17.1.4.2. Check all bolted bus connections.

17.1.4.3. High-pot cable with 25 kV DC.

17.1.4.4. Insure that all exposed bus work is properly insulated.

17.1.4.5. Bridge all bus work.

17.1.4.6. Perform dielectric insulation and power factor tests on all bus work.

17.1.4.7. Check breaker-lifting devices for alignment and adjust limit switches, if necessary.

17.1.4.8. Adjust auxiliary and cell switches.

17.1.4.9. Check continuity for all AC, DC control, and current transformer circuits.

17.1.5. The recommended tests and inspections for transformers are as follows:

17.1.5.1. Visually inspect for internal shipping damage and check all internal connections.

17.1.5.2. Install bushing and accessories per manufacturer's instructions.

17.1.5.3. Inspect load tap changer (LTC) compartment and adjust per manufacturer's instruction and check LTC operation, if applicable.

17.1.5.4. Bridge primary and secondary windings on all tap positions and a final check on the tap position that will be used.

17.1.5.5. Ratio check, excitation test, perform insulation resistance test, and check polarity on all current transformers. Leave unused current transformers shorted and grounded on the secondary.

17.1.5.6. Vacuum fill per manufacturer's instructions.

17.1.5.7. Check for oil and gas leaks. (This may be done prior to vacuum filling).

17.1.5.8. Test oil before and after filling. (Maximum power factor, minimum dielectric strength, color, acidity, and interfacial tension).

17.1.5.9. Test oil for dissolved combustible gas and moisture content (Note: This test is to be performed 24 to 48 hours after the substation has been energized)..

17.1.5.10. Check voltage regulating relay and controls.

17.1.5.11. Check cooling equipment and controls.

17.1.5.12. Check nitrogen-regulating equipment and adjust per manufacturer's instructions.

17.1.5.13. Check sudden pressure relay and associated circuits.

17.1.5.14. Check and connect desired alarm circuits.

17.1.5.15. Perform insulation resistance test and insulation power factor test of bushing and windings (e.g., "Doble testing").

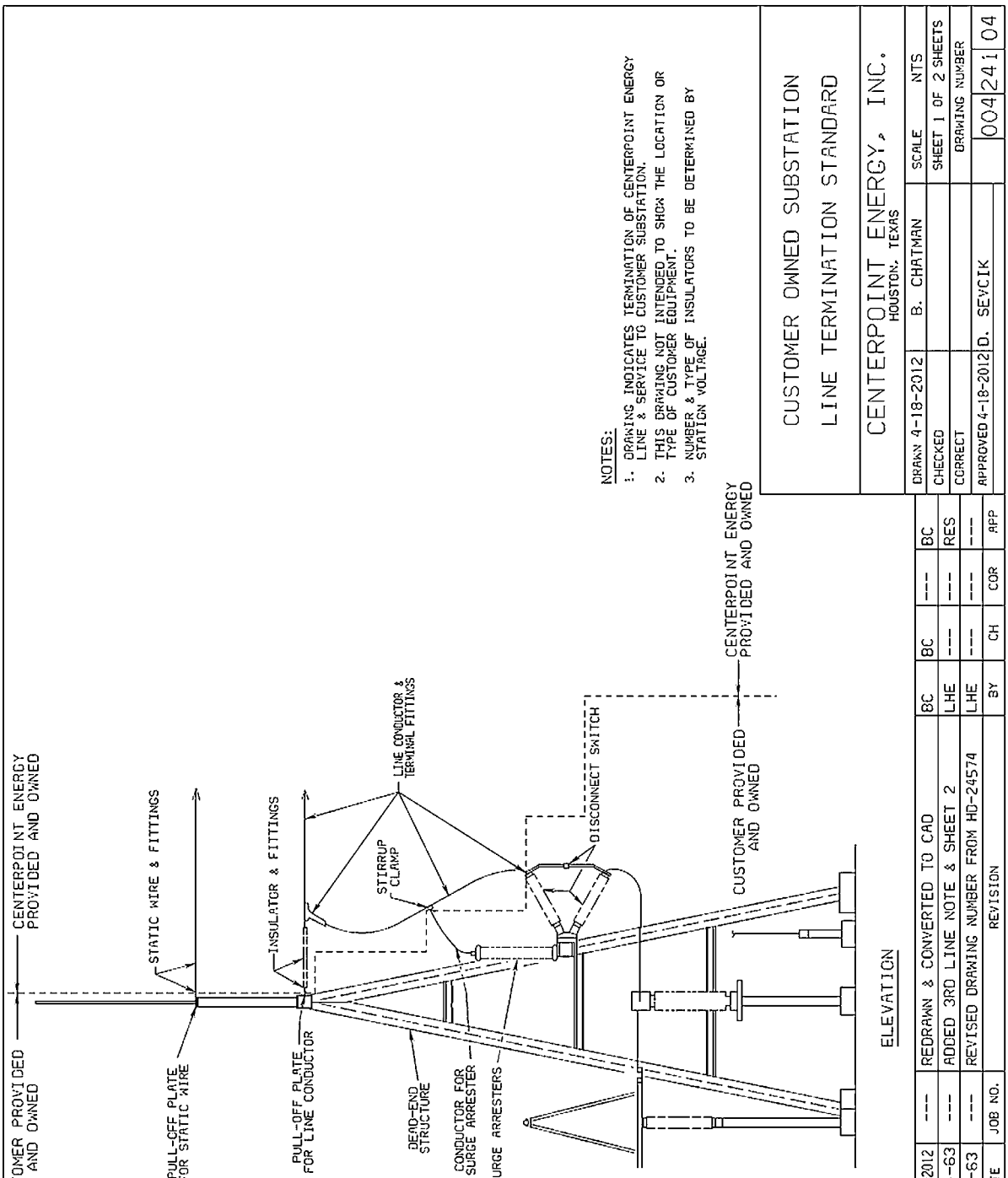
17.1.5.16. Check all bushings to bus connections.

17.1.5.17. Check all current transformers and control circuit connections.

17.1.5.18. Record all measurements and readings.

17.1.5.19. Check core ground.

REFERENCE DRAWINGS



ENERGY
EXAS

E. C. Reid	
L. G. Pond	

NO	DATE	ITEMS REVISED	BY	CH	APP			
16	8-3-2017	Update Sections 8 & 9 for Telecom	cwm	Var	MDB			
15	11-16-2015	Updates	Var	Var	DRS	APPROVED	7/17/74	C. S. Kayser
14	7-22-2005	Change to 4000A and other updates	Var	Var	DRS		Page **43** of **46**	

