SECTION 26 10 00

ELECTRIC METERING

PART 1 -DESIGN DIRECTIVES

1.1 CAMPUS ELECTRICAL METERING SYSTEM DESCRIPTION

A. Dartmouth Facility Metering: Provides both energy data and facility monitoring to FO&M.

1. FO&M Controls Technicians, Energy Analysts and Facility Engineers: Access data via software where meter data is gathered, logged, and monitored.

B. Electric Meters Communication: Via Dartmouth Campus Network Infrastructure.

1. Energy VLAN: Private VLAN to which all meters are connected.
   a. Energy VLAN Management: FOM Electric Shop

2. Campus Network Management: Dartmouth College Network Services

C. Dartmouth's Energy Management Software: For revenue billing and power monitoring data.

1. Software which collects Meter Data:
   a. Kepware KepServer
   b. Factory Talk Energy Metrix
   c. Rockwell VantagePoint.

D. Dartmouth's Electrical Power Monitoring System Software:

1. Schneider Electric EcoStruxure Power Monitoring Expert (PME).

1.2 The electrical contractor shall coordinate with the BAS contractor to ensure compliance with this section and Division 25 – Integrated Automation.

1.3 DESIGN CRITERIA

A. Main Building Electric Meter:

1. Each building on campus is to be metered for electrical consumption and monitored for power quality on the secondary side of building transformers.

B. When Building Main Disconnect and Distribution is Switchgear:

1. Meters and meter components other than CTs: Installed in separate, isolated cabinet section of switchgear.

C. When Building Main Disconnect and Distribution is a Switchboard or Panelboard:

1. Provide a separate enclosure to house meter, shorting blocks, power supply, ethernet gateway, and other associated components of meter equipment.
2. Design Drawings: Include details for field assembly, meter connections, and enclosures on switchboard and panelboard installations.

3. Main Meters Connections: Directly to campus network via integrated ethernet gateway functionality, enabling the capability to connect via Ethernet to downstream, serially connected devices. Electrical meters used for switchgear, or larger building loads shall communicate via Modbus TCP/IP.

D. Meters Other Than Main Meter Connections: Via RS485 daisy-chain metering bus to a meter with an ethernet gateway, or to an ethernet gateway device.

1. Metering Bus: Limited to a single floor and a limited area.
   a. Meters on a Single Metering Bus and Ethernet Gateway: Six maximum.

2. All electric meters and submeters operating on a serial RS-485 bus must be physically separated from all other devices over serial communications.

E. Design Engineer: Encouraged to consult with meter manufacturer's representative. Verify meter specification and connectivity meets Dartmouth FOM Electrical Engineering and Energy Management needs and requirements and is represented correctly in the documents.

F. Dartmouth FO&M Requires Meters for:

1. Building Mains: On load side of main building transformers.
2. Emergency and Standby Feeders: Options to meter power include:
   a. Breaker monitoring modules; to provide normal load data only.
   b. Meter on Transfer switch load side.
   c. Ethernet Connection to Transfer Switches:

      1) Russelectric Controller RTCS05
      2) ASCO Controller with accessory 72EE2 Ethernet gateway.

3. Solar PV or other electrical energy fed into the system (PM5500 meter with integral or remote display standard)
4. Other Feeders: As requested by Dartmouth FOM Engineering & Utilities.

G. Current Transformers (CTs):

1. Design team to size CTs based on anticipated loads and not on panel rating.
2. Consult with Dartmouth College FOM Electrical Engineer and Energy Management Engineer regarding CT sizing.

H. Communications:

1. Proprietary communication protocols, mapping, data encoding, or socket types are prohibited. If multiple disparate systems require access to the meter data, the Electrical contractor shall provision for multiple communication outputs when ordering meters, prior to construction submittals.
2. All meters and submetering devices that communicate via Modbus protocol must provide all protocol and register mapping to the Project Manager and FOM-Energy Management System Engineer.
3. Where possible meters to be daisy chained together via ethernet rather than RS485.

I. Data Jacks:

1. Main Electric Room: Two Data jacks installed as close as possible to ethernet gateway at meter compartment or enclosure.
   a. 1 inch conduit from the data jack to the ethernet gateway location.
   b. Data Jumper Cable: Installed by Dartmouth College FO&M EL Shop or IT system contractor.

