

SPECIFICATION

FOR

REMOTE TELEMETRY OF A CUSTOMER OWNED FACILITY



ELECTRIC ENGINEERING DEPARTMENT

P.O. BOX 1700 HOUSTON, TEXAS 77251

REFERENCE DRAWINGS: Latest Revisions of
CenterPoint Energy, CNP Drawing No.BSC-007-400-01 SH.3.
CenterPoint Energy, Telecom Board drawing 101, 102, 103, 104.

REFERENCE SPECIFICATIONS: Latest Revisions of
CenterPoint Energy, CNP Specification No. 007-231-14, Customer 138kV Substation
Design.

REFERENCE DOCUMENTS: Latest Revisions of
CenterPoint Energy, Transmission & Substation Outage and Clearance Coordination
Procedures.
CenterPoint Energy, Substation IFC Process.

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						Page 1 of 11			
						SPC	007	400	02

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CONTENTS

TITLE	PAGE NO.
SCOPE	3
GENERAL	3
SCADA SYSTEM	4
DESIGN, LAYOUT AND PHYSICAL CRITERIA	5
COMMUNICATION LINES & TELEMETRY TRANSPORT	6
CALIBRATION AND MAINTENANCE	8
CURRENT TRANSFORMERS AND POTENTIAL TRANSFORMERS	8
DRAWING APPROVAL	8
TABLE 1 – ACCEPTABLE TRANSDUCERS AND TEST SWITCHES	9
LIST OF ABBREVIATIONS USED IN FIGURES	10
FIGURE 1 – BREAKER CONTROL AND STATUS WIRING	11

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	Page 2 of 11			
	SPC	007	400	02

1. SCOPE

- 1.1. This specification defines the requirements for the engineering, installation, calibration, and commissioning of a Supervisory Control and Data Acquisition (SCADA) Remote Terminal Unit (RTU) and Metering Telemetry, as applicable, at a customer owned facility on the CenterPoint Energy (CNP) transmission system.

2. GENERAL

- 2.1. Installation of a CNP owned SCADA RTU in customer-owned facilities is required for all new transmission substations.. Existing customer substations originally connected without SCADA monitoring will be required to install SCADA when there is a significant change in the topology of the substation or as directed by ERCOT.
- 2.2. All equipment and work covered by this specification shall be designed, constructed, and tested in accordance with the latest revisions or editions of industry requirements in effect at the time of fabrication. Industry requirements include the applicable codes, standards, specifications, regulations, tests, and procedures of all federal, state and local laws, and include (but are not limited to) the following:
 - 2.2.1. American National Standards Institute (ANSI)
 - 2.2.2. IEEE formerly the Institute of Electrical and Electronics Engineers, Inc.
 - 2.2.3. National Electrical Manufacturers Association (NEMA)
 - 2.2.4. Occupational Safety and Health Administration (OSHA)
 - 2.2.5. Federal Communications Commission (FCC)
- 2.3. In the event of conflicting requirements, the order of precedence shall be this specification, other referenced CNP specifications, and the standards referenced in section 2.2.
- 2.4. CNP will specify and install the SCADA RTU and associated SCADA equipment. The SCADA RTU will be in a locked cabinet installed in the customer substation control cubicle. The customer must provide interface equipment such as electronic panel meters, transducers, status and alarm contacts, cabling, terminal blocks, and conduit to provide the data required in this specification.
- 2.5. The customer must also install and maintain voice communication equipment in the customer substation control cubicle.
- 2.6. CNP will specify, install and maintain a locked Substation Communications cabinet(s) inside the customer control cubicle for SCADA, metering, and other CNP communications needs.
- 2.7. Communications to substation protection devices for CNP SCADA monitoring shall be serial. Substation electronic devices that can directly or indirectly trip a circuit breaker connected to the CNP transmission circuit (i.e. transmission line protective relay, transformer bus protective that includes breaker failure relaying, etc.) are not allowed to be monitored by the customer. Data can be provided to the customer from a serial port on the CenterPoint Energy SCADA RTU. .
- 2.8. Equipment specified may be substituted with written approval from CNP Substation Engineering and System Protection.
- 2.9. All equipment, engineering and installation shall be furnished by the customer unless otherwise noted in this specification or separate agreements.
- 2.10. Generating facilities will have additional data that is covered below and will be defined in the Standard Generating Interconnection Agreement.