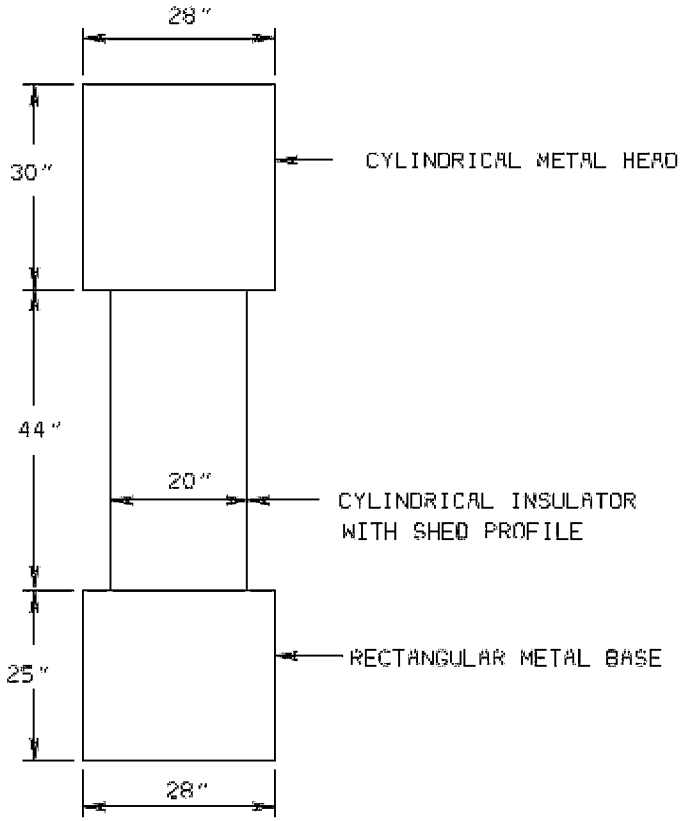
SPECIFICATION NO. 007 231 14

THIS DIAGRAM REPRESENTS THE MAXIMUM DIMENSIONS, AND MAXIMUM WEIGHT OF POSSIBLE 138 KV CT'S OR PT'S THAT CENTERPOINT ENERGY WILL PROVIDE FOR THE 138 KV BILLING METER.

THIS DIAGRAM PROVIDES THE NECESSARY STRUCTURAL AND MECHANICAL DESIGN PARAMETERS TO BE USED FOR THE INSTRUMENT TRANSFORMER FOUNDATIONS AND STANDS THAT WILL SUPPORT 138 KV CT'S OR PT'S THAT CENTERPOINT ENERGY WILL PROVIDE.

THIS DIAGRAM MUST ALSO BE USED, IN CONJUNCTION WITH SUBSTATION BUS PROFILE DIMENSIONS, TO DETERMINE THE HEIGHT OF THE STANDS THAT WILL SUPPORT THE INSTRUMENT TRANSFORMERS THAT CNP WOULD PROVIDE FOR THE 138 KV BILLING METERING.

AFTER THE INSTRUMENT TRANSFORMER STAND HEIGHT HAS BEEN DETERMINED BASED ON THE ABOVE INFORMATION, THE MANUFACTURER'S OUTLINE DRAWING FOR THE ACTUAL 138 KV CT'S AND PT'S THAT CENTERPOINT ENERGY WILL PROVIDE MUST BE USED TO DETERMINE THE DETAILS OF THE PRIMARY CONNECTION(S) AND SECONDARY TERMINAL BOX CONDUIT CONNECTION.



WEIGHT = 1500 LBS

DESIGN CRITERIA
138KV STANDARD
INSTRUMENT TRANSFORMER STAND
CENTERPOINT ENERGY, INC.
HOUSTON, TEXAS

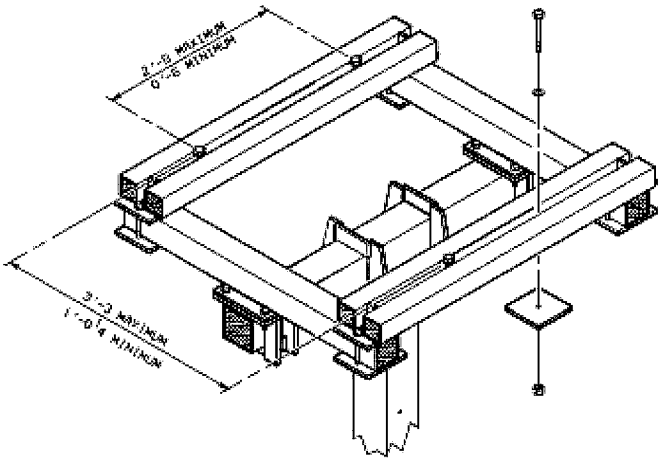
DESIGN 1-24-94	REK	SCALE NTS	
CHECKED 1-24-94	REK	SHEET 1 OF 2 SHEETS	
CORRECT		DRAWING NUMBER	
APPROVED		175 190 06	

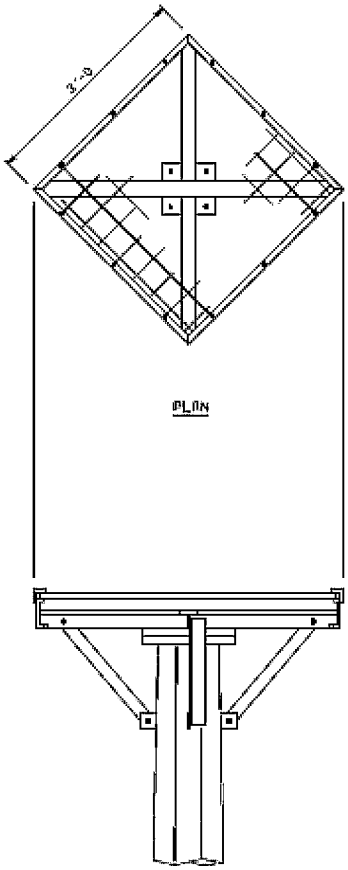
NO.	DATE	JOB NO.	REVISION	BY	CH	CSR	APP
1	7-3-14		CHANGED DESIGN PARAMETERS	DRS			BC

NT ENERGY
I, TEXAS

	4	E. C. Reid
CHECKED	7/17/74	L. G. Pond
APPROVED	7/17/74	C. S. Kayser

NO	DATE	ITEMS REVISED	BY	CH	APP
17	9-2-2021	Update sections 4 & 11	Var	Var	GAC
16	8-3-2017	Update Sections 8 & 9 for Telecom	cwm	Var	MDB
15	11-16-2015	Updates	Var	Var	DRS
14	7-22-2005	Change to 4000A and other updates	Var	Var	DRS





THE INSTRUMENT TRANSFORMER STAND MOUNTING SURFACE FOR THE 138 KV CT & PT THAT CENTERPOINT ENERGY WILL PROVIDE FOR THE 138 KV BILLING METERING MUST BE ADJUSTABLE OR USE GRATING TO ACCOMMODATE DIVERSE INSTRUMENT TRANSFORMER MOUNTING BOLT PATTERNS.

