SECTION 26 09 01 – CAMPUS CENTRAL METERING SYSTEM DESIGN CRITERIA

1. General

   A. Electrical usage on the Brown campus is presently monitored by a Siemens-brand, web-based central metering system, which includes a central file server and individual ION-type (Integrated Object Network) building meters and submeters, which are interconnected via the campus Ethernet system. The metering system is presently configured to operate on Siemens "WinPM.NET" supervisory software

   B. Metering and consumption data is stored locally within each meter as well as archived within the main file server located in the Facilities Management Building.

   C. High Temperature Hot Water, Medium Temperature Hot Water as well as district cooling system Chilled Water are also reported to and stored by the Siemens central metering system. Information for BTU meters includes interval and total to date flow rates and BTU consumption, as well as instantaneous supply and return temperature information.

   D. Building gas consumption is also monitored by the Siemens central metering system.

   E. Large emergency generators are monitored and supervised by the Siemens central metering system for energy usage and alarm monitoring. This system is separate and distinct from the Johnson Controls and Andover (TAC) building automation and control systems.

2. Electrical Metering:

   A. All building projects that interface with the building electrical distribution system shall provide a digital electric meter if not already present.

   B. Metering of incoming electrical power, as well submetering of major systems (Lighting, HVAC, Etc.) is required in new building construction as well as gut renovations of existing buildings. Metering of incoming electrical power is required in the course of electrical and mechanical systems renovations to existing buildings.

   C. In general, there are three types of electric meters presently being specified: power quality, energy, and power meters, as follows:

      1. Power quality meters are high end meters that measure voltage/current per phase, average, unbalance, real power, reactive power, apparent power, power factor, energy, and

harmonics up to the 63rd order; monitor voltage sag / swells; capture, display and store phasor representations of the system. Power quality meters shall have an Ethernet port, and log data for up to one year. Meter shall be provided with a minimum of 10 MB of on-board memory. The model number for this meter is Siemens 9510.

2. Energy meters measure voltage/current per phase, average, unbalance, real, reactive and apparent power; power factor, energy and harmonics up to the 15th order. Energy meters shall have an Ethernet port, and log data for up to one year. The model number for this meter is Siemens 9330.

3. Power meters measure voltage/current per phase, average, unbalance, real, reactive and apparent power; power factor, energy, and total harmonic distortion. Power meters shall be Modbus capable and have an RS-485 port. The model number for this meter is Siemens 9200. These meters shall only be used in conjunction with an adequately configured Power Quality or Energy meter that has sufficient on-board memory to locally store 1 year of power meter data, in addition to its own memory storage requirements.

D. All new electrical meters and submeters shall match and be fully compatible with the existing metering system components and software.

E. Proposed meter locations and the specific type of meter shall be reviewed by the Brown University Engineering Office and shall be specified in the project design documents. Medium-voltage switchgear feeders and buildings with research or a large proportion of Information Technology systems, research, or other equipment sensitive to power quality issues shall be provided with type 9510 power quality meters. Normal building services shall be provided with type 9330 energy meters. Small submetered building loads shall be monitored with type 9200 power meters. 9200 series meters shall be programmed in the central metering system software for data logging of all essential voltage, amperage and power parameters.

F. Electric meter installation requirements:

1. In addition to provision of the actual meters, all required system configuration and programming shall be included for the integration of any new building meters and submeters into the existing central metering and data archiving system. The contractor will be responsible for obtaining the software setup and meter configuration from Siemens.

2. See Sections 26 09 02 - Campus Metering Network Connection Criteria for typical utility meter interconnection wiring to the campus Ethernet, and Section 16004C for typical utility meter interconnection wiring details. Unless otherwise noted, all materials and wiring are to be provided by the Contractor, as well as all required meter and campus metering system programming and setup.

3. For retrofit applications and for new building loads that are served via small panelboards, prewired metering enclosures, as supplied by Siemens, shall be installed adjacent to the metered equipment. The enclosure shall generally consist of a meter (type as required), interconnection wiring terminal strips, and shorting blocks for connection to the current transformers. The Contractor shall be responsible to install and wire the meter. Required interconnections include split-core current transducers (supplied by Siemens, size as required, fused voltage inputs (three phase plus neutral and ground) and a 120 VAC power supply connection.

4. For larger building loads that are served via a new distribution switchboard(s), the meters shall be installed directly within a dedicated, barriered metering compartment that is designed within the switchboard. The metering compartment shall be factory prewired, to terminal strips, with all required three-phase current transducers, voltage inputs and 120 VAC meter power supply. The Contractor shall be responsible to install the meter, make all interconnection wiring connections,

3. High Temperature Hot Water, Medium temperature Hot Water and Chilled Water Metering:

   A. All new building construction and renovation projects that have provisions for high temperature hot water for heating use, or district chilled water for air-conditioning use shall include a BTU (flow) meter if not already present. The BTU meter shall be selected, configured, programmed, and mapped to the campus central metering system software for data logging via a building electric meter, to provide for monitoring and trending of the building thermal loads.

   B. High temperature hot water and chilled water is being metered by the following type of meter:

      1. Ultrasonic-type flowmeters are GE Panametrics, model DF868 series, Flexim Instruments model 7407, or approved equal, and communicate with the electric meter via Modbus interface. Required data includes flow and temperature of the supply and

return water, net water flow, instantaneous building BTU consumption, net and peak BTU demands.