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	Page 3 of 11			
	SPC	007	400	02

2.11. This specification covers the requirements between the customer and CenterPoint Energy and is not meant to cover any additional requirements that the Customer may have with ERCOT.

3. SCADA SYSTEM

- 3.1. The SCADA RTU is composed of three subsystems: (1) analog, (2) status, and (3) control.
- 3.2. Analog Subsystem: Analog Data is typically gathered from Intelligent Electronic Devices (IEDs) or transducers. IEDs include Electronic Meters and microprocessor relays. Communication to various IEDs shall be serial, via DNP3 or Modbus protocols. If transducers are used, CNP will determine the transducer electrical requirements. See Table 1 for acceptable transducer models. Meter test switches are required for the transducer current and voltage connections. The customer shall provide an electrical relaying and metering one-line diagram of the proposed customer-owned substation for review by CNP.
- 3.2.1. Customer Substation Analog Telemetry Requirements for substations that sectionalize the CNP system or tap substation as applicable.
- 3.2.1.1. Kilovolts for transmission level voltages (i.e. two line positions or two substation buses), AØ
- 3.2.1.2. Megawatts for each line position, 3Ø
- 3.2.1.3. Megavars for each line position, 3Ø
- 3.2.1.4. Megawatts for each substation load and/or substation transmission level transformer, 3Ø
- 3.2.1.5. Megavars for each substation load and/or substation transmission level transformer, 3Ø
- 3.2.2. CNP will require the following additional analog data for Generating facilities:
- 3.2.2.1. Generator terminal voltage for each generator bus, A phase only
- 3.2.2.2. Megawatts (net preferred) for each generator unit, 3Ø
- 3.2.2.3. Megavars (net preferred) for each generator unit, 3Ø
- 3.2.2.4. Frequency for each generator unit
- 3.2.2.5. Data from the plant electrical load EPS meters (watts, vars, watt-hour from each meter)
- 3.3. Status Subsystem: The status subsystem of the SCADA RTU shall consist of the following.
- 3.3.1. Status of selected transmission voltage circuit breakers or other devices directly affecting the CNP electrical system, as determined by CNP Real Time Operations (RTO). Status shall be derived from either an isolated auxiliary "a" contact in the breaker or monitoring a trip coil of the breaker. Refer to Figure 1 for Breaker Status Connection using trip coil monitoring method.
- 3.3.2. Indication of low voltage and battery charger failure is required for the 130 VDC battery system(s). Typical charger alarms include the following: low voltage, high voltage, loss of AC input, and loss of charger. All these indications shall be combined so that an occurrence of any one of these shall cause a single battery alarm (normally open contact) to the SCADA RTU.
- 3.3.3. SCADA Close Inhibit (SCI) indication is required of breakers controlled by SCADA whenever a lockout relay can inhibit breaker closure by SCADA. A dry, normally open, contact from that relay shall be supplied for SCI indication. Indication contacts from all lockout relays shall be wired in parallel for a single indication in the SCADA cabinet, see Figure 1.
- 3.3.4. Indication of Carrier Tester (CAR) or Pilot (PIL) relaying failure where applicable.
- 3.3.5. Indication for the loss of a potential to a line relay (PT1) that could cause a misoperation of the zone. This alarm is typically generated by a contact from the line relay. Indications from

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	Page 4 of 11			
	SPC	007	400	02

separate relays will be combined for a single alarm.

3.3.6. Indication of a failed self-check diagnostic of a microprocessor based relay. Designated Relay CPU Fail (RCPU). This alarm is typically generated by a contact from the line relay. Indications from separate relays will be combined for a single alarm.

3.3.7. Cabinet Alarm (CABS) for the SCADA RTU and the CNP Communications Cabinets. This alarm will be generated when the cabinet door is opened.