DESIGN CRITERIA
138KV STANDARD
INSTRUMENT TRANSFORMER STAND
CENTERPOINT ENERGY, INC.
HOUSTON, TEXAS

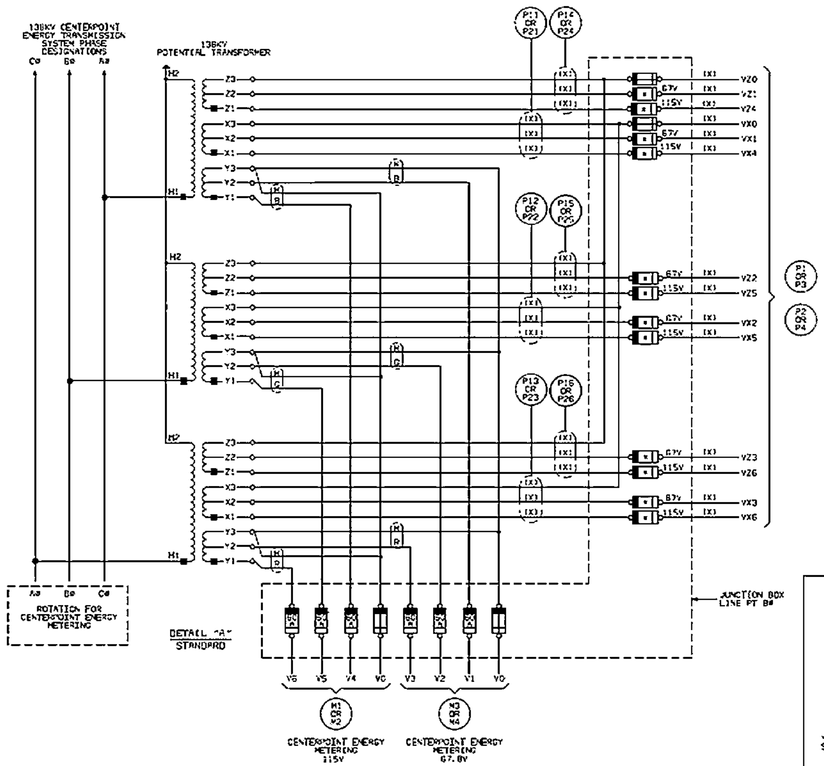
DRAWN 1-24-94	REK	SCALE NTS	
CHECKED 1-24-94	REK	SHEET 2 OF 2 SHEETS	
CORRECT		DRAWING NUMBER	
APPROVED		171 180 06	

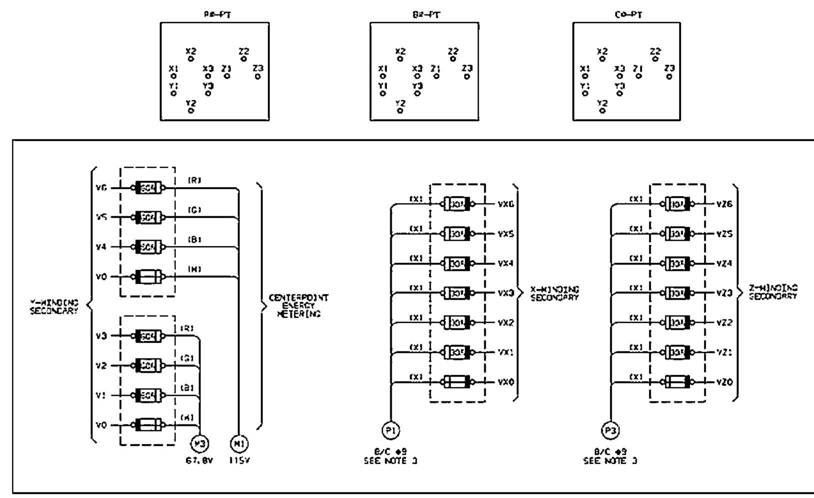
NO.	DATE	JOB NO.	REVISION	BY	CH	COR	APP
1	7-3-14		CHANGED MOUNTING BASE OPTIONS	DRS			BC

NT ENERGY
I, TEXAS

4		E. C. Reid
CHECKED	7/17/74	L. G. Pond
APPROVED	7/17/74	C. S. Kayser

NO	DATE	ITEMS REVISED	BY	CH	APP
17	9-2-2021	Update sections 4 & 11	Var	Var	GAC
16	8-3-2017	Update Sections 8 & 9 for Telecom	cwm	Var	MDB
15	11-16-2015	Updates	Var	Var	DRS
14	7-22-2005	Change to 4000A and other updates	Var	Var	DRS





LINE #1 138KV PT PULLBOX LAYOUT

NOTES:

1. THE 'X' & 'Z' SET OF POTENTIAL TRANSFORMER SECONDARIES ARE TO BE GROUNDED AT THE RELAY PANEL. THE NEUTRALS SHOULD NOT BE FUSED.
   THE 'Y' SET OF POTENTIAL TRANSFORMER SECONDARIES IS TO BE GROUNDED AT THE METER BOX. THE NEUTRAL SHOULD NOT BE FUSED.
2. METERING POTENTIAL CONNECTIONS ARE TO BE MADE VIA AN UNBROKEN CONDUIT CABLE FROM THE PT JUNCTION BOX TO THE METER BOX.
3. FOR DISTANCES OF 300 FEET OR MORE, THE CUSTOMER MAY BE REQUIRED TO PULL SPECIAL CABLE SPECIFIED BY CENTERPOINT ENERGY.
4. SECONDARY LEADS FOR A SET OF CURRENT OR POTENTIAL TRANSFORMERS COMPRISING ONE METERING INSTALLATION SHOULD BE ROUTED TO AVOID THE PICK-UP OF INDUCED VOLTAGES FROM OTHER CONDUCTORS THAT COULD CAUSE METERING ERRORS.
5. THE EFFECTS OF INDUCED VOLTAGES CAN BE REDUCED BY RUNNING SECONDARY LEADS IN A GROUP AS A CABLE OR TOGETHER IN A SINGLE CONDUIT. CENTERPOINT ENERGY REQUIRES THE USE OF RIGID GALVANIZE STEEL CONDUIT, 2 INCHES IN DIAMETER FOR METERING POTENTIAL & METERING CURRENT.
6. LEADS SHOULD BE KEPT AWAY FROM CONDUCTORS CARRYING HEAVY CURRENT AND SHALL NOT BE RUN IN THE SAME CONDUIT WITH SUCH CONDUCTORS.
7. THE POLARITY AND NEUTRAL SECONDARY WIRES FROM A GIVEN INSTRUMENT TRANSFORMER SHOULD BE RUN IN THE SAME CONDUIT.
8. THE ABOVE REQUIREMENTS (NOTES 4,5,6 & 7) ARE INTENDED TO BE SPECIFICALLY APPLIED TO ALL SECONDARY LEADS OF CURRENT OR POTENTIAL TRANSFORMERS UTILIZED FOR CENTERPOINT ENERGY METERING. HOWEVER, APPROPRIATE PRECAUTIONARY MEASURES SHOULD BE CONSIDERED WHEN ROUTING OTHER SECONDARY LEADS OF CURRENT OR POTENTIAL TRANSFORMERS.
9. CABLE LEAD COLORS TO BE PROVIDED BY CONTRACTOR FOR RELAY PANEL. CABLE LEAD COLORS SAME ON BOTH SIDES OF FUSE.
10. CABLE FOR METERING TO BE PROVIDED AND PULLED BY CENTERPOINT ENERGY METERING DEPARTMENT, UNLESS OTHERWISE SPECIFY. ALL CONNECTIONS MADE BY CENTERPOINT ENERGY METERING DEPARTMENT.
11. (X) = CABLE COLOR BY CUSTOMER.

