by the approved access matrix; lower-access associations may use the mechanism defined in the final approved profile. Alignment with the permanent HES/MDM shall be verified during FAT/SAT.
SM-66	Reference-profile compliance	The Bidder shall provide evidence of support for the communication profiles, DLMS/COSEM objects, security associations, OBIS mappings, event logs and data-exchange structures required by the project reference documents. Deviations shall be declared in a mapping table and shall be accepted where the required function can be implemented by configuration, agreed firmware adaptation or a standard functional equivalent without proprietary lock-in.
SM-67	OBIS and event-code mapping	The Bidder shall submit the complete OBIS and event-code mapping implemented in the offered active firmware, including billing registers, load profiles, multi-tariff structures, events, security objects, firmware objects and PRIME-related objects. Gaps against the Moldova Reference Smart Meter Data Model shall be clearly identified. The final approved mapping and required adaptations shall be completed before FAT.
SM-68	Implementation and acceptance stages	Bid stage: exact-model certifications, active-firmware documentation, as-is mapping and a binding adaptation commitment. Before FAT: mandatory meter firmware/configuration, data objects, security associations, OBIS/event mappings and data-concentrator interoperability shall be complete. Before or during SAT: final DSO parameters, tariff settings, keys and permanent HES/MDM-specific end-to-end mapping shall be completed and verified.

Bidder evidence and submission package

ID	Deliverable	Minimum content
SM-69	Technical compliance matrix	Line-by-line response: Comply / Partially comply / Do not comply, with exact documentary evidence references. For the Moldova Reference Smart Meter Data Model, the matrix shall distinguish: supported as specified; standard functional equivalent; configurable/adaptable before FAT; or not supported.
SM-70	PRIME certificate package	Certificate or test report summary for the exact meter, profile and firmware; laboratory name; date; supported bands/channels; and limitations.
SM-71	Metrology certificates	MID or legally valid local certificate, accuracy-class evidence, production conformity, calibration and factory-test process.
SM-72	Protocol and data-model documentation	DLMS/COSEM object list, OBIS map, event-code map, association/access-level matrix, security-suite declaration, project reference-profile mapping, Moldova Reference Data Model gap matrix and HES integration guide.
SM-73	Cybersecurity package	Security architecture, authentication and association model , key management, firmware signing, access control, invocation-counter handling , vulnerability management and hardening checklist.
SM-74	Mechanical documentation	Dimensioned drawings, fixing details, terminal and conductor data, sealing arrangement, nameplate example, connection diagrams and evidence of compliance with the standard DSO envelope or commitment to the physical cabinet fit test.
SM-75	Lifecycle statement	Production availability, spare parts, firmware support, cybersecurity support and end-of-life notice process.
SM-76	Local-provider compliance path	Local providers may qualify on the same basis as international vendors if exact-model certificates, local/legal metrology approvals, protocol documents, cybersecurity documents and samples are provided. Brand, country of origin or distributor status alone is not sufficient.

Acceptance testing plan

ID	Stage	Tests and minimum expectations
SM-77	Pre-award sample test	If requested by UNDP: visual inspection; nameplate; dimensions and fixing points; physical fit in representative DSO cabinets where the offered dimensions or fixing arrangement are outside the standard reference path; transparent terminal cover; sealing; terminal block and connection layout; optical communication; DLMS/COSEM reads; as-is OBIS/event verification; PRIME 1.4 join/registration; event simulation; relay operation; clock synchronisation; firmware version; and cybersecurity

ID	Stage	Tests and minimum expectations
		baseline check. Project-specific data-model adaptations committed for completion before FAT shall not be required to be fully implemented at this stage.
SM-78	Factory acceptance test (FAT)	Verify the bill of materials, exact hardware/firmware versions, certificates, production-test results, mechanical requirements, HES/testing-tool onboarding, awarded meter-to-data-concentrator interoperability, bulk reading, final mandatory Moldova data-model/OBIS/event mapping, security associations and key-management functions, remote configuration, firmware update and relay controls. FAT shall not be passed until all mandatory pre-FAT adaptations are implemented and demonstrated.
SM-79	Site acceptance / integration support (SAT)	The Supplier shall support UNDP, the Beneficiaries, the awarded data-concentrator supplier and the selected permanent HES/MDM provider during SAT and integration testing. Tests shall include provisioning, registration, bidirectional DLMS/COSEM communication through the data concentrators/gateways, final DSO- and HES/MDM-specific OBIS/event mapping, security and key provisioning, clock synchronisation, firmware-update demonstration and reading of billing and load profiles in the permanent HES/MDM environment.

