SECTION 260913 – ELECTRICAL MONITORING & CONTROL SYSTEM

ASHRAE 90.1 Compliance

University of Pennsylvania buildings shall comply with the Commercial Energy Efficiency Requirements of ASHRAE Standard 90.1-2016. The ASHRAE 90.1-2016 compliance paths shall be followed instead of the International Energy Conservation Code (IECC) requirements as permitted by 2018 IECC Section 401.2 Application.

Refer to Section 255500 "Instrumentation and Integrated Control" for Electrical Energy Monitoring requirements.

SCADA System

System design shall include all components, system software, system hardware, testing, and training, supervision of installation, integration and connection to University SCADA system. The Power Monitoring system communicates with the SCADA system via a VPN within the greater PennNet ethernet communications network. The SCADA system supports information display at the University's Operations Control Center (OCC).

Metering System

In addition to the basic information provided to the OCC via the SCADA system, the University maintains power metering platform that collects and displays detailed metering information. The system used is the Iconics Genesis 64.

Security

All devices shall be password protected such that settings may not be altered by non-authorized persons

1.0   System Monitoring Functions:

      A.   The system shall be capable of monitoring the following functions:

            1.   Primary Switchgear:

                  a.   Main, tie and feeder circuit breaker status (open/closed)
                  b.   Relay/Auto transfer controls status (normal/fault)
                  c.   Lockout relay coil failure
                  d.   Transfer scheme in manual
                  e.   Main breaker(s) metering
                          RMS amperes
                          RMS volts (Phase-Phase average)
                          KW (3 phase)
                          KVA (3 phase)
                          Power factor
                          Loss of voltage alarm

            2.   Secondary Substation:

                  a.   Main and tie circuit breaker(s) status (open/closed).
                  b.   Transfer scheme in manual
                  c.   Main breaker(s) metering
                          RMS amperes

RMS volts (Phase-Phase average)
KW (3 phase)
KVA (3 phase)
Power factor
Loss of voltage alarm

    d.   Transformer Alarms:
Temperature – dry and liquid (normal/high)
Pressure – liquid filled (normal/high)
Vacuum – liquid filled (normal/high)
Sudden pressure – liquid filled (normal/tripped)

3.   Switchgear control batteries

    a.   Battery voltage (overall, + to -)
    b.   Battery Charger Common Trouble

4.   UPS System:

    a.   UPS common trouble alarm point.

5.   Generator:

    a.   Generator Running
    b.   Common trouble.
    c.   Fuel tank low level alarm points.

6.   ATS Status:

    a.   Switch connected to Normal Source.
    b.   Switch connected to Emergency/Standby Source.
    c.   ATS control failure

2.0   Metering

A.   Metering shall be provided for primary and secondary switchgear main breakers.

B.   All power meters shall be Schneider Electric/Square D PM8000 series, Siemens 9510, Eaton PXM 4000 series, or University Engineering Department approved equal. For Switchgear Installations, refer to Section 261000.

C.   In most cases, equipment status information will be transmitted to SCADA utilizing digital I/O to be provided with meters. Meters should be specified with adequate I/O to meets the requirements of each project.

D.   Power meters shall have certified revenue accuracy as per ANSI C12.20 and IEC 60687 class 0.5S or better.

E.   The meter and associated instrument transformers shall provide accuracy of +/- 1% over the range of 5% to 100% of rated current or voltage, +/- 2% over the range of 5% to 100% of rated power.

3.0   Integration

   A.   The integration of the Electrical Power Monitoring System into the SCADA system is the responsibility of the project that is providing the electrical power equipment to be monitored.

   B.   In general, all of the above parameters that are to be provided to the SCADA system shall be delivered via Modbus TCP/IP communications, to the SCADA node in the building. It is generally not possible to interface hardwired analog or discrete signals directly to the SCADA system. The University Engineering Department shall be consulted for specific direction.

   C.   Electrical power system equipment that does not support Modbus communications must be equipped with one or more gateway devices that serve as the interface between hardwired discrete and analog signals and the Modbus TCP/IP communications channel.

   D.   The project shall bear the responsibility for all hardware, software and programming required for successful integration into the SCADA system, including HMI programming and graphics. For performing any SCADA integration. construction documents shall require installers to procure the services of one of the following:

      1.   Thermo Systems, Dave Musto (609-371-3000)
      2.   Applied Control Engineering, Timothy Cole (302-738-8800)
      3.   eMagic, Dave Noel (905-737-3170),

4.0   Communications

   A.   Communications from the power monitoring equipment to the University SCADA system is via Modbus TCP/IP to PennNet ethernet data drop.

   B.   Provide PennNet data drops as required to transmit electrical power and equipment status information to SCADA for display at OCC. The number of PennNet drops should be kept to a minimum.

   C.   Contract documents shall require the installer to coordinate with the University ISC group for location and installation of all PennNet Ethernet drop locations.