SPECIFICATION

FOR

REMOTE TELEMETRY OF INTERCONNECTIONS

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 Customer Project Plan.

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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11	08-02-2021	Rewritten	HAL	SPS	SPS
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CenterPoint Energy Houston Electric		
WRITTEN	12/30/03	C.W. Mogannam
CHECKED	12/30/03	R.M. Secrest
APROVED	12/30/03	M.W. Furnish
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	SPC 007 400 02	

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SECTION 1

GENERATOR INTERCONNECTION FACILITY

AND ENERGY STORAGE FACILITY

1.1. Typical interconnection arrangement

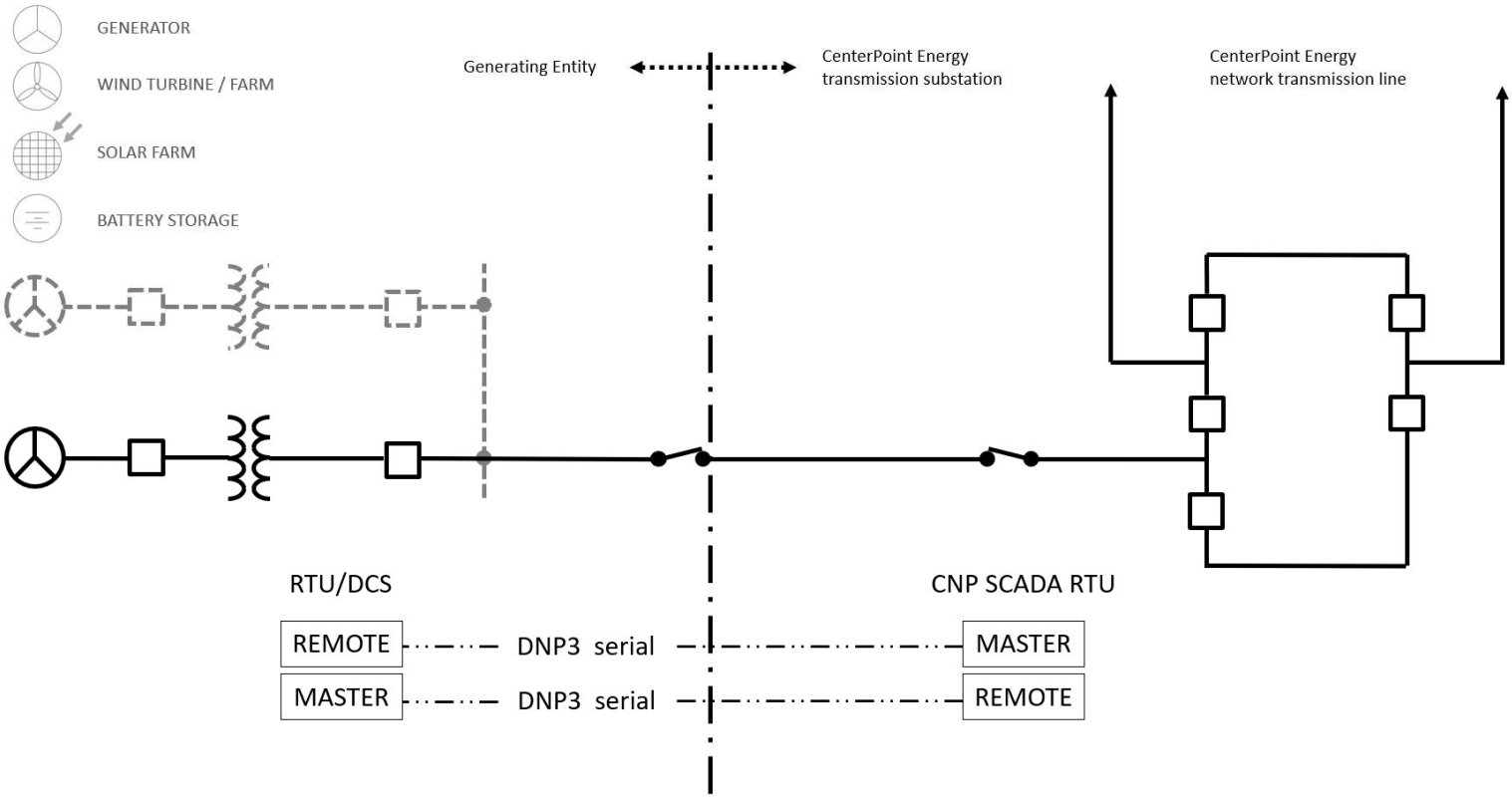


Figure 1 – Typical Generator and Energy Storage facility interconnection arrangement

1.2. General SCADA requirements

1.2.1. Installation of a CenterPoint Energy (CNP)-owned SCADA RTU in the customer-owned Generator Interconnection Facility or Energy Storage Facility **is not required**. The customer shall provide data from the customer's RTU/DCS system via a communication medium (such as fiber optic or RS-232/RS-485 cable) to the SCADA RTU in the CNP Transmission Interconnection Facility (TIF) substation. The communication protocol shall be **DNP3 serial**.

