

SECTION 26 09 13 ELECTRICAL POWER MONITORING AND CONTROL

PART 1 - GENERAL

1.1 SCOPE

- A. This section defines the low voltage *[embedded sub-metering] [kWh revenue class multi-circuit metering]* for use in the AC electrical equipment as outlined in the one-line and/or riser drawings. These solutions will provide a low voltage metering system integrated into the electrical equipment. *[The multi-circuit energy sub-meter solution shall offer an efficient system for commercial, industrial, and residential sub-metering.]* The metering system shall provide the ability to report the energy information remotely using a web based software platform *[and a billing solution for tenant bill generation.]* The system must be expandable to accept non-electrical meter input for water and gas.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
1. *[Section 26 09 26.03 – Lighting Control Devices]*
 2. *[Section 26 23 00 – Low Voltage Switchgear]*
 3. *[Section 26 24 13 – Switchboard]*
 4. *[Section 26 24 16 – Panelboards]*
 5. *[Section 26 24 19 – Motor Control Centers]*
 6. Section 26 – Electrical Installation

1.3 SUBMITTALS

- A. Submit shop drawings and product data for approval and final documentation in the quantities listed according to the Conditions of the Contract. Customer name, customer location and customer order number shall identify all transmittals.
- B. *[Final Documents: Record documentation to include but not limited to: as-built wiring diagrams, meter/breaker/load schedule, factory test results and certificate(s), system commission report, manufacturers contact information, operation and installation manuals.]*

1.4 RELATED STANDARDS AND COMPLIANCE

- A. Meet the following recognized standards and approvals for applications:
1. Accuracy:
 - a. ANSI C12.1
 - b. ANSI C12.20/0.5
 2. Safety/Construction
 - a. CSA C22.2 No. 1010-1 Safety Requirements for Electrical Equipment for
 - b. Measurement
 - c. UL916 Energy Management Equipment
 - d. UL61010-1 (IEC 61010-1) Test and Measurement Equipment
 3. Approvals/Certification
 - a. New York State PSC (Public Service Commission) approved Meter
 - b. ANSI C12.20 certification done through NRTL (Nationally Recognized Test Lab)
 - c. BTL Certified (BACnet Test Laboratories)
 - d. CTEP Certified (California Type Evaluation Program) by CDFA (California Department of Food and Agriculture), a division of Measurement Standards, CA
 4. Electro Magnetic Compatibility
 - a. IEC 61000-4-2 Electrostatic Discharge (B)

- b. IEC 61000-4-3 Radiated Immunity (A)
- c. IEC 61000-4-4 Electric Fast Transient (B)
- d. IEC 61000-4-5 Surge Immunity (B)
- e. IEC 61000-4-6 Conducted Immunity
- f. FCC Part 15 subpart B, Class A Digital Device, Radiated Emissions

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of this equipment shall have a minimum of 5 years experience producing electronic submetering system equipment.
- B. Manufacturer shall provide both external and embedded metering solutions.
- C. Manufacturer shall offer both a 1% and 0.2% accuracy solution.
- D. Comply with requirements of latest revisions of applicable industry standards.
- E. Manufacturer shall have remote web based tenant billing software solutions.
- F. Metering hardware shall be designed, factory installed and tested before shipping to site.
- G. Embedded solution must be a standard product offering by the panel manufacturer. Custom "one off" installed metering solutions are not acceptable.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from potential damage from weather and construction operations. If the meters are installed in equipment, store the equipment so condensation will not form on or in it. If necessary, apply temporary heat where required to obtain suitable service conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The low voltage power meter shall be SEM3 metering solution by Siemens or pre-approved equal. Approved manufacturers are as follows:
 - 1. SIEMENS - ACCESS
 - 2. []

2.2 HARDWARE OVERVIEW

- A. The meters and the ancillary equipment shall meet revenue approval by the recognized authorities in Section 1.4.A **[and the authorities having jurisdiction]**.
- B. Current Transformers (CTs) - Manufacturer shall offer solid core designs and be rated for at least the following maximum amperage ratings; 50,125, 250, 400, 600, 800 and 1200 amps. Solid core CTs shall meet Accuracy standard IEC 60044-1, Class 0.2s
 - 1. CT's shall only have milliamp (100mA) output and measure accurately down to 1% of the maximum range.
 - 2. CT's shall be self protecting and not require shorting blocks.
 - 3. CT's shall support 1.3 times CT rating.
 - 4. CT's shall be rated for (CAT IV UL metering)
 - 5. CT's shall be rated for 600VAC.
- C. Micro Meter Modules – Individual micro metering modules shall be provided, one for each phase of the metered circuit. These meter modules will tie to the milliamp CT's. The CT's must be supplied by the manufacturer of the Meter Modules.
 - 1. Meter modules shall measure data at **[1%] [0.2%]** accuracy as tested in accordance with ANSI C12.20