2. One Data Jack: Installed adjacent to each additional ethernet gateway.
   a. 1 inch conduit from the data jack to the ethernet gateway enclosure/location.
   b. Data Jumper Cable: Installed by Dartmouth College FO&M EL Shop or IT system contractor.

3. Refer to Division 270000 for related requirements.

1.4 RELATED SECTIONS

A. Schedule/Table of Dartmouth College Campus Connected Systems. See example pasted at end of this section.

PART 2 - PRODUCTS

2.1 METERS

A. Meters Manufacturer: Schneider Electric Powerlogic or ION product series and/or models described per the following.

B. Main Meters in general Buildings:

1. Provide all main meters with serial RS-485 Modbus, 2 Ethernet ports, and at least one D/I standard with option for adding more.
2. Main meters to be provided with dedicated space in switchgear isolated from active bus and breaker connections or provided in a remote enclosure of type 9761C (PM8240 or PM5500) or type FAEV (ION9200) or Schneider equivalent.

C. Large or High Priority Buildings:

1. Main Meter: Schneider Electric ION9200 advanced power quality meter. Provided with 2 Ethernet ports and allow wiring from meter to meter as a RS 485daisy-chain; be capable of serving data over the Ethernet network accessible through a standard web browser.

D. Medium Buildings

1. Main Meter: Schneider Electric PM8240 series Intermediate Power Quality Meter. Provided with 2 Ethernet ports and allow wiring from meter to meter as a RS 485daisy-chain; be capable of serving data over the Ethernet network accessible through a standard web browser.

E. Smaller or Lower Priority Buildings

1. Main Meter: Schneider Electric PM5500 series. Provided with 2 Ethernet ports and allow wiring from meter to meter as a RS485 daisy-chain; be capable of serving data over the Ethernet network accessible through a standard web browser.

F. Feeder Loads such as Emergency, Standby, Solar PV, and building sub-loads:

1. Metering devices require RS485 connections to a meter with ethernet connectivity or to an ethernet gateway device Panel Server.
   a. Solar PV: Schneider Electric PM5500 series
   b. ATSs: Built in ATS monitoring as approved by Dartmouth College FOM Electrical Engineering or Schneider Electric EM3550 meter
   c. Building sub-loads (i.e. lighting, plug loads): Schneider Electric iEM3455
   d. All other loads - consult Dartmouth College FOM Electrical Engineering and Energy Management System Engineer for metering requirements.

G. All metering submittals must be reviewed and approved by Dartmouth College FOM Electrical Engineering and Energy Management prior to project team approval and equipment acquisition.

PART 3 - EXECUTION

3.1 METERING INSTALLATIONS

A. Meter System Installations: Provided with manufacturer's start-up and training.

B. Other Devices in the Gear: To be wired in via RS-485 or dry contact D/I as appropriate

1. Other Devices include but are not Limited to the Following:
   a. Micrologic trip units.
   b. TVSS units.
   c. Transformer fan controllers

C. Meters: Served by a dedicated set of current transformers wired through a shorting terminal block, unless microamp CTs are employed.

1. One side of each current transformer must be grounded at the CT shorting block.
2. Voltage Inputs: Provided by a dedicated 3pole 15-amp circuit breaker.
3. Control Power: Provided by a dedicated 1pole 15-amp circuit breaker.

3.2 DATA/ETHERNET INSTALLATION

A. Main Electric Rooms:

1. Two data jacks as close as possible to ethernet gateway at meter compartment or enclosure.
   a. 1 inch Conduit: From data jack to ethernet gateway location.
   b. Data Jumper Cable: Installed by Dartmouth College FO&M EL Shop, project Electrician, or IT system contractor.

2. One Data jack adjacent to each additional ethernet gateway.
   a. 1 inch Conduit: From data jack to ethernet gateway location.
   b. Data Jumper Cable: Installed by Dartmouth College FO&M EL Shop, project Electrician, or IT system contractor.

3.3 METERING START-UP and CONNECTION to DARTMOUTH NETWORK

A. Meter Installations: By installing Electrician

1. Install per Manufacturer's Specifications and Other Sections of the Dartmouth Design Guidelines: Meters, CTs, shorting blocks, voltage reference, control power, and interconnecting wires, and ethernet gateway as necessary.
2. Network Jumper Cable: From meter (Ethernet gateway) to network outlet.
3. Multiple Meters in Same Switchboard and/or on Same Floor: To be interconnected on meter wiring bus per manufacturer's instructions.