1.2.2. The customer shall provide to CNP the following signals originating at the customer facility:

1.2.2.1. Analog data from Plant

1.2.2.1.1. Kilovolts for each low-side generator or collector bus (AØ scaled as a line-to-line value).

1.2.2.1.2. Net megawatts and megavars for each generator feeder (3Ø).

1.2.2.1.3. Net megavars for the reactive support equipment (3Ø).

1.2.2.1.4. Kilovolts for transmission voltage (AØ scaled as a line-to-line value).

1.2.2.1.5. Net megawatts and megavars for the transmission line (3Ø).

1.2.2.1.6. Frequency at each collector bus.

1.2.2.1.7. Megawatts and megavars for each transformer (3Ø), either on the high side or the low side.

1.2.2.2. Status data from Plant

1.2.2.2.1. Status of the transmission voltage circuit breakers.

1.2.2.2.2. Status of all low-side circuit breakers for feeders and reactive support equipment.

1.2.2.2.3. Status of generator automatic voltage regulator (automatic and manual).

1.2.3. A separate CNP SCADA RTU serial communication port shall be used to provide data to the customer upon customer's request. CNP shall provide to the customer the following signals originating at CNP's substation:

1.2.3.1. Analog data from CNP

1.2.3.1.1. Kilovolts for the Point of Interconnection (AØ scaled as a line-to-line value).

1.2.3.2. Status data from CNP

1.2.3.2.1. Status of transmission voltage circuit breakers associated with the generator lead(s).

1.2.3.2.2. Alarm for failure of Pilot Wire/fiber optic relaying communication channels, if applicable.

1.2.4. Real-time telemetry data from ERCOT-Polled Settlement (EPS) meters and revenue meters shall not be shared with the customer through the CNP SCADA RTU or through direct connection(s).

1.2.5. All applicable data listed in this section shall be provided continuously to CNP Real Time Operations (RTO), whether through a CNP-owned RTU, through CNP-connected communication ports, or customer-owned SCADA RTU ports. CNP's periodicity for scanning the data from established communication ports and SCADA RTU ports shall be set in accordance with the Electric Reliability Council of Texas (ERCOT) requirements.

1.2.6. The customer shall provide plant data to ERCOT according to ERCOT requirements. CNP is not responsible for providing the customer plant data to ERCOT.