2. When grouped together, the Meter Modules shall allow for measurement of 1, 2 and 3 phase circuits.
 3. Meter Modules shall incorporate a dip switch selector to select phase A, B, or C, and have a LED indicator to indicate the phase.
 4. The Meter Module shall be able to accept inputs from all available milliamp CTs ranging from 50 to 1200A.
 5. Setup for the CT sizing on each Meter Module shall be done through the controller web page.
 6. Meter modules shall plug directly into the metering rack without any additional installation work or tools needed.
 7. All embedded metering solutions shall have the metering modules installed at the electrical equipment manufactures factory. No field installation shall be required.
 8. Meter modules shall be pre-calibrated and will never need future calibration.
 9. Meter modules shall provide a LED indicator to indicate if the unit has power and is communicating.
 10. Micro Metering module shall record the kWh reading and retain it for over 45 years without external power.
- D. Racks – Micro Meter Modules are to be mounted on scalable Racks. The Rack Assembly shall be designed to allow the Micro Meter Modules to be snapped into the Rack without use of any tools.
1. Rack Assemblies shall be available in sizes of 3, 9, 15 and 21 Micro Meter Modules.
 2. Rack Assemblies shall be sized to meter all circuits denoted for metering on the drawings accept up to 3, 9, 15 or 21 Micro Meter Modules.
 3. Rack Assemblies will allow for open slots to accommodate future expansion as noted on the drawings.
 4. Rack Assemblies shall be connected to the controller using a 600v rated communications cable.
- E. Controller – The controller shall function as the collection, processing and setup point for the Micro metering units with a built-in web page interface.
1. Built-in Web page configuration and real-time data screens will include:
 - a. System settings: CT Ratios, PT Ratios, System type, Alarm Settings, communications settings and passwords
 - b. Global settings: for threshold and set-point alarms.
 - c. Branch Meter configuration: for one, two or three pole; and individual meter warnings, CT ratings, and labels. Dynamic logic shall be built-in to the web configuration tool as to prevent the user from setting up an incorrect arrangement.
 - d. Real-Time data monitoring.
 - e. Diagnostics data to be used to monitor Modbus register address information being passed to other monitoring or control systems.
 - f. No third party software shall be required to configure the Controller or Micro Metering modules.
 2. The Controller shall communicate metered values to outside systems by:
 - a. HTML Web page interface, Modbus RTU or Modbus TCP.
 3. One Controller shall be able to manage up to 45 Micro Meter Modules from the same voltage.
 4. The Controller shall have two digital pulse inputs for receiving pulse inputs from other metering devices, such as gas and water.
 5. The Controller shall have one configurable (KY or KYZ) digital pulse output that can be used to output total Kwh data from one or more Micro Metering modules totalized together.
 6. The Controller shall be powered from its own voltage inputs and rated suitable for 480V, 240V, 208V and 120V AC applications.
- F. Service Types
1. *[Single Phase Two Wire]*

2. *[Single Phase Three Wire]*
3. *[Two Phase Network]*
4. *[Poly- Phase Four Wire]*

G. Metering Data – Data recorded and calculated that can be passed on to an external system or displayed on the Controllers web page shall include for each breaker:

1. Energy: The meters shall provide true RMS, fully bi-directional and either 4-quadrant, revenue accurate or revenue certified energy metering for the following parameters.
 - a. kWh (Active Energy)
 - b. kVarh (Reactive Energy)
 - c. KVAh (Apparent Energy)
 - d. kW Demand
 - e. Integration of any instantaneous measurement
2. Instantaneous: The meters shall provide high accuracy, 1 second, ½ cycle measurements, including true RMS per phase and total for the following parameters.
 - a. Voltage and current
 - b. Active, Reactive, and Apparent power (kW, kVAR, kVA)
 - c. Phase Angle
 - d. Power Factor
 - e. Current Demand
 - f. kW Demand
3. Instantaneous Max: The meters shall record each new maximum value for the following parameters:
 - a. Current Demand
 - b. Current
 - c. kW Demand
 - d. kW
4. Alarming/Monitoring: The system shall display and configure alarming for the following parameters
 - a. Phase Loss
 - b. Over Current Warning
 - c. Over Current Alarm
 - d. Over kW Demand Alarm
 - e. Under/Over Voltage Alarm