3.3.8. CNP will require the following additional status signals from the Generating facility:

3.3.8.1. Generator Breaker for each unit

3.3.8.2. Motor operated switches for each unit

3.3.8.3. Generator automatic voltage regulator status (Automatic/Manual).

3.4. Control Subsystem: The control subsystem of the SCADA RTU shall consist of the following:

3.4.1. CNP shall have remote control of all transmission (69kV, 138kV, 345kV) circuit breakers that directly affect the CNP transmission system as determined by CNP Real Time Operations (RTO). Dual remote control (control of a breaker by both the customer's control system and CNP RTO) is not permitted. Figure 1 illustrates how SCADA control will interface with a typical breaker control scheme.

3.4.2. CNP shall have remote control, automatic carrier removal (ATCR), of each pilot relaying scheme. A control contact from the SCADA RTU shall be installed in each pilot circuit. See Figure 1 for typical carrier control circuit.

3.5. All applicable data, listed in Sections 3.2 and 3.3, whether through a CNP-owned RTU, through CNP-connected communication ports, or customer-owned SCADA RTU ports, shall be provided continuously by design. CNP's periodicity for scanning the data from established communication ports and SCADA RTU ports will be set in accordance with the Electric Reliability Council of Texas (ERCOT) requirements.

4. DESIGN, LAYOUT AND PHYSICAL CRITERIA

4.1. SCADA Set Designation: The type of SCADA RTU installed by CNP will depend on the number of controlled breakers.

4.1.1. At ring bus substation or breaker and half substations CNP will typically install a free-standing cabinet 24" wide by 18" deep and 72" tall, with front access. Clearance of 30" in front of the door shall be reserved for maintenance access. Substations with more than four transmission breakers may require a larger cabinet(s). Refer to latest customer RTU drawing submitted by CNP at the project kick-off.

4.1.2. Tap substations will generally require a smaller wall mounted cabinet. The wall mount cabinet is 30" wide by 12" deep and 42" tall. Clearance of 30" in front of the door shall be reserved for maintenance access.

4.1.3. Access to the SCADA RTU cabinet shall be controlled by CNP.

4.2. Connections to the RTU: The Construction Contractor shall install all interconnections between the SCADA RTU and the substation panels.

4.2.1. The customer shall provide a 120 VAC, fifteen (15) amp, dedicated AC power circuit, protected by a fifteen (15) amp circuit breaker, to the SCADA RTU Cabinet for lighting and a convenience outlet.

4.2.2. The customer shall provide a 130 VDC, fifteen (15) amp, dedicated DC power circuit, protected by a fifteen (15) amp circuit breaker, to the SCADA RTU Cabinet for the main RTU power.

4.2.3. All cable shields shall be grounded at a location other than the

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	Page 5 of 11			
	SPC	007	400	02

SCADA RTU Cabinet. Cable shields shall be grounded at one end only.

- 4.3. Cabling: The customer shall size and install all conduit or cable troughs in accordance with ANSI/NFPA 70 (National Electrical Code).

4.3.1. Polyethylene Polyvinylchloride (PEPVC) insulated shielded 2/C #16 cable with stranded copper conductors shall be used for terminations for all transducer outputs.

4.3.2. Breaker controls shall use seven conductor (#12) PEPVC insulated cable with stranded copper conductors for terminations.

Two conductor (#10 or larger) PEPVC insulated cable with stranded copper conductors shall be used for terminations of the AC and DC power circuit.

4.3.3. Status and alarms shall be terminated with two conductor (#16) PEPVC insulated cable with stranded copper conductors.

The customer shall install the necessary conduit or cable management between the SCADA RTU and the relay panels.

- 4.4. Every breaker with 130 VDC SCADA control circuits shall have breaker coil surge suppression. A one hundred (100) ohm, eleven (11) watt resistor (Ohmite style 995-10A) and a Zener diode (Motorola type IN3051A) or equivalent shall be used for this suppression. The series combination of the Zener diode and the resistor shall be parallel to each breaker trip and breaker close coil. States slider-link terminal blocks shall be installed in the breakers for terminating the resistors and Zener diodes. CNP will verify breaker coil surge suppression. See Figure 1.