CUSTOMER OWNED SUBSTATION
138KV POTENTIAL TRANSFORMER
SCHEMATIC & WIRING DIAGRAM

CENTERPOINT ENERGY, INC.
HOUSTON, TEXAS

3	4-23-12		UPDATE FOR 3 WINDING PT	ST	ST		ST
2	1/12/12		ADD CEII NOTICE	JBD	JBD		DJK
1	10-1-92		ADD NOTES 12 & 13.	DMM	RNB	RCP	LGP
NO.	DATE	JCO NO.	REVISION	BY	CH	COR	APP

DRAWN 2-14-92	KS	SCALE NTS
CHECKED	R.N. BURT	SHEET 1 OF 1 SHEETS
CORRECT	R.C. PHILLIPS	DRAWING NUMBER
APPROVED	L.G. POND	MSC 581 500 01

NO	DATE	ITEMS REVISED	BY	CH	APP
16	8-3-2017	Update Sections 8 & 9 for Telecom	cwm	Var	MDB
15	11-16-2015	Updates	Var	Var	DRS
14	7-22-2005	Change to 4000A and other updates	Var	Var	DRS

		E. C. Reid
	74	L. G. Pond
APPROVED	7/17/74	C. S. Kayser

NT ENERGY
, TEXAS

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SPECIFICATION NO. 007 231 14

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.

NO	DATE	REVISION	BY	CH	APP
11	08-02-2021	Rewritten	HAL	SPS	SPS
10	07-26-2017	Revised section 5	CWM	HAL	MDB
9	12-13-2016	Revised sections	CWM	HAL	MDB

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
	Page 1 of 15	
	SPC 007 400 02	

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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
	Page 2 of 15	
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SECTION 1

GENERATOR INTERCONNECTION FACILITY

AND ENERGY STORAGE FACILITY

1.1. Typical interconnection arrangement

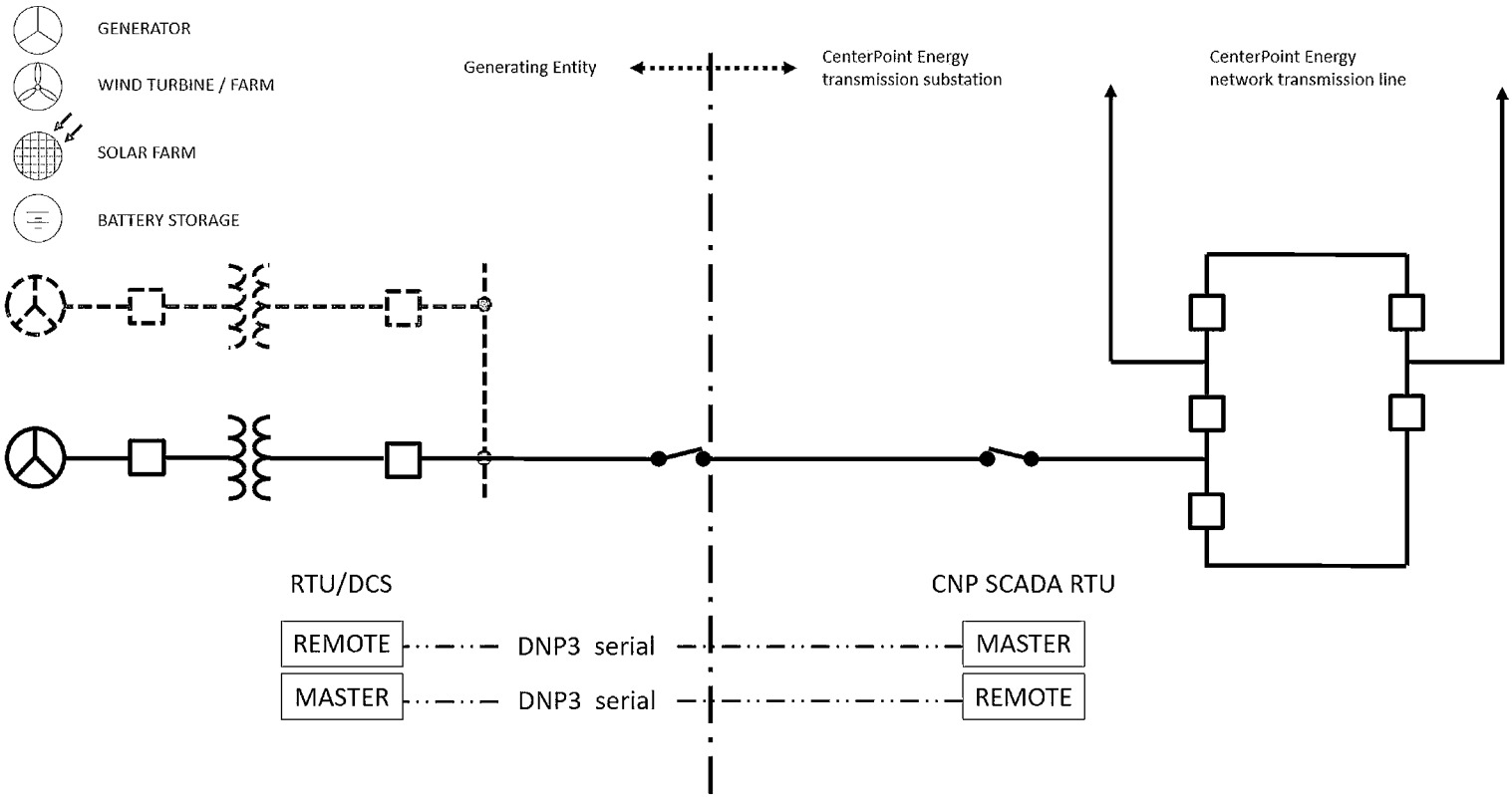


Figure 1 – Typical Generator and Energy Storage facility interconnection arrangement

