

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 along with HES for installation across the service territories 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 Bidder's Head-End System (HES) solution /HES module, testing environment or Integration tools for onboarding, testing, DLMS/COSEM mapping, firmware management and interoperability verification of the supplied meters should be delivered under this contract, without separate licence fees sufficient to cover all meters delivered, valid for the required warranty period/pilot implementation. Data model and description will be provided only to the awarded Bidder.

Installation and site works including meter data managements platforms are excluded from this procurement and are addressed under separate arrangements.

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
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. All the meters and DCU have to be tested by accredited laboratory based on Spanish specification Prime version 1.4
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 approval, where required for billing use, shall be provided before commissioning.
SM-04	DLMS/COSEM	IEC 62056 series compatibility, OBIS code mapping, companion profile or protocol implementation conformance statement, access-level matrix and event-code list.
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	DLMS Security Suite 1, AES-128. Support secure authentication, role-based access, encryption where supported by the selected protocol profile, key management, signed firmware and auditable remote commands.
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	Minimum 5 A; bidder shall state exact I_b/I_{ref} .	Minimum 5 A; bidder shall state exact I_b/I_{ref} .	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 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.	The meter shall comply with IEC 62053-21 Class 1 accuracy 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.	The meter shall comply with Class 1 accuracy per IEC 62053-21, enforcing a starting current (I_{st}) of 0.2% of I_n and maintaining strict accuracy limits down to a minimum current (I_{min}) of 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	≤ 5 W / 10 VA	≤ 3 W / 10 VA per phase	≤ 3 W / 10 VA per phase
SM-16	Clock accuracy	≤ 0.5 s/day IEC 62052-21 compliant.	≤ 0.5 s/day IEC 62052-21 compliant.	≤ 0.5 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	Design life not less than 15 years; firmware and cybersecurity	Design life not less than 15 years; firmware and cybersecurity

		support for at least 10 years after final acceptance.	support for at least 10 years after final acceptance.	support for at least 10 years after final acceptance.
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PRIME 1.4 PLC communication requirements

	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.
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	Dual-Stack PRIME Communication Capability: Meters shall incorporate a dual-stack communication architecture that supports operational compatibility with both PRIME v1.3 and PRIME v1.4 profiles.
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 min 14 interval profiles of 15 minutes. Minimum 90 days storage at 15 minute interval for key

		billing channels, or bidder shall state exact capacity and retention assumptions.
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.
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 device shall maintain seven separate, timestamped event logs categorized into power events, communication events, tamper events, firmware/configuration events, relay events, security access events, and a general system log, with a combined total storage capacity of 500 records managed under a strict First-In, First-Out (FIFO) retention policy. All recorded events across these seven groups must be securely formatted and exportable to the HES.
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

ITB26/03280: Supply of 65,000 PRIME 1.4 Smart Electricity Meters and 495 PRIME 1.4 Data Concentrators (Smart Metering Pilot)

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 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.