Section 5 – Communication Lines and Telemetry Transport

5. Communication Lines and Telemetry Transport

- 5.1. The customer shall provide and maintain a direct dial telephone landline for voice communications inside the control house cubicle. The phone shall have an extendable cord such that the handset can be stretched to the front of the relay panels and SCADA RTU so they can be viewed and operated by the person using the phone. The telephone landline must continue to operate during a site power failure.
- 5.2. CNP will provide a Telecom transport option for telemetry backhaul and connectivity using one of the following options: CNP Microwave, CNP Fiber or a Leased Circuit.
- 5.3. If the option is CNP Microwave;
- 5.3.1. CNP will provide tower height and wind load specifications to the customer.
- 5.3.2. The customer shall procure, install, own, and maintain the tower.
- 5.3.3. CNP will procure, install, own and maintain the microwave radio and related equipment
- 5.3.4. The customer shall provide a flame retardant coated 4'x 8' sheet of ¾" plywood for CNP enclosures.
- 5.3.5. CNP will install a Telecom enclosure on the backboard provided by the customer as shown in CNP Drawing 103, Telecom Board Layout.
- 5.3.6. The customer shall install conduits and cables to the Telecom enclosure for grounding, dedicated 15A 120V AC power, and dedicated 15A 130V DC power as shown in CNP Drawing 103, Telecom Board Layout.
- 5.4. If the option is CNP Fiber;
- 5.4.1. The customer shall provide a path for the fiber to the control cubicle.
- 5.4.2. The path may be either aerial or underground.
- 5.4.3. CNP will provide site specific underground or aerial specifications to the customer in a Statement of Work (SOW).
- 5.4.4. The customer shall install the underground duct or poles for aerial installation.
- 5.4.5. The customer shall install fiber supplied by CNP. CNP will own and maintain the fiber.
- 5.4.6. CNP will terminate the fiber and install fiber distribution panels.

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	Page 6 of 11			
	SPC	007	400	02

- 5.4.7. The customer shall provide a flame retardant coated 4'x 8' sheet of 3/4" plywood for CNP enclosures.
- 5.4.8. CNP will install a Telecom enclosure on the backboard provided by the customer as shown in CNP Drawing 103, Telecom Board Layout.
- 5.4.9. The customer shall install conduits and cables to the Telecom enclosure for; grounding, dedicated 15A 120V AC power, and dedicated 15A 130V DC power as shown in CNP Drawing 103, Telecom Board Layout.
- 5.5. If the option is leased circuit
 - 5.5.1. The customer shall provide a flame retardant coated 4'x 4' sheet of 3/4" plywood space for the Telco demark inside the control cubicle.
 - 5.5.2. The customer shall provide a flame retardant coated 4'x 8' sheet of 3/4" plywood for CNP enclosures.
 - 5.5.3. CNP will install a Telecom enclosure to be mounted on the backboard provided by the customer as shown in CNP Drawing 103, Telecom Board Layout.
 - 5.5.4. The customer shall install conduits and cables to the Telecom enclosure for; grounding, dedicated 15A 120V AC power, and dedicated 15A 130V DC power as shown in CNP Drawing 103, Telecom Board Layout.
 - 5.5.5. The customer shall provide dedicated 15A 120V AC power and grounding to backboard. See CNP Drawing 104, Third Party Telco Board Design.

6. CALIBRATION AND MAINTENANCE

- 6.1. After all equipment necessary for remote telemetry has been installed, CNP personnel will calibrate and verify operation of all equipment installed per this specification.
- 6.2. The RTU and transducers installed per this specification will be maintained by CNP unless otherwise noted in an agreement with the customer. Maintenance will include accuracy checks, recalibration and replacement/repair of equipment when needed.
- 6.3. CNP shall furnish locks that will remain in series with customer locks to permit access to all switchyard gates, substation control cubicle door(s), and disconnect switches.