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

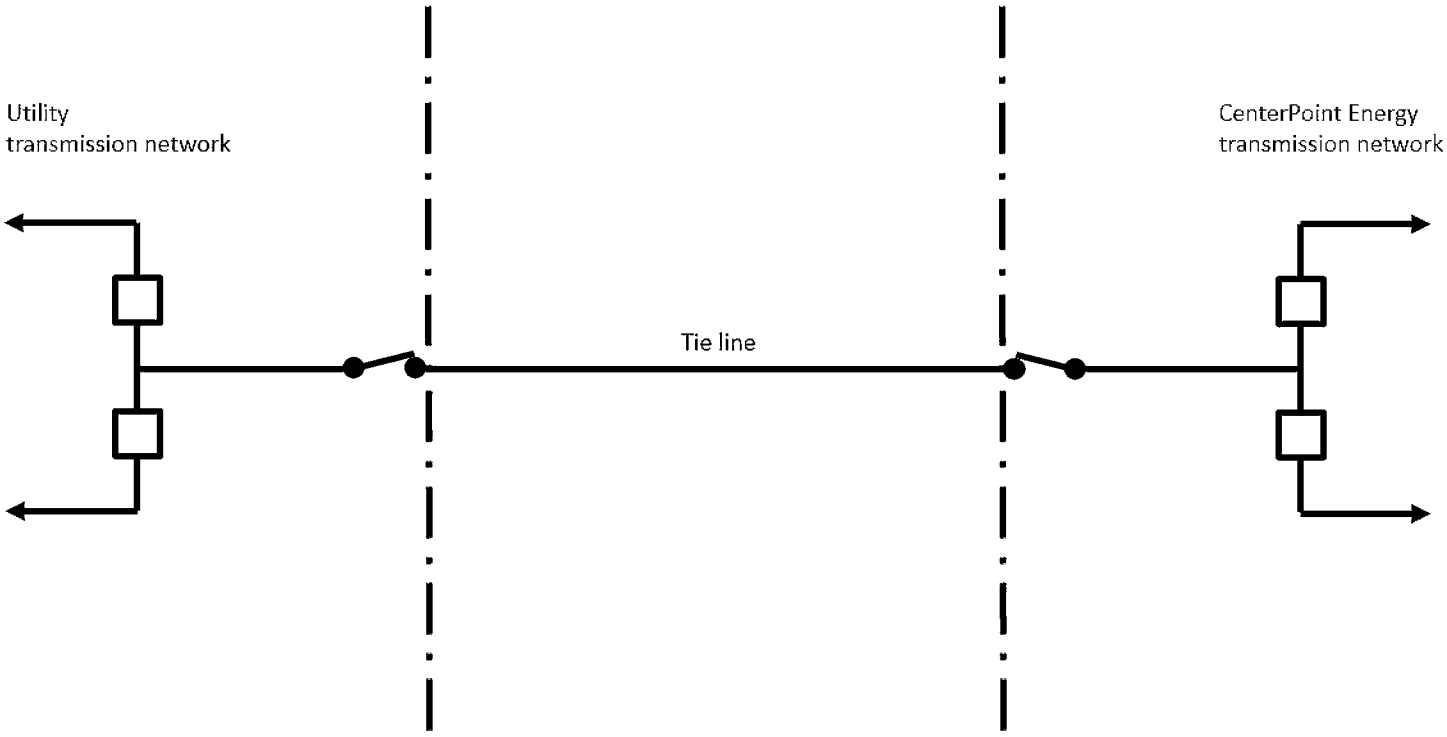


Figure 2 – Typical Utility interconnection arrangement

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).

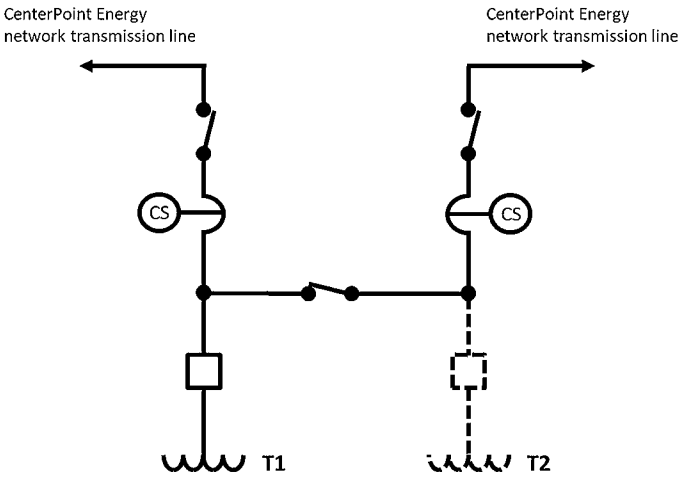
2.2.5. All applicable data listed in this section shall be provided continuously to CNP Real Time Operations (RTO), whether through a CNP-owned RTU, through CNP-connected communication ports, or customer-owned SCADA RTU ports. CNP's periodicity for scanning the data from established communication ports 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.

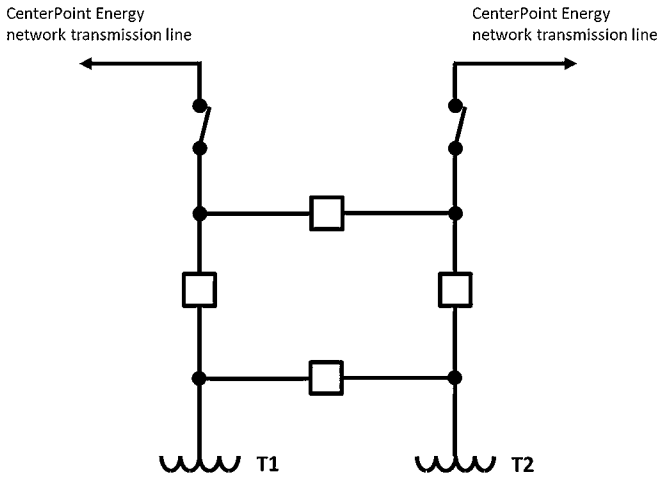
SECTION 3

CUSTOMER-OWNED LOAD TRANSMISSION SUBSTATION

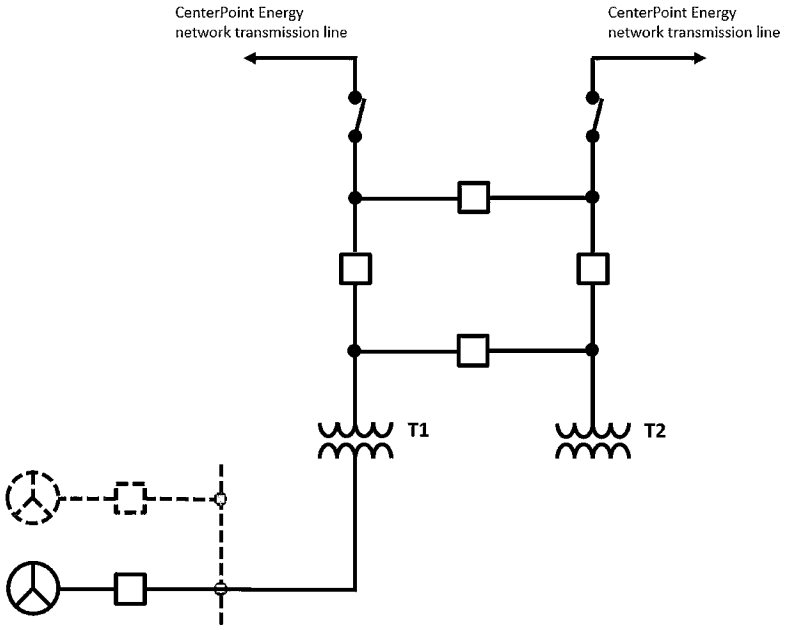
3.1. Typical interconnection arrangements



(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

CenterPoint Energy Houston Electric		
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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