SECTION 2

UTILITY INTERCONNECTION

2.1. Typical interconnection arrangement

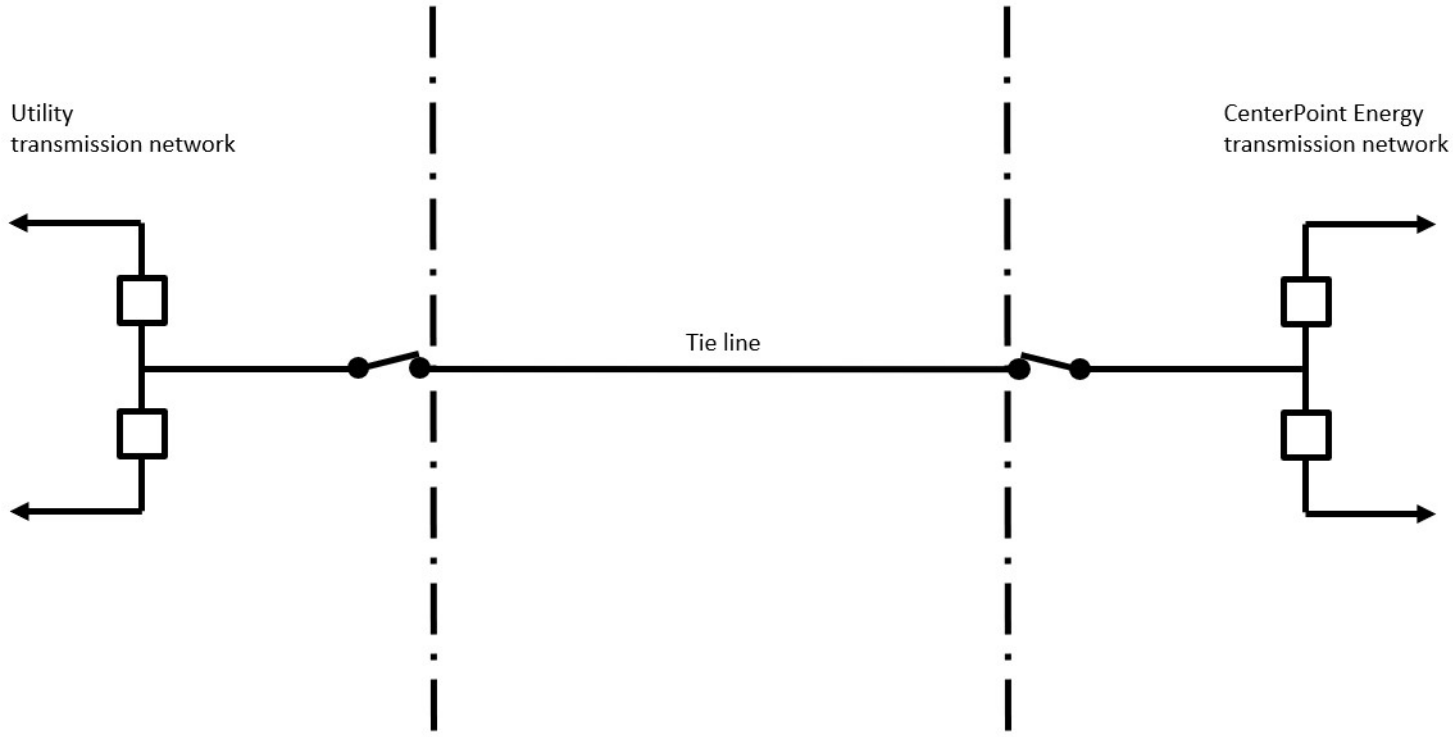


Figure 2 – Typical Utility interconnection arrangement

2.2. General SCADA requirements

2.2.1. SCADA communication options, as agreeable between Utility and CNP:

2.2.1.1. If there is a fiber optic cable between Utility's substation and CNP's substation, CNP shall obtain Utility's data via fiber utilizing **DNP3 serial** protocol.

2.2.1.2. Where fiber optic cable is not available, Utility shall reserve a serial port with DNP3 serial protocol of Utility's RTU/DCS at the Utility's substation for CNP use. CNP shall connect a communication circuit to the reserved port of Utility's RTU/DCS to obtain data.

2.2.1.3. If none of the above options is available, CNP shall install a CNP-owned SCADA RTU with communication circuit to CNP RTO at the Utility's substation. More details of the CNP-owned SCADA RTU are in Section 3 of this specification.

2.2.2. Utility shall provide to CNP the following signals originating at Utility's substation:

2.2.2.1. Analog data from Utility

2.2.2.1.1. Kilovolts at the tie point(s) (AØ scaled as a line-to-line value).

2.2.2.1.2. Megawatts and Megavars for all transmission lines (3Ø).

2.2.2.1.3. Megavars for all reactive devices.

2.2.2.2. Status data from Utility

2.2.2.2.1. Status of the transmission voltage circuit breakers at the tie line voltage.

2.2.3. A separate CNP SCADA RTU serial communication port shall be used to provide data to Utility upon Utility's request. CNP shall provide to Utility the following signals originating at CNP's substation:

2.2.3.1. Analog data from CNP

2.2.3.1.1. Kilovolts for the Point of Interconnection (AØ scaled as a line-to-line value).

2.2.3.2. Status data from CNP

2.2.3.2.1. Status of transmission voltage circuit breakers associated with the tie line(s).

2.2.3.2.2. Alarm for failure of the tie line Pilot Wire/fiber optic relaying communication channels, if applicable.

2.2.4. Real-time telemetry data from ERCOT-Polled Settlement (EPS) meters and revenue meters shall not be shared with the customer through the CNP SCADA RTU or through direct connection(s).