B. IP address and internal BACnet ID for the meter:

1. Obtained by Project Manager, or by Meter Technician if no project manager.
   a. IP address: Request by initiating a work order to the DC FOM BAS shop two weeks prior to meter startup. Must describe meter type, name of meter, and location.
   b. IP address/BACnet ID: Provided by DC FOM BAS Shop to Project Manager, Installing Electrician, FOM-Engineering, and FOM-Energy Management System Engineer.

C. Network Jack (cables, test, punch-down, etc.): By DC Network Services approved ITS Contractor.

1. Test Connectivity to network jack and activation on Energy Management VLAN: By DC Network Services.
2. Verify Connectivity (ping device) and test Modbus tool: By FOM Meter Technician.

D. Startup Meter: By Schneider Electric technician.

E. Startup Meter: Provide labor by Schneider Electric technician. Technician is to power up and configure the meter for the electrical system, CT/PT ratio, system type configuration, firmware updates, logging, communications, IP Address, and Modbus address if applicable.

F. Connect and Configure to PME software: By Schneider Electric Powerlogic Engineer either in person or via remote session and in coordination with FOM-Electrical Engineer. and FOM-Energy Management System Engineer.

1. Contractor shall set up schedule: With minimum 5-days notice.
   a. Schedule Schneider Electric Engineer with DC-FOM Electrical Engineer and DC-Energy Management System Engineer.
   b. Notice FOM-Electric shop.
   c. Plan for 1/2 day per meter.
   d. Confirm network jack activation and assignment to Energy Management VLAN and connect meter gateway(s) to ethernet jacks.

2. FOM-Engineer:
   a. Provide access to server via remote desktop and an online session with Schneider Engineer.
   b. Provide the correct information for each meter:

      1) IP address including gateway and sub-net mask and modbus address if applicable.
      2) Site name, Group name, and Device name.

a) Group Name: The name of the building/source/ transformer (electric system) that meter is connected to. Wording will show up as a prefix to each meter name in PME.

1) Example: "Burke Main A" and "Burke Main B" are two different group names.

a) Submeters need to be assigned correctly to each respective substation.

b) Site Name: Will identify gateway/device the meter and breaker module are connected to. This wording will not show up in PME.

c) Meter Device Name: The name of the meter. Define the load being metered, followed by the assigned (by Energy Management) meter number. This name will be displayed in PME.

3) Any particular alarm or monitoring setup requirements.

4) CT ratio info.

c. Schneider Technician: Set up graphics per FOM-Engineering direction; locations, name of buildings.

G. Connect and Configure to Energy Management Software: By FOM-Energy Management System Engineer

1. Energy Meters: Connected and configured to energy management software within ten days of commencing energy consumption.

Project Manager: Ensure the above steps are completed and provide sign-off to FOM-Engineering and to O&M files upon completion.

DARTMOUTH COLLEGE - NETWORK CONNECTED SYSTEMS

This Table shall be filled out and shall appear on project construction documents

System	Device or Equipment Name	Location	Dartmouth Network Description	IP Address
Building Manegment System (BMS)	Control Panels		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Building Manegment System (BMS)	Special Equipment?		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Building Manegment System (BMS)	Name of jack used for contractor ?		Static IP Address, not on Energy VLAN	Network Services will provide IP Address
Lighting Controls	Gateway		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Lighting Controls	Hubs (Lutron Vive)		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Lighting Controls	Control Panels		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Lenel Access Control	Lenel Access Control Panels (LNL-3300)		Static IP Address, not on Energy VLAN	Network Services will provide IP Address
Fire Alarm Monitoring Device	Keltron Panel NET922/24		Static IP Address, not on Energy VLAN	Network Services will provide IP Address
Electric Meters	Main Meter		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Electric Meters	Gateway(IFE) for breaker modules		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Breaker Monitoring	Gateway for Sub-Meters		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Energy (Flow) Meter	Hot Water Flow meter		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Energy (Flow) Meter	Chilled Water Flow Meter		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN
Energy (Flow) Meter	Condensate Meter		Energy VLAN, IP Address	FOM will provide IP on Energy VLAN

END OF SECTION