7. CURRENT TRANSFORMERS AND POTENTIAL TRANSFORMERS

- 7.1. The current transformers (CTs) and potential transformers (PTs) necessary for transducers and meter circuits itemized in this specification shall be provided according to CNP specification 007-231-14. If a particular application is not covered by this specification, then CNP will designate the necessary PT(s) and CT(s) on the substation one-line diagram that the customer submits for comment and approval.
- 7.2. For some substation layouts a potential rollover circuit shall be needed. If a potential rollover circuit is needed, it will be designated by CNP on the one-line diagram that the customer submits for comment and approval.

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	Page 7 of 11			
	SPC	007	400	02

8. DRAWING APPROVAL

- 8.1. The Engineering Contractor shall provide electronic and paper copies of all drawings showing equipment connections and structural details of all equipment associated with SCADA installation as per the CenterPoint Energy Substation IFC Process document.
- 8.2. Drawings required by this specification include:
1. Substation one-line relaying and metering diagrams illustrating the overall telemetry scheme,
 2. Substation control cubicle layout(s) and floor plan(s),
 3. Conduit and cable lists
 4. Conduit Layout or Plan and Profile
 5. RTU manufacturers prints and customer connections
 6. AC Schematics for all power and control circuits,
 7. AC Relaying Schematics (Electrical Three-Line),
 8. Relay panel layouts,
 9. Bill of material for items required by this specification,
 10. Battery charger alarm relay(s) schematics,
 11. AC & DC Distribution Panels,
 12. Communication cable and conduit routing through customer facility,
 13. Customer Facility Plot Layout,

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	Page 8 of 11		
	SPC	007	400
			02

DESCRIPTION	MANUFACTURER	MODEL NO.	MONITORING POINTS
VOLTAGE TRANSDUCER	AMETEK SCIENTIFIC COLUMBUS	VT110A4	ONE PER SUBSTATION BUS
TEST SWITCH SINGLE PHASE	DURHAM	2-1022F-03	ONE PER EACH TRANSDUCER
WATT/VAR TRANSDUCER SINGLE PHASE	AMETEK SCIENTIFIC COLUMBUS	XLWV5C5	ONE PER EACH LINE OR LOAD
WATT/VAR TRANSDUCER THREE PHASE	AMETEK SCIENTIFIC COLUMBUS	XLWV342K5A4	ONE PER EACH LINE, GENERATOR OR LOAD
TEST SWITCH THREE PHASE	DURHAM ABB MEGA POWER SYS STATES	2-1058F-00 FS3A171171001NULL CS3A-556-556-162 FMS #293R-330JF-ST	ONE PER EACH TRANSDUCER

Table 1 ACCEPTABLE TRANSDUCERS AND TEST SWITCHES

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Page 9 of 11			
	SPC	007	400 02

LIST OF ABBREVIATIONS USED IN FIGURES

aN4, aN14 = TYPICAL WIRE NAMES IN CNP CARRIER RELAYING SCHEMES

ATCR = AUTOMATIC CARRIER REMOVAL

C = CLOSE

CS = CONTROL SWITCH

CVE = SYNCRO-VERIFIER RELAY

ICR = INDICATION CONTROL RELAY

N 11, N21 = TYPICAL WIRE NAMES IN CNP RECLOSE REMOVAL SCHEMES

NO = NORMALLY OPEN

OC = BREAKER CLOSE COTL

RC = AUTOMATIC RECLOSING RELAY

RR = RECLOSE REMOVAL LATCHING RELAY

T = TRIP

TC = BREAKER TRIP COIL

X, Y = AUXILIARY COILS OF RC RELAY

SSS = SLIDER-LINK TERMINAL

R = RESISTOR

DDD = ZENER DIODE

AMS = AUTOMATIC / MANUAL THROWOVER SWITCH

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	Page 10 of 11			
	SPC	007	400	02



ATCR = AUTOMATIC CARRIER REMOVAL

ICR = INDICATION CONTROL RELAY MONITORS STATUS OF A SWITCH

SCI = SCADA CLOSE INHIBIT

A1 DISCONNECTING TERMINAL BLOCK,

8 ↓ - DARK END IS TOP, LINK OPENS DOWN

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	Page 11 of 11			
	SPC	007	400	02