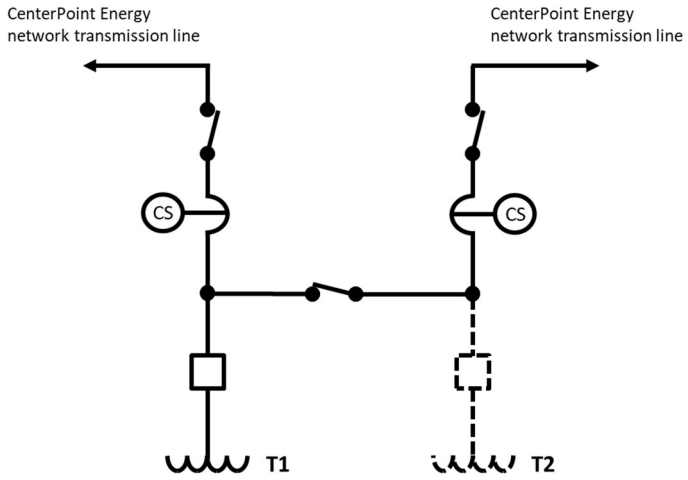
2.2.5. All applicable data listed in this section shall be provided continuously to CNP Real Time Operations (RTO), whether through a CNP-owned RTU, through CNP-connected communication ports, or customer-owned SCADA RTU ports. CNP's periodicity for scanning the data from established communication ports and SCADA RTU ports shall be set in accordance with the Electric Reliability Council of Texas (ERCOT) requirements.

2.2.6. Utility shall provide data to ERCOT according to ERCOT requirements. CNP is not responsible for providing Utility's substation data to ERCOT.

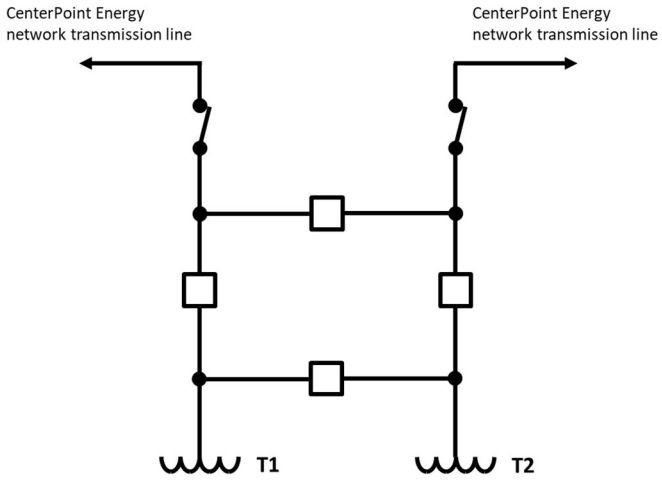
SECTION 3

CUSTOMER-OWNED LOAD TRANSMISSION SUBSTATION

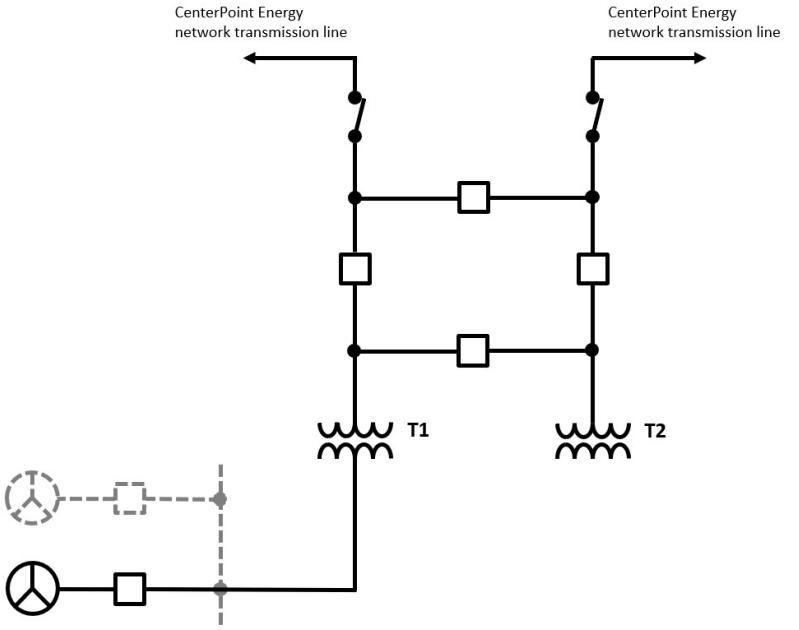
3.1. Typical interconnection arrangements



(a) Customer "loop tap" substation



(b) Customer "full loop" substation



(c) Customer "full loop" substation with ERCOT registered Generation Resource(s)

Figure 3 – Typical customer-owned load transmission substation interconnection arrangements

3.2. General SCADA requirements

3.2.1. Installation of a CNP-owned SCADA RTU in customer-owned facilities **is required** for all new customer-owned load transmission substations, including load customer substations with ERCOT registered generation resource(s).

3.2.2. Existing customer-owned substations originally connected without SCADA monitoring shall be required to install a new CNP-owned SCADA RTU when there is a significant change in the topology of the substation or as directed by ERCOT. Existing customer-owned substations with obsolete SCADA equipment shall be required to upgrade the SCADA equipment at CNP's discretion.

3.2.3. CNP shall specify and install SCADA equipment as required. The CNP SCADA RTU shall be in a locked cabinet installed in the customer substation control cubicle.

3.2.3.1. The customer shall provide an electrical relaying and metering one-line diagram of the proposed customer-owned substation for review by CNP.

3.2.3.2. The customer shall provide interface equipment such as SCADA electronic panel meters, transducers, status and alarm contacts, cabling, terminal blocks, and conduit to provide the data required in this specification.

3.2.3.3. The customer shall install and maintain voice communication equipment in the customer substation control cubicle.

3.2.3.4. CNP shall specify, install, and maintain a locked Substation Communications cabinet(s) inside the customer control cubicle for SCADA, metering, and other CNP communications needs.

3.2.4. The CNP SCADA RTU shall gather data from substation Intelligent Electronic Devices (IEDs) such as microprocessor relays or SCADA electronic meters.

3.2.4.1. IEDs that CNP provides and maintains settings for (i.e. protective relays for CNP transmission network) **are not allowed** to be monitored directly by the customer. The data from these IEDs can be provided to the customer from a serial port on the CNP SCADA RTU.

3.2.4.2. The customer can connect directly to other IEDs such as SCADA electronic meters and microprocessor relays that CNP does not provide and maintain settings for.

3.2.5. Most data in the CNP SCADA RTU as described in Section 3.3 below, except CNP transmission network power flow data, shall be available to share with the customer upon customer's request, via a designated DNP3 serial port of the CNP SCADA RTU.

3.2.6. Real-time telemetry data from ERCOT-Polled Settlement (EPS) meters and revenue meters shall not be shared with the customer through the CNP SCADA RTU or through direct connection(s).

3.2.7. All applicable data listed in this section shall be provided continuously to CNP RTO, whether through a CNP-owned RTU, through CNP-connected communication ports, or customer-owned SCADA RTU ports. CNP's periodicity for scanning the data from established communication ports and SCADA RTU ports shall be set in accordance with the ERCOT requirements.

3.2.8. Load customers with ERCOT registered generation resource(s) shall provide plant data to ERCOT according to ERCOT requirements. CNP is not responsible for providing the customer plant data to ERCOT.

3.2.9. 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:

3.2.9.1. American National Standards Institute (ANSI)

3.2.9.2. IEEE formerly the Institute of Electrical and Electronics Engineers, Inc.

3.2.9.3. National Electrical Manufacturers Association (NEMA)

3.2.9.4. Occupational Safety and Health Administration (OSHA)

3.2.9.5. Federal Communications Commission (FCC)

3.2.10. In the event of conflicting requirements, the order of precedence shall be this specification, other referenced CNP specifications, and the standards referenced in Section 3.2.9 above.

3.2.11. All equipment, engineering, and installation shall be furnished by the customer unless otherwise noted in this specification or separate agreements.

3.2.12. 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.

3.3. The CNP SCADA RTU subsystems

The CNP SCADA RTU is composed of three subsystems: analog, status, and control.

3.3.1. Analog subsystem

Analog data is typically gathered from IEDs and/or transducers. If transducers are used, CNP shall determine the transducer electrical requirements. See table 1 in the Appendix for acceptable transducer models. Meter test switches are required for the transducer current and voltage connections.

The following analog data shall be monitored by the CNP SCADA RTU:

3.3.1.1. Kilovolts for transmission level voltages (AØ scaled as a line-to-line value).

3.3.1.2. Megawatts and megavars for each line position (3Ø).

3.3.1.3. Megawatts and megavars for each substation load and/or substation transmission level transformer (3Ø).

3.3.1.4. Net megavars for transmission reactive support equipment (3Ø).

3.3.2. Status subsystem

The status subsystem of the CNP SCADA RTU shall consist of the following:

3.3.2.1. Status of selected transmission voltage circuit breakers or other devices directly affecting the CNP electrical system, as determined by CNP 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 4 in the Appendix for Breaker Status Connection using trip coil monitoring method.

3.3.2.2. 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 CNP SCADA RTU.

3.3.2.3. 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 4.

3.3.2.4. Indication of Carrier Tester (CAR) or Pilot Wire/Fiber Optic (PIL) relaying failure where applicable.

3.3.2.5. Indication for the loss of a potential to a line relay (PT1) that could cause a mis-operation of the zone. This alarm is typically generated by a contact from the line relay. Indications from separate relays shall be combined for a single alarm.