2. Flow meter shall have the capability to log all measured and calculated values for up to one year. Meter shall be provided with the following outputs:

   - Modbus output, for connection to the Brown campus metering system
   - Ethernet output, for direct access with thermal meter manufacturer's software via the campus Ethernet
   - 4-20mAmp outputs, for water flow and BTU consumption, for connection(s) to the building automation system

C. Proposed meter locations, the specific type of meter and meter options and accessories shall be reviewed by the Brown University Engineering Office and shall be specified in the project design documents.

D. BTU flow meter installation requirements:

1. Flow meters shall be wired back to the nearest accessible Siemens electrical meter via a Modbus output and Belden # 9841, run in ¾" conduit. Flow meters shall also be wired back to the building energy management system network-level controller, via multiple Belden # 9841, run in ¾" conduit.

2. Panametrics brand BTU meters are installed with an insert spool piece installed on the incoming water line. The spool piece contains the wetted flow transducer elements as well as an RTD temperature probe thermowell. In addition, an RTD temperature probe thermowell shall also be installed in the return water line. Flexim brand BTU meters are installed with the flow transducer elements and temperature elements mounted to existing piping. Regardless of meter type, the contractor shall connect and wire all field sensor wiring back to the controller, per the manufacturer's requirements and provide a 120VAC dedicated power supply to the meter.

3. Each BTU meter shall be provided with an Ethernet data drop connection to enable remote system diagnostics, programming and data collection.

4. See Section 26 09 04-Thermal (BTU) Meter Interconnection Detail for typical meter interconnection wiring connections. Unless otherwise noted, all materials and wiring are to be provided by the Contractor.

5. In addition to provision of the actual flow meters, all required flow meter system configuration and programming shall be included. Also, all required system configuration and programming shall be included for the integration of the BTU meters into the existing campus central metering system software. The contractor will be responsible for obtaining the software setup and meter configuration from the BTU meter vendor and Siemens.

4. Gas Metering:

   A. All new building construction and renovation projects that have provisions for natural gas shall provide a gas meter incorporating a pulse output if not already present.

   B. Pulse outputs from the gas meters shall be wired back to the nearest accessible Siemens electrical meter via a Modbus output and Belden # 9841, run in ¾" conduit.

   C. In addition to provision of the actual gas meters, all required system configuration and programming shall be included for the integration of any new gas meters into the existing Siemens central metering and data archiving system. The contractor will be responsible for obtaining the software setup and meter configuration from Siemens.

5. Emergency Generator Metering and Alarm Monitoring

   A. All critical use and new large (150 KW and up) emergency generators, are to be provided with a dedicated power meter and input/output controller for supervisory monitoring and remote control of the generator and associated automatic transfer switches. The Power meter and components shall match, and be fully compatible with, the existing campus central metering system components and software

   B. The generator power meter shall generally comprise a 9350–series Siemens Power Meter with Ethernet connection, Ethergate connections for Modbus Communications, expanded on-board memory for data logging, and minimum of 4 assignable output contacts for system control. Meter shall be provided with an additional Input/Output controller, Siemens Model S7io, incorporating digital inputs for equipment status, serial communications capacity for transfer switch and generator status monitoring and digital outputs for transfer switch load shed and manual transfer functions, and generator remote start/stop. Meter, 120VAC power supply and Input/Output controller shall be furnished, installed and prewired complete within a common 20" X 20" (nominal) Nema 4/12 Enclosure, with all required wall mounting hardware, ready for field installation. Factory-prewired LED's shall be provided to illuminate when

remote load transfer and generator start/stop functions are active for troubleshooting purposes.

C. Generator power meter shall be configured to monitor generator load via generator-mounted ct's and generator voltage inputs. When so required for load-shed purposes, the meter shall be programmed to provide a minimum of (4) user-programmable dry contact outputs to the BAS system or other system, to enable the BAS to enable various load shed sequences as may be required.

D. Generator power meter shall be programmed to allow for remote and generator start/stop and remote activation of transfer switch control via discrete contact outputs to the generator control panel and to each controlled transfer switch.

E. Generator power meter shall be programmed to allow for remote monitoring of the emergency generator and each connected automatic transfer switch. The Power meter shall be configured to monitor the following status points from each connected transfer switch: Load (amps), voltage, switch position (load connected to normal, load connected to Emergency, and remote test switch position status. Meter shall also be configured to monitor the generator run status and alarm status panel alarm points. Meter monitoring shall be via MODBUS (RS 485) connection to each transfer switch and generator.

F. Provide the services of a qualified Siemens programmer/technician for integration of the generator power meter, its associated monitoring and controls functions into the existing campus central metering system components and software. Programming to include setup and trend logs for meter interval data and all system status alarm points, setup of custom graphic display screens denoting system status points and setup of password protected, remote system start-stop and transfer switch control from the campus head end. The Contractor is responsible to coordinate this programming effort with the generator and transfer switch suppliers.

G. See Section 26 09 05-Emergency Generator Power Metering & Load Shed Interconnection Detail for typical power meter interconnection wiring to the campus Ethernet, emergency generator and automatic transfer switch(es).

END OF SECTION