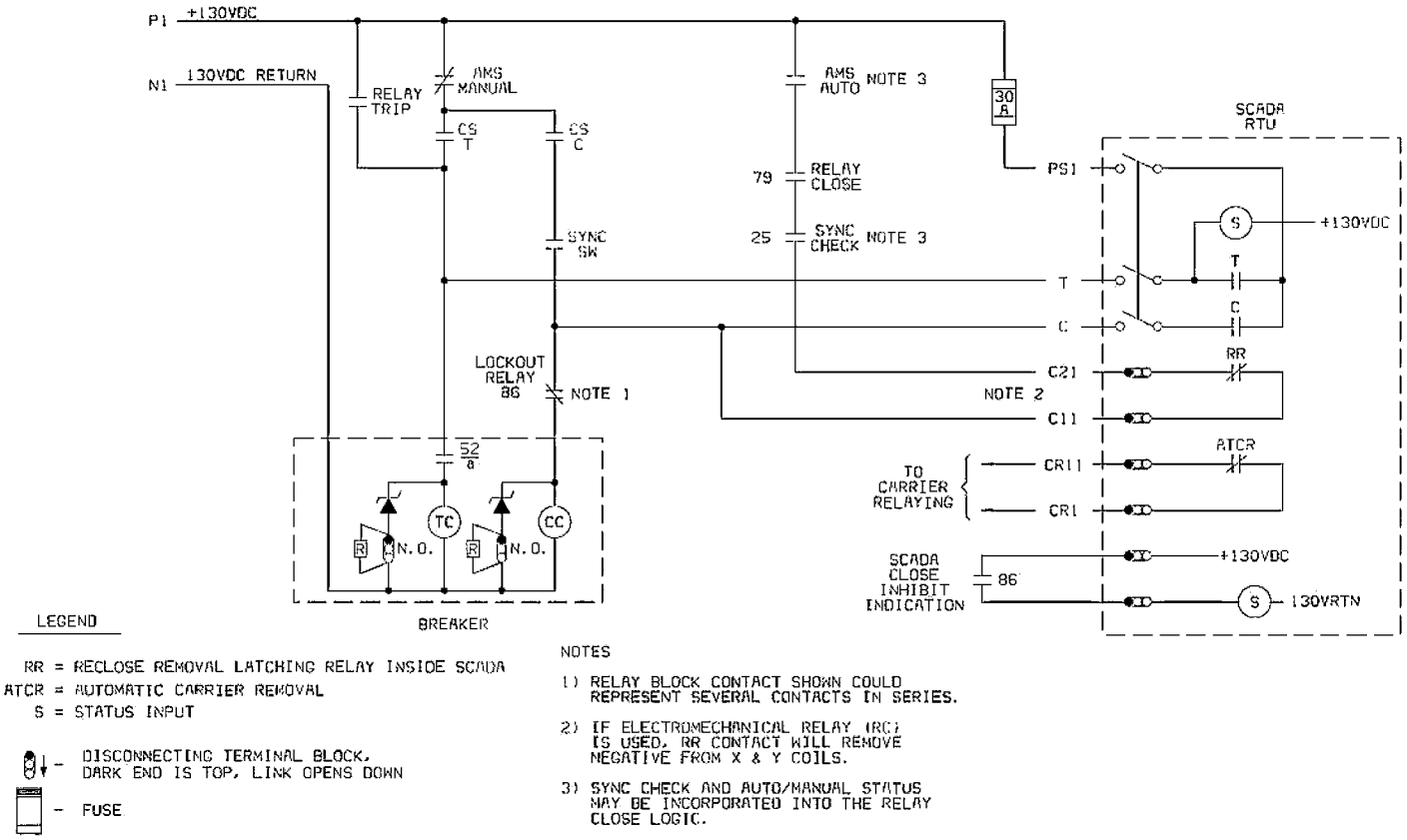

Figure 4 – Breaker Status Connection using trip coil monitoring method

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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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)

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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Transmission & Substation Outage and Clearance Coordination Procedures

Real Time Operations Department

Revised October 13, 2020

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CenterPoint Energy Telephone Numbers

Real Time Operations Department (RTO)

RTO System Controller	281-894-0491 (24 hours)
RTO HOTLINE (Emergency)	281-894-1625 (24 hours)

Outage Scheduling:

Submit request to: OutageRequest@centerpointenergy.com

Outage Questions call 713/207-2714 (Primary) or 713-207-2196

Metering Department:

High Voltage Metering	713-945-6689
Metering Engineering	713-207-6287

Transmission Accounts Representatives:

Nicholas Carroll	713-207-2785
Greg DonCarlos	713-207-3512
Reverteo McHaney	713-207-2263
Tim Raines	713-207-3538
Kevin Sarvis	713-207-5639

1. Introduction

1.1. Applicability

This procedure applies to entities (the Customers) who own high voltage transmission and/or generation facilities interconnected to CenterPoint Energy Houston Electric, LLC's (CNP) 69kV, 138kV, or 345kV transmission system. Customer, as used in this document, includes the Customer's authorized contractors or agents. The Customer shall ensure that the provisions in this document are applied to facilities that may be owned by others and that are interconnected to the Customer's facility at the same voltage at which the Customer's facility is interconnected to CNP's transmission system.

1.2. Purpose

The purpose of this document is to facilitate the coordinated operation, outage coordination, maintenance, design, and modification of the Customer's high voltage transmission or generation facilities with CNP facilities.

1.3. Copies of This Procedure

The Customer shall keep copies of this procedure in applicable Customer substation control houses and plant operating centers. This procedure, including forms, may be reproduced.

1.4. Facility Ownership or Name Change

The Customer shall inform CNP of any change in ownership or name of their interconnected facilities or facilities owned by others that are interconnected to their facilities.

1.5. Procedure Conflicts

Any conflicts between this procedure and the Customer's procedures shall be thoroughly discussed with appropriate CNP representatives and resolved before beginning any work.

1.6. Equipment Changes

The Customer shall provide all equipment, in accordance with CNP specifications, whenever changes in CNP transmission system, including monitoring and protection devices, require changes in the Customer's interconnected facilities to maintain compatibility.

The Customer shall provide sufficient notice to CNP of any proposed changes to their facilities as specified in Section 9 (Equipment Additions, Replacement, Upgrades and Removal) of this document. This notification shall include providing necessary details, so that CNP can provide comments based upon a general, functional review. The Customer shall not procure any equipment or materials or begin any work until all CNP comments are incorporated or resolved.

1.7. Generation Installation and Operation

Customers desiring to connect generation that will operate in parallel to CNP's transmission system shall file an application with the Electric Reliability Council of Texas (ERCOT) requesting interconnection in accordance with ERCOT's Generation Interconnection Procedure.

The Customer's generation facility shall be operated in accordance with the ERCOT Protocols and Operating Guides available at:

http://www.ercot.com/mktrules/nprotocols

http://www.ercot.com/mktrules/guides/noperating/cur

1.8. Power Factor

The Customer shall provide suitable apparatus to maintain power factor consistent with the requirements of CNP's Tariff for Retail Delivery Service.

1.9. Voltage Fluctuations

The Customer shall provide suitable apparatus to mitigate voltage fluctuations to reasonable limits should the Customer's equipment cause voltage fluctuations that interfere with CNP's transmission system.

1.10. Emergency Response

In an emergency, the Customer shall switch substation equipment, reduce MW output, change reactive output, or perform other measures as directed by ERCOT or CNP's Real Time Operations Department (RTO), to help alleviate the emergency.

CNP may interrupt transmission service to and deliveries from the Customer in the event of an emergency.

1.11. Unplanned Outage Restoration

Customer substations are an integral part of the interconnected transmission system, and CNP personnel may need to perform switching activities in a Customer substation to restore service to other customers in a timely manner. Customer actions that delay such switching activities can result in economic and/or environmental impacts for neighboring customers and pricing impacts for electricity market participants.

The Customer shall follow the applicable provisions as specified in Section 6 (Unplanned Outages) of this document.

Following evaluation of available information, the RTO System Controller shall issue switching orders to restore CNP transmission lines. Available information may include Customer reports, CNP field inspections of transmission lines and substations, lightning data, digital fault recorder data, protective relay data, fault location analysis, and Traveling Wave System ("TWS") fault location.