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

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

3.3.3. Control subsystem

The control subsystem of the SCADA RTU shall consist of the following:

3.3.3.1. CNP shall have remote control of all transmission (69kV, 138kV, 345kV) circuit breakers that directly affect the CNP transmission system as determined by CNP RTO. Dual remote control (control of a breaker by both the customer's control system and CNP RTO) is not permitted. Figure 4 in the Appendix illustrates how SCADA control interfaces with a typical breaker control scheme.

3.3.3.2. 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 4 for typical carrier control circuit.

3.3.4. For load customer substations with ERCOT registered generation resources, additional data below shall be required by CNP from the customer's Plant. This data is typically obtained via communication from the Plant RTU/DCS to the CNP SCADA RTU.

3.3.4.1. Analog data from Plant

3.3.4.1.1. Kilovolts for each low-side generator or collector bus (AØ scaled as a line-to-line value).

3.3.4.1.2. Net megawatts and megavars for each generator feeder (3Ø).

3.3.4.1.3. Net megavars for the reactive support equipment (3Ø).

3.3.4.1.4. Net megawatts and megavars for the transmission line (3Ø).

3.3.4.1.5. Frequency at each collector bus.

3.3.4.1.6. Megawatts and megavars for each transformer (3Ø), either on the high side or the low side.

3.3.4.2. Status data from Plant

3.3.4.2.1. Status of all low-side circuit breakers for feeders and reactive support equipment.

3.3.4.2.2. Status of generator automatic voltage regulator (automatic and manual).

3.4. CNP SCADA RTU design, layout, and physical criteria

3.4.1. SCADA RTU designation

The type of SCADA RTU installed by CNP shall depend on the number of controlled breakers.

3.4.1.1. For breakered transmission substation configuration such as "full loop", "ring bus", or "breaker-and-a-half", CNP typically installs 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.

3.4.1.2. Substations with "loop tap" configuration generally require a smaller, wall-mounted RTU cabinet. The wall-mounted cabinet is 30" wide by 12" deep and 42" tall. Clearance of 30" in front of the door shall be reserved for maintenance access.

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

3.4.3. Connections to the RTU

The Construction Contractor shall install all interconnections between the CNP

SCADA RTU and the substation panels.

3.4.3.1. 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.

3.4.3.2. 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.

3.4.3.3. All cable shields shall be grounded at a location other than the CNP SCADA RTU Cabinet. Cable shields shall be grounded at one end only.

3.4.4. Cabling

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

3.4.4.1. Polyethylene Polyvinylchloride (PEPVC) insulated shielded 2/C #16 cable with stranded copper conductors shall be used for terminations for all transducer outputs and all RS485 inter-panel connections.

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

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

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

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

3.4.4.6. Every breaker with 130 VDC SCADA control circuits shall have breaker coil surge suppression. One 100 [Ω], 11 [W] resistor (Ohmite style 995-10A) and one 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 sliding link terminal blocks shall be installed in the breakers for terminating the resistors and Zener diodes. See Figure 4. CNP shall verify breaker coil surge suppression.

3.5. Communication lines and telemetry transport

3.5.1. 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.

3.5.2. CNP shall provide a Telecom transport option for telemetry backhaul and connectivity using one of the following options determined by CNP: CNP microwave, CNP fiber, or leased circuit.

3.5.3. For CNP microwave option:

3.5.3.1. CNP shall provide tower height and wind load specifications to the customer.

3.5.3.2. The customer shall procure, install, own, and maintain the tower.

3.5.3.3. The customer to provide 2” conduit from the microwave pole/tower to Telecom Enclosure as per CNP Telecom Customer Project Plan.

3.5.3.4. CNP shall procure, install, own and maintain the microwave radio and related equipment.

3.5.3.5. The customer shall provide a flame retardant coated 4'x 8' sheet of ¾" plywood for CNP enclosures.

3.5.3.6. CNP shall install a communications enclosure on the backboard provided by the customer as shown in CNP Telecom Customer Project Plan, Telecom Board Layout.

3.5.3.7. The customer shall install conduits and cables from the communications enclosure to the AC distribution panel, DC distribution panel, ground bus bar, SCADA RTU cabinet, meter can, and the TWS cabinet if there is one. CNP communications equipment requires a dedicated 20A 120VAC power breaker, and a dedicated 20A 130VDC power breaker as shown in CNP Telecom Customer Project Plan, Telecom Board Layout.

3.5.4. For CNP fiber option:

3.5.4.1. The customer shall provide a path for the fiber to the control cubicle.

3.5.4.2. The path may be either aerial or underground.

3.5.4.3. CNP shall provide site specific underground or aerial specifications to the customer in a Statement of Work (SOW).

3.5.4.4. The customer shall install the underground duct or poles for aerial installation.

3.5.4.5. The customer shall install fiber supplied by CNP. CNP shall own and maintain the fiber.

3.5.4.6. CNP shall terminate the fiber and install fiber distribution panels.

3.5.4.7. The customer shall provide a flame retardant coated 4'x 8' sheet of ¾" plywood for CNP enclosures.

3.5.4.8. CNP shall install a communications enclosure on the backboard provided by the customer as shown in Telecom Customer Project Plan, Telecom Board Layout.

3.5.4.9. The customer shall install conduits and cables from the communications enclosure to the AC distribution panel, DC distribution panel, ground bus bar, SCADA RTU cabinet, meter can, and the TWS cabinet if there is one. CNP communications equipment requires a dedicated 20A 120VAC power breaker, and a dedicated 20A 130VDC power breaker as shown in CNP Telecom Customer Project Plan, Telecom Board Layout.

3.5.5. For leased circuit option:

3.5.5.1. The customer shall provide a flame retardant coated 4'x 4' sheet of ¾" plywood space for the Telco demark inside the control cubicle.

3.5.5.2. The customer shall provide a flame retardant coated 4'x 8' sheet of ¾" plywood for CNP enclosures.

3.5.5.3. CNP shall install a Communications enclosure to be mounted on the backboard provided by the customer as shown in CNP Telecom Customer Project Plan, Telecom Board Layout.

3.5.5.4. The customer shall install conduits and cables from the communications enclosure to the AC distribution panel, DC distribution panel, ground bus bar, SCADA RTU cabinet, meter can, and the TWS cabinet if there is one. CNP communications equipment requires a dedicated 20A 120VAC power breaker, and a dedicated 20A 130VDC power breaker as shown in CNP Telecom Customer Project Plan, Telecom Board Layout.

3.5.5.5. The customer shall provide dedicated 15A 130VDC power and grounding to the backboard. See CNP Telecom Customer Project Plan, Third Party Telco Board Design.

3.6. Calibration and maintenance

3.6.1. After all equipment necessary for remote telemetry has been installed, CNP personnel shall calibrate and verify operation of all equipment installed per this specification.

3.6.2. The RTU and transducers installed per this specification shall be maintained by CNP unless otherwise noted in an agreement with the customer. Maintenance shall

include accuracy checks, recalibration and replacement/repair of equipment when needed.

3.6.3. CNP shall furnish locks in series with customer locks to permit access to all switchyard gates, substation control cubicle door(s), and disconnect switches.

3.7. Current transformers and potential transformers

3.7.1. The current transformers (CTs) and potential transformers (PTs) necessary for telemetry and protection 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 shall designate the necessary PT(s) and CT(s) on the substation one-line diagram that the customer submits for comment and approval.

3.7.2. For some substation layouts, a potential rollover circuit shall be needed. If a potential rollover circuit is needed, it shall be designated by CNP on the one-line diagram that the customer submits for comment and approval.

3.8. Drawing approval

3.8.1. The Engineering Contractor shall provide electronic and paper copies of all drawings showing equipment connections and structural details of all equipment associated with the installation of the CNP-owned RTU at the customer facility.