Mandatory disqualification triggers

- No valid PRIME 1.4 certification evidence for the exact offered meter, communication profile and firmware baseline.
- No valid metrology approval, or no legally acceptable and documented path to the required local approval for the offered variant.
- No active-firmware DLMS/COSEM object list, OBIS/event-code mapping, access matrix, security declaration or Moldova Reference Data Model gap matrix.
- No acceptable mechanical drawings, terminal/cover documentation or evidence of compliance with the standard DSO envelope or the alternative cabinet fit-test path.
- Refusal to provide requested samples or to participate in FAT, SAT and integration testing.
- Refusal to complete the mandatory project-specific firmware, data-model, security or mapping adaptations within the agreed pre-FAT/pre-SAT milestones.
- Proprietary restrictions that prevent future onboarding of other PRIME-certified equipment, full access to utility-owned data or operation through the selected permanent HES/MDM.
- Failure to commit to warranty, lifecycle, firmware support and cybersecurity-remediation obligations.

Mandatory requirements

- All offered meters shall be new, unused production-grade units and shall match the sample-tested hardware, firmware, metrology and PRIME profile.

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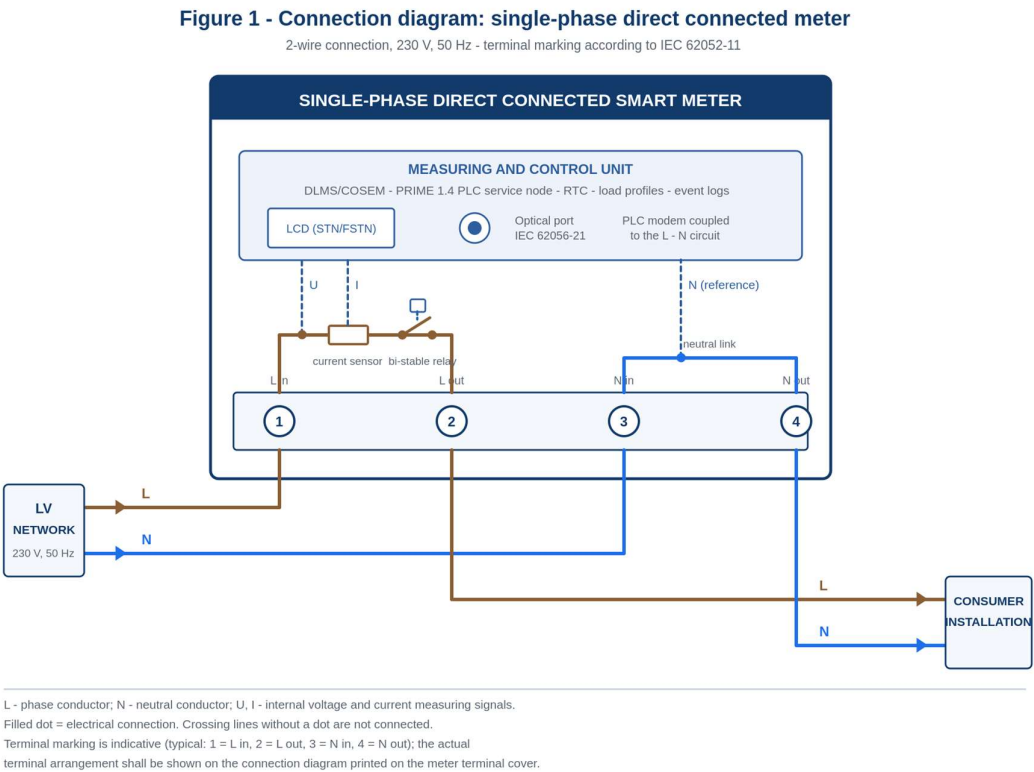
- The Supplier shall provide **exact-model PRIME 1.4 and metrology evidence** and shall support interoperability with the **awarded PRIME 1.4 data concentrator**.
- **At bid submission, the Bidder shall provide complete as-is protocol documentation and a transparent compliance/gap matrix against the Moldova Reference Smart Meter Data Model.**
- **The awarded Supplier shall complete all mandatory meter-side data-model, OBIS, event, security and configuration adaptations before FAT and the final DSO/HES/MDM-specific integration before or during SAT.**
- **Mechanical compliance shall be demonstrated either through the standard DSO reference envelope and fixing arrangement or through a successful physical sample fit test without structural cabinet modification.**
- **The Supplier shall cooperate with UNDP, PED, RED Nord, the awarded data-concentrator supplier and the selected permanent HES/MDM provider throughout FAT, SAT and integration.**
- **No shared production keys, unaudited remote-access mechanisms, undeclared mandatory objects or proprietary lock-in are permitted.**
- **The Beneficiaries shall own all metering, event, configuration and asset data. Export shall be available in open documented formats without termination fees.**
- **During the warranty period, defective meters shall be replaced at no additional cost within 30 calendar days from receipt of the written notification. The Supplier may determine the location and management of spare stock and the transport/logistics arrangements, provided that the 30-day deadline is met. Replacement meters shall be identical or fully compatible and shall meet the same technical, certification, firmware, security, data-model and HES/MDM integration requirements as the original equipment.**