Cybersecurity and privacy controls

ID	Control	Requirement
SM-45	Device identity	Unique serial number and unique logical device identity. Shared default credentials are not permitted in production.
SM-46	Authentication and access	Role-based access for local and remote operations, with separate roles for reading, configuration, firmware, relay and administration.
SM-47	Encryption	Standard-compatible encryption for DLMS/COSEM and backhaul where supported Security Suite 1, AES-128 or stronger shall be supported
SM-48	Key management	Documented key generation, injection, storage, rotation, revocation and recovery process; keys protected during manufacturing and field operation.
SM-50	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-51	Firmware security	Signed firmware packages, protected bootloader or equivalent, version verification and auditable update campaigns.
SM-52	Audit and logs	Security-relevant operations shall be logged and exportable to the utility security monitoring process.
SM-53	Vulnerability process	Supplier shall provide vulnerability disclosure contact, patch SLA and lifecycle support statement.
SM-54	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-55	Application Layer Standards	The application layer for data exchange must strictly comply with DLMS/COSEM (IEC 62056) standards. The implementation must ensure that all data objects, profiles, and registers are universally understood, standard-compliant, and fully accessible without proprietary translations.
SM-56	Cross-Vendor Interchangeability	The network infrastructure must guarantee that PRIME 1.4 Smart Meters from Vendor A can seamlessly register as Service Nodes, authenticate, and upload all data profiles (including billing, hourly load curves, and tamper/fraud events) to a PRIME 1.4 Data Concentrator (acting as the Base Node) from Vendor B. This interoperability must be native, plug-and-play, and achieved without requiring any hardware modifications, proprietary software patches, or custom middleware.
SM-57	Security Protocol Alignment	The Bidder must explicitly specify and document the exact DLMS/COSEM security suite implemented in the device firmware. The proposed Smart Meters must natively support advanced key-management, robust authentication mechanisms (minimum High-Level Authentication - HLA), and industry-standard encryption algorithms (minimum AES-128 GCM). These security layers must fully align with the active cybersecurity requirements enforced by the central Head-End Systems (HES).
SM-58	Companion Compliance	The Bidder must provide definitive technical evidence demonstrating that their Smart Meters natively support and fully satisfy the Spanish Companion Standard 2.0 . Submissions must verify native compatibility with all specified communication profiles, protocol stack adaptations, and data exchange architectures without requiring custom firmware modifications, thereby ensuring seamless interoperability with Data Concentrators (DC) and the Head-End System (HES).
SM-59	OBIS Code Mapping and Regulatory Compliance	The Bidder must submit the complete, unedited OBIS code mapping list (IEC 62056-61) implemented within the meter's active firmware. This register mapping must fully align with the Spanish Companion Standard 2.0, matching the exact billing blocks, multi-tariff structures and event logs mandated by this standard.

Bidder evidence and submission package

ID	Deliverable	Minimum content
SM-60	Technical compliance matrix	Line-by-line response: Comply / Partially comply / Do not comply, with exact documentary evidence references.

SM-61	PRIME certificate package	Certificate or test report summary for exact meter, profile and firmware; lab name; date; supported bands/channels; limitations.
SM-62	Metrology certificates	MID/local certificate, accuracy class evidence, production conformity, calibration and factory test process.
SM-63	Protocol documentation	DLMS/COSEM object list, OBIS map, event-code map, access levels, companion profile and HES integration guide.
SM-64	Cybersecurity pack	Security architecture, key management, firmware signing, access control, vulnerability management and hardening checklist.
SM-67	Lifecycle statement	Production availability, spare parts, firmware support, cybersecurity support and end-of-life notice process.
SM-68	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

	Stage	Tests and minimum expectations
SM-69	Pre-award sample test	Visual inspection, nameplate check, optical communication, DLMS/COSEM reads, OBIS verification, PRIME 1.4 join/registration, event simulation, relay operation where fitted, clock synchronization, firmware version readout and cybersecurity baseline check, if requested by UNDP.
SM-70	Factory acceptance test (FAT)	Verify bill of materials, hardware/firmware versions, certificates, production test results, HES onboarding, bulk reading, event delivery, remote configuration, firmware update and relay controls.

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 legally acceptable path to local metrology approval for the offered variant.
- No DLMS/COSEM object list, OBIS mapping, event-code map or HES integration documentation.
- No acceptable cybersecurity documentation, including key management and firmware update controls.
- Refusal to provide samples upon UNDP request or to participate in FAT
- Proprietary lock-in that prevents future onboarding of other PRIME-certified meters or access to utility-owned data.
- Failure to commit to warranty, spare parts, firmware support and cybersecurity remediation obligations for the required lifecycle.

Mandatory requirements

- All offered meters shall be new, unused, production-grade units and shall match the sample-tested hardware, firmware, metrology and PLC profile.
- The supplier shall provide PRIME 1.4 certification evidence for all offered meters and shall warrant interoperability with the certificated PRIME 1.4 data concentrator.
- The supplier shall provide full DLMS/COSEM documentation, OBIS mapping, event-code mapping, access-level matrix and integration documentation before FAT.
- No default credentials, shared production keys or unaudited remote-access mechanisms are permitted in production.
- Remote disconnect/reconnect and firmware upgrade actions shall be role-controlled, logged, auditable and subject to buyer-approved operating procedures.
- The buyer shall own all metering data, events, configuration data and asset records. Data export shall be available in open documented formats without termination fees.