3.8.2. Drawings required by this specification include:

3.8.2.1. Substation one-line relaying and metering diagrams illustrating the overall telemetry scheme,

3.8.2.2. Substation control cubicle layout(s) and floor plan(s),

3.8.2.3. Conduit and cable lists,

3.8.2.4. Conduit Layout or Plan and Profile,

3.8.2.5. RTU manufacturers prints and customer connections,

3.8.2.6. AC Schematics for all power and control circuits,

3.8.2.7. AC Relaying Schematics (Electrical Three-Line),

3.8.2.8. Relay panel layouts,

3.8.2.9. Bill of material for items required by this specification,

3.8.2.10. Battery charger alarm relay(s) schematics,

3.8.2.11. AC & DC Distribution Panels,

3.8.2.12. Communication cable and conduit routing through customer facility, and

3.8.2.13. Customer Facility Plot Layout.

APPENDIX

Table 1: Acceptable transducers and test switches

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

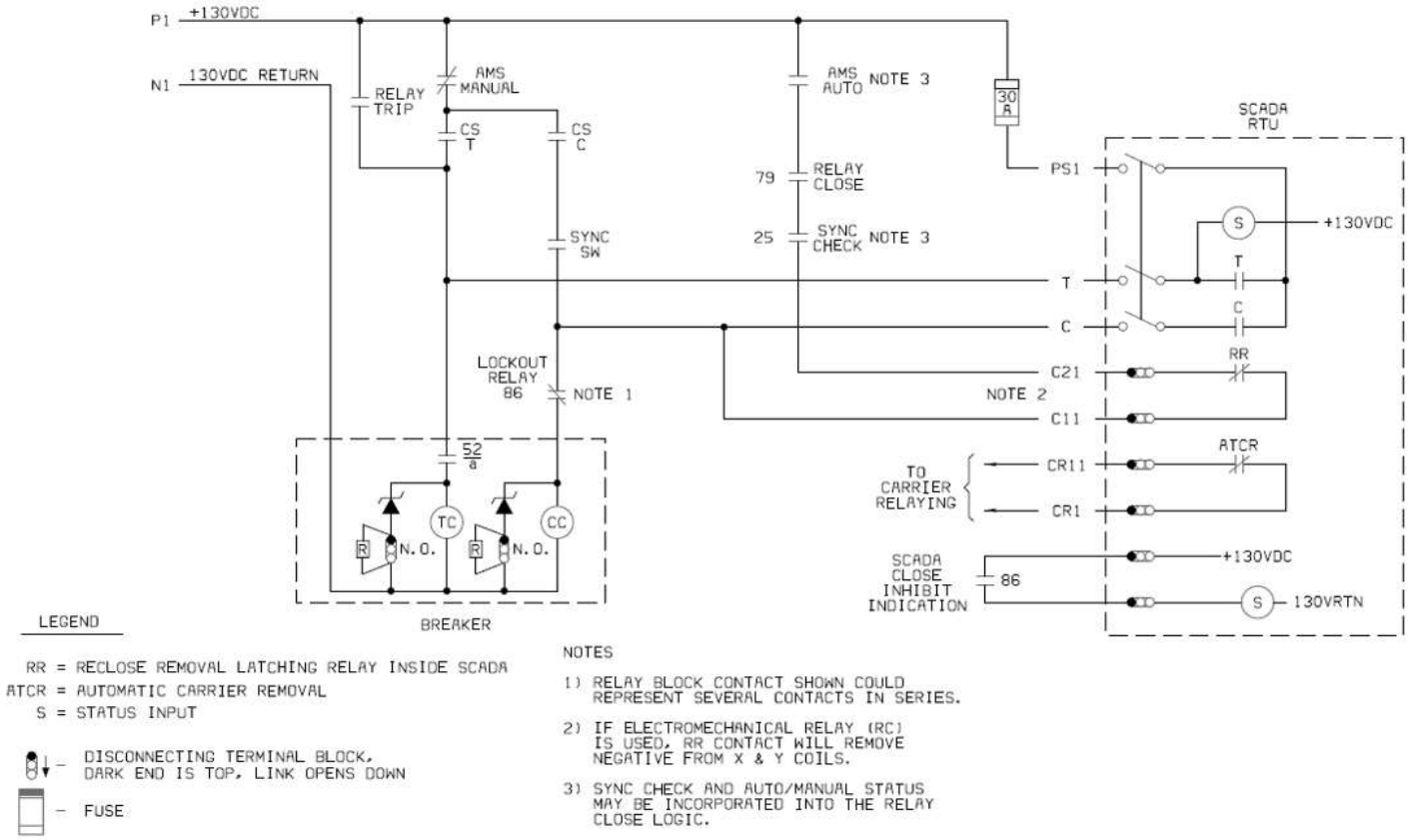


Figure 4 – Breaker Status Connection using trip coil monitoring method

List of abbreviations

RTU = REMOTE TERMINAL UNIT

DCS = DISTRIBUTED CONTROL SYSTEM

CR1, CR11 = TYPICAL WIRE NAMES IN CNP CARRIER RELAYING SCHEMES

ATCR = AUTOMATIC CARRIER REMOVAL

C = CLOSE

CS = CONTROL SWITCH

25 = SYNCRO-VERIFIER RELAY

S = SCADA STATUS INPUT

C11, C21 = TYPICAL WIRE NAMES IN CNP RECLOSE REMOVAL SCHEMES

NO = NORMALLY OPEN

CC = BREAKER CLOSE COTL

79 = AUTOMATIC RECLOSING RELAY

RR = RECLOSE REMOVAL LATCHING RELAY

T = TRIP

TC = BREAKER TRIP COIL

SSS = SLIDING LINK TERMINAL

R = RESISTOR

DDD = ZENER DIODE

AMS = AUTOMATIC / MANUAL THROWOVER SWITCH (SHOWN IN MANUAL MODE)