H. *[Display*

1. *A touch screen display of at least 7” diagonal shall be provided in a central location for viewing each SEM3 sub-metered circuit’s data.*
 - a. *The touch screen shall be mounted in a separate NEMA 1 enclosure for mounting in the designated location as shown in the drawings.*
 - b. *The touch screen shall come prewired for 120VAC control power. Electrical Contractor to power from a designated control power circuit as shown in the drawings.*
 - c. *The touch screen shall be able to communicate to (6) six SEM3 sub-meter controllers to allow viewing and navigation from circuit to circuit for (6) six panelboard or switchboards meter data.*
 - d. *The touch screen shall show circuit naming and designations as configured in each SEM3 controller specific to the panel [ie – HVAC #4, Hall Lighting, etc.]. Standard numbering is not acceptable [ie – Panel 1, Ckt. 5].*
 - e. *An Ethernet communications switch for connecting the SEM3 controllers to the touch screen display shall be mounted and pre-wired into the enclosure.]*

2.3 TENANT METERING SOFTWARE **IF TENANT METERING SOFTWARE IS NOT NEEDED, THEN DELETE THIS SECTION 2.3.**

- A. The meter manufacturer shall provide a web-based third party or local tenant metering software that will allow the (management company) to download, store, view and provide tenant bills at predefined intervals. *[Approved manufacturers are as follows:*

1. ***[Priority Billing Services USA***
 2. ***Or equal third party billing company ADD NAME HERE]]***
- B. System Overview
1. System
 - a. The sub-metering system shall automatically upload all the metering based data on a predefined time period.
 - b. Tenant software shall be expandable up to 5,000 tenant meters per site.
 - c. Input of other utilities such as water, air, gas and steam shall be allowed.
 - d. Detailed energy profiles (Consumption Tracker) with a time period scalable by hour, day, month or yearly basis shall be included.
 - e. Energy usage bar charts by meter or groups of meters shall be included.
 - f. Detailed consumption reports with meter profile information shall be included.
 - g. Provide a Resident Management tool that shall allow the property management company to manage the residents as they move in and out and show vacant units.
 - h. ***[Provide a Web based Tenant Metering Dashboard to allow easy access to the billing and tenant information. This dashboard will allow users to print bills, reports, and save notes on individual customers.]***
- C. Software operating system requirements for local computer work station.
1. Operating Environment
 - a. Windows 7 professional
 - b. Microsoft Database capability included. Provide storage and collection services that shall host the data within a standard exchange format such as XML, MS ACCESS, EXCEL or CSV format and capable of exporting this data to the Management accounting system if desired.
 - c. Data shall be collected at a central point in the system known as the “data concentrator” or PTLIS and connected to the Internet VIA standard TCP/IP Ethernet.
 - d. The Local server (PC) shall support at least:
 - 1.) 1.6 Ghz, with 1-2 Gig Ram , 100-160 GB space and Microsoft Excel or other aforementioned database formats for reporting.
 2. Management Reports
 - a. The system shall automatically upload metering based data on a predefined time period 1-60 minute intervals and print reports on demand or on a schedule.
 - b. The Billing Engine for local software shall be an easy to use wizard that will allow the user to set:
 - 1.) Multiple rates
 - 2.) Taxes
 - 3.) Late payment dates
 - 4.) Late payment charges
 - 5.) Custom charges, such as GAS and Water services
 - 6.) Customer names and unique account to be accessed by HOA or management company only numbers.
 - 7.) Tenant access shall be secure billing data and consumption profile only.
 - c. Reports shall include the Customers name, location, period covered, move in & out dates, payment type and invoice number.
 - d. ***[Reports shall include:***
 - 1.) ***[electrical]***
 - 2.) ***[gas]***
 - 3.) ***[water]***
 - 4.) ***[steam]***
 - 5.) ***[air]]***

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The Contractor shall furnish, install and terminate all communication conductors and associated conduits external to any factory supplied equipment.
- B. All communications conductor wiring and routing shall be per the manufacturer's recommendations and as shown on the contract drawings.
- C. Additional connections to metering systems, where applicable, shall be done in the field by *[the manufacturer's start-up service group] [the installing contractor]*.

3.2 ADJUSTING AND CLEANING

- A. The meters and CT's shall be pre-calibrated and require only basic setup via the embedded web pages.
- B. Clean exposed surfaces using manufacturer recommended materials and methods.

3.3 TESTING

- A. Perform factory and installation tests in accordance with applicable NEC, NEMA, UL, ANSI, Weights and Measures California requirements.

3.4 WARRANTY

- A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

3.5 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service of the metering system. The representative shall be trained and qualified for metering systems.
- B. Provide a qualified tradesman to assist in the commissioning of system.
- C. Obtain and submit as part of final documents a field commissioning report.
- D. Verify that the *[meter is] [meters are]* installed and connected according to the Contract Documents.
- E. Complete installation and startup checks according to manufacturer's written instructions.

3.6 SUPPORT

- A. The electrical equipment manufacturer shall provide a 1-800 number for telephone support.
- B. The vendor shall provide training at a dedicated training facility, complete with software, devices and demonstrations or offer remote training services if required.
- C. The vendor shall also provide on-line support for technical information and literature.

END OF SECTION