2. CNP Access to the Customer's Facilities

2.1. Authorized Representative of CNP

An authorized representative of CNP shall have access to the Customer's premises for the purpose of performing switching orders, inspecting CNP's wiring and apparatus, repairing, erecting, removing, or replacing CNP-owned equipment, reading CNP meters, performing routine testing of certain Customer equipment, performing inspections of CNP apparatus and switching following an unplanned outage of CNP transmission lines, and for all other purposes related to the interconnection.

3. Communications with CNP

3.1. Operating Personnel Communications

To reduce the possibility of miscommunication that could lead to action or inaction harmful to the reliability of the Bulk Electric System (BES) CNP shall require operating personnel that issue an oral two-party, person-to-person Operating Instruction to take one of the following actions:

- Confirm the receiver's response if the repeated information is correct.
- Reissue the Operating Instruction if the repeated information is incorrect or if requested by the receiver.
- Take an alternative action if a response is not received or if the Operating Instruction was not understood by the receiver.

CNP requires operating personnel that receive an oral two-party, person-to-person Operating Instruction to take one of the following actions:

- Repeat, not necessarily verbatim, the Operating Instruction and receive confirmation from the issuer that the response was correct.
- Request that the issuer reissue the Operating Instruction.

Operating Instruction definition: A command by operating personnel responsible for the Real-time operation of the interconnected Bulk Electric System to change or preserve the state, status, output, or input of an Element of the Bulk Electric System or Facility of the Bulk Electric System.

3.2. Real Time Operations Department

RTO operates CNP's transmission system and coordinates the operation of interconnected high voltage facilities. RTO provides routine and emergency switching instructions, issues clearances, and dispatches CNP personnel in response to electrical outages and problems. The Customer shall schedule planned outages with RTO and obtain from RTO switching instructions for any equipment at the Customer's substation that is directly interconnected with CNP's transmission system. Switching in the Customer's facilities that are remote to the Customer's substation directly interconnected with CNP's transmission system does not need to be scheduled. CNP will notify the Customer one or more days in advance if switching is required in the

Customer's substation for planned transmission line outages or if the Customer's substation will be placed in a single-ended condition.

3.3. *Scheduling Transmission Equipment Outages*

CNP's substation equipment outage scheduling and reporting requirements have been developed to support ERCOT requirements for scheduling outages on circuit breakers, bus sections, transmission lines, and transformers that have an operating voltage of 60kV and higher and to support requirements for scheduling outages of ERCOT Polled-Settlement (EPS) metering equipment.

The Customer shall contact the RTO Outage Scheduler as shown in Table 1 at the end of this section to coordinate outages in the substation that is directly interconnected with CNP's transmission system. Requests are considered in the order they are received.

Switching Orders, Clearances - The Customer shall follow switching instructions provided by the RTO System Controller prior to initiating any switching to remove equipment from service or return equipment to service in the Customer's facilities. The Customer shall request a clearance from the RTO System Controller when required. A "Switching Order" form and a "Transmission Switching Check List" form are included in this document. The RTO System Controller can be contacted at 281-894-0491.

Unplanned Outages, Emergencies - The Customer shall contact the RTO System Controller as soon as possible whenever any unplanned tripping of any circuit breaker operating at a voltage of 60 kV and higher occurs. An "Unplanned Outage Check List" form is included in this document. In the event of an unplanned generation outage, the Customer or his designated representative shall advise CNP's RTO System Controller as soon as possible. In emergency situations, switching may be performed by a qualified person, which is authorized by the Customer, based upon switching instructions provided by the RTO System Controller. An "Emergency Switching Check List" form is included in this document. The RTO System Controller can be contacted at 281-894-0491 or at the RTO HOTLINE 281-894-1625.

ERCOT Approvals - The RTO System Scheduler will coordinate a review and notify the Customer whether the outage can be scheduled for the desired day. Transmission line outages and the energization of new equipment require the approval of ERCOT. The Customer shall notify the RTO System Scheduler as soon as possible if an outage is canceled prior to the outage date. The Customer shall immediately notify the RTO System Controller if an outage is canceled on the day of the outage. CNP endeavors to notify the Customer as soon as possible when it is deemed necessary to cancel an outage.

Customer Substation Evacuations – During emergencies requiring evacuation of the Customer's facility, the Customer shall contact RTO prior to the evacuation and provide information regarding the operational status of their substation and associated support facilities, such as substation station service power, battery and battery charger, and ability for CNP to access the substation. The Customer's

substation is an integral part of the interconnected transmission system and disabling them has an impact on the electrical grid.

3.4. *Transmission Accounts Division*

CNP's Transmission Accounts Division ("Transmission Accounts") is responsible for coordinating the Customer's service needs within CNP. Transmission Accounts representatives endeavor to inform the Customer of long range planned switching and projects that may affect the Customer's facility.

The Customer shall notify the Transmission Accounts representative as specified in Section 9 (Equipment Additions, Replacement, Upgrades and Removal) when equipment additions or removals are planned or when high voltage equipment 60 kV and higher or associated equipment requires modification or replacement. The Customer shall contact a Transmission Accounts representative to request current CNP specifications and applicable bills of material for substation equipment additions and replacement.

Transmission Accounts representatives may be contacted for any questions concerning the operation of the Customer's substation. The Transmission Accounts representatives are listed on the CenterPoint Energy Telephone Numbers page in this document.

3.5. *Substation and Equipment Identification*

CNP assigns a substation name, or a Substation ID of three characters, to identify the Customer's substation facility. The Substation ID is also referred to as the three-character mnemonic. CNP mounts signs with the substation name or the Substation ID on a substation control house door and on a substation entrance gate at the Customer's facility.

The Customer's high voltage circuit breakers switches, transformers, and certain low side equipment shall be identified with CNP's assigned numbers. CNP develops a substation basic one-line diagram that includes these assigned numbers. CNP or the Customer shall mark these numbers on the substation equipment. CNP may stencil identification numbers on substation equipment and mount signs, labels, drawings, telephone numbers, and instructions on the Customer's facilities.

The Customer shall use CNP's assigned substation name, or Substation ID, and equipment identification numbers in discussions with the RTO System Controller and the RTO System Scheduler.

3.6. *Telephone Lines and Data Communication*

The customer is responsible for arrangements with the telephone service provider to establish a direct dial telephone land line to the customer substation control cubicle.

Refer to CenterPoint Energy 007-400-02 Specification for Remote Telemetry of a Customer-Owned Facility for details pertaining to required communications circuits (i.e., customer provided voice communication and CenterPoint Energy provided telemetry communications for SCADA, metering, etc.)

3.7. Alarm Response

CNP responds to alarms for communication equipment installed to protect CNP transmission circuits.

The Customer shall report substation alarms to the RTO System Controller and respond to alarms pertaining to their equipment. A protective relay "CPU Failure" alarm shall be immediately reported to the RTO System Controller. A "Loss of DC" alarm shall be immediately reported to the RTO System Controller and investigated by the customer

3.8. Outage Scheduling Requirements

Per ERCOT and CNP outage reporting requirements: planned outages on circuit breakers, transmission lines, and autotransformers that are rated 60 kV and higher must be submitted to the ERCOT Outage Coordinator by the CNP RTO Outage Coordinator.