APPENDIX A - REFERENCE FUNCTIONAL CONNECTION DIAGRAMS

The following diagrams define the required external functional connection arrangements. The manufacturer may use a different internal measuring architecture or terminal numbering, provided that the offered arrangement is functionally equivalent, permanently marked and fully documented.

Figure A1 - Single-phase direct connected meter

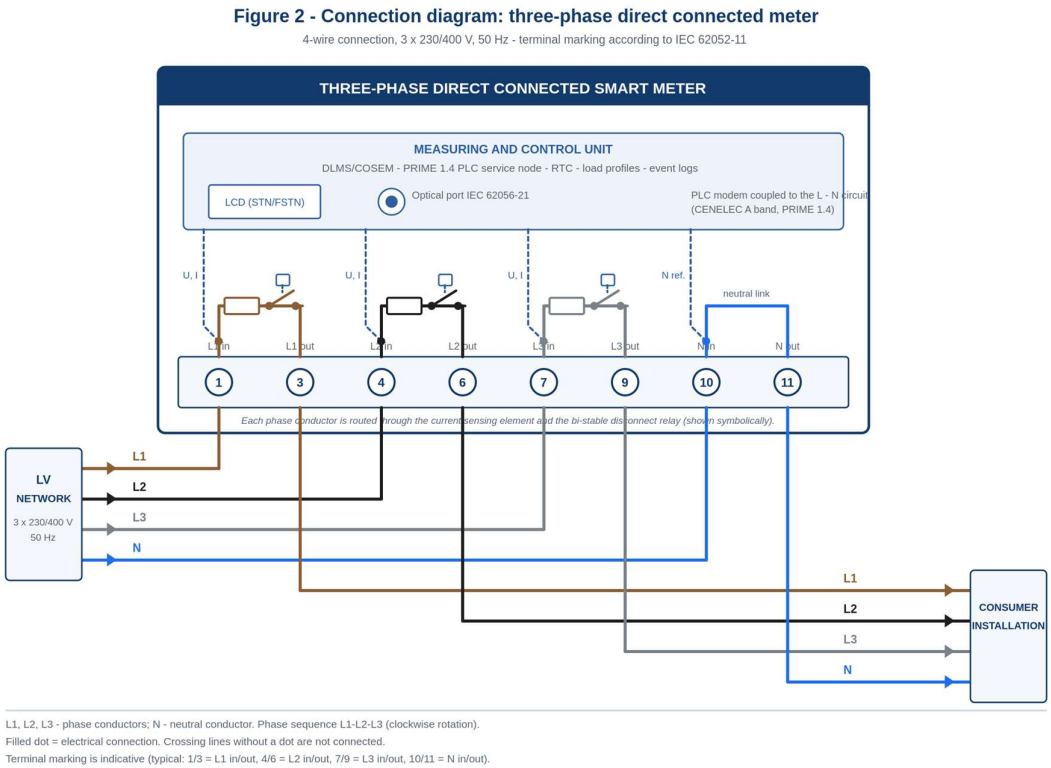
Two-wire connection, 230 V, 50 Hz.



Terminal numbering shown in the figure is indicative. The Supplier shall provide the exact connection diagram and terminal designation for the offered meter. Filled dots indicate electrical connections; crossing lines without a dot are not connected.

Figure A2 - Three-phase direct connected meter

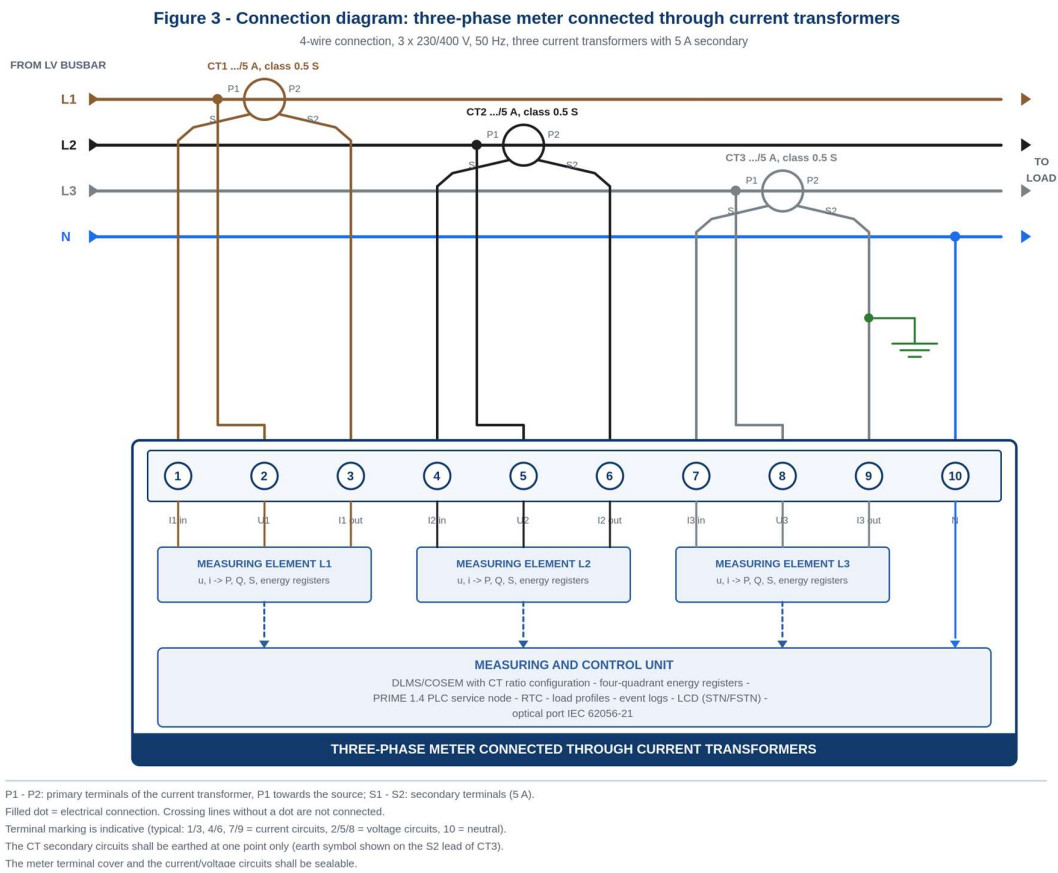
Four-wire connection, 3 x 230/400 V, 50 Hz.



Terminal numbering shown in the figure is indicative. The Supplier shall provide the exact connection diagram and terminal designation for the offered meter. Filled dots indicate electrical connections; crossing lines without a dot are not connected.

Figure A3 - Three-phase meter connected through current transformers

Four-wire connection, 3 x 230/400 V, 50 Hz, three current transformers with 5 A secondary.



Terminal numbering shown in the figure is indicative. The Supplier shall provide the exact connection diagram and terminal designation for the offered meter. Filled dots indicate electrical connections; crossing lines without a dot are not connected.