Per ERCOT Protocols, planned outages on ERCOT Polled Settlement ("EPS") meters and the equipment to which they are connected require a 5 day minimum notice. A 10 calendar-day minimum notice is required for any modifications to approved EPS equipment.

Table 1 Planned Outage Scheduling

Equipment Being Requested	Minimum Advance Notice	Contact
69 kV and 138 kV lines, single load transformers, individual breakers and bus outages of no more than one day in duration.	No later than 1200 hours Wednesday two weeks before the Planned Outage is to take place.	Outage Scheduler @ 713-207-2196 or 713-207-2714
All transmission line outages and equipment outages, including busses, of up to four contiguous days duration (daily or continuous outages).	35 Calendar Days	Outage Scheduler @ 713-207-2196 or 713-207-2714
Any transmission line outages and/or equipment outages, including busses, of 5 days or longer duration (daily or continuous)	90 Calendar Days	Outage Scheduler @ 713-207-2196 or 713-207-2714

Amount of time between the request for approval of the proposed Outage and the scheduled start date of the proposed Outage:	ERCOT shall approve or reject no later than:
Three days	1800 hours, two days before the start of the proposed Outage
Between four and eight days	1800 hours, three days before the start of the proposed Outage
Between nine days and 45 days	Four days before the start of the proposed Outage
Between 46 and 90 days	30 days before the start of the proposed Outage
Greater than 90 days	75 days before the start of the proposed Outage

3.9. Cyber Security Incident

A Cyber Security Incident is a malicious act or suspicious event that disrupts, or was an attempt to disrupt, the operation of a Bulk Electric System (BES) Cyber System. A SCADA remote terminal unit (RTU) is an example of a BES Cyber System.

If the Customer identifies a possible, or verified, Cyber Security Incident impacting the operation of a CNP-owned BES Cyber System, the Customer shall contact RTO as soon as practicable.

4. Switching, Clearances, Grounding

4.1. Billable Costs

Grounding and switching requested by the Customer to be performed during other than normal working hours is billable to the Customer.

Grounding and switching charges will be waived under the following conditions:

- The Customer requesting switching or grounding activities by CNP is a transmission voltage service customer that is interconnected to CNP's transmission system through a customer-owned substation; and
- The requested activities are to allow the Customer to perform maintenance activities or equipment upgrades on its transmission voltage facilities within the Customer's substation; and
- The switching and grounding field activities are requested to occur on a normal CNP work day, with outages commencing no earlier than 0800, and outages concluding no later than 1600.

Outages extending beyond the timeframes identified in Section 4.1.2.3 above (commencing no earlier than 0800 and concluding no later than 1600) on a forced basis may result in billing for associated switching and grounding activities, as determined on a case-by-case basis.

Outages with switching or grounding activities requested for more than two consecutive days may be subject to charges for each additional consecutive day, even if the outages occur within the timeframes identified in Section 4.1.2.3 above (commencing no earlier than 0800 and concluding no later than 1600), unless early or intermittent outage restoration is required by ERCOT or for CNP system requirements.

Questions regarding charges should be directed to the Transmission Accounts representative.

4.2. Switching

CNP performs necessary switching at the remote end of a CNP transmission line for outages at the Customer's substation that require switching of CNP transmission lines. CNP provides switching instructions for the high voltage devices in the Customer's substation that is directly interconnected with CNP's transmission system. Switching instructions are not provided for remote facilities interconnected to the Customer's substation that is directly interconnected with CNP's transmission system. A "Switching Order" form and a "Transmission Switching Check List" form are included in this document.

The Customer shall follow switching instructions provided by the RTO System Controller prior to initiating any switching to remove equipment from service or return equipment to service in the Customer's facilities. The Customer shall implement specific procedures for the switching of its facilities. These procedures shall include a visual check that all phases have fully opened or closed. A device bearing a Hold Tag shall not be operated under any circumstances.

The Customer shall provide a Hold Order to RTO for switching at generation facilities for equipment that interconnects with CNP.

4.3. Clearances

A clearance is required for applicable work on high voltage apparatus connected to CNP transmission lines when switching at the remote end of a CNP transmission line is necessary. Clearances are also issued when the Customer and CNP will be working on apparatus within the same isolated area at the Customer's facilities. Each party will be issued an individual clearance.

A clearance is required for applicable work on high voltage apparatus connected to CNP transmission lines when switching at the remote end of a CNP transmission line is necessary. Clearances are also issued when the Customer and CNP will be working on apparatus within the same isolated area at the Customer's facilities. Each party will be issued an individual clearance.

The Customer shall request a clearance from the RTO System Controller when required. Personnel authorized by CNP will perform either "trip & hold" or "check for trip & hold" on necessary devices before a clearance will be issued.

A clearance cannot be released by anyone other than the person to whom it was issued unless uncontrollable circumstances make that impossible. In this situation, the person's supervisor may, after informing each member of the crew that such action is being taken, contact the RTO System Controller to release the clearance. For field personnel shift changes, the person assuming the leadership of the work will be issued a new clearance and the person to whom the clearance was originally issued will then release the clearance.

4.4. Grounding

CNP issues clearances, as identified in Section 4.3.1 above, indicating that high voltage devices have been opened, locked, and tagged to prevent the devices from operating. After receiving a clearance from the RTO System Controller, if required, and verifying that the apparatus is de-energized, the Customer shall install protective grounds on all de-energized electrical apparatus before applicable work is performed on it. The Customer shall not install protective grounds on CNP transmission lines or CNP equipment.

When more than one party (e.g., the Customer and CNP) will be working on apparatus within the same isolated area at the Customer's facilities, each party shall install their own individual grounds before applicable work is performed.

The Customer may perform work on the control circuits and mechanisms of a device without grounding the apparatus, if such work can be performed without risk of contact with primary voltages. Grounds may be temporarily removed if required by testing procedures.
Before a grounding device is attached to any Customer high voltage bus work, the Customer shall first test the bus work to confirm that it is de- energized. Grounds shall be placed such that the operation of a switching device cannot remove their protection.

The clamps and conductors of grounding devices used by the Customer shall be designed for the available fault current. Grounding devices shall be inspected for broken strands and loose connections. The surface of the ground clamps shall be clean of corrosion and oxides.

Grounding devices used by the Customer for high voltage bus work shall be installed and removed with the use of applicable live line tools. Grounding devices shall be securely connected at the ground end before connection is made to the Customer high voltage bus work. Grounds shall be removed by first detaching the connection at the conductor and, then, detaching the connection at the ground end. When grounding to a steel structure, the ground shall not be applied to a flat surface unless an appropriate flat surface clamp is used.

CNP does not ground Customer-owned substation equipment except for work being performed by CNP.

4.5. Switching 345 kV Facilities Equipped with Ferroresonance Protection

Ferroresonance protection is installed whenever a wound potential transformer (PT) is connected to 345 kV and the possibility of a ferroresonance condition occurring exists. If applicable, the Customer shall implement specific procedures for switching 345 kV equipment that has ferroresonance protection installed.

Procedures shall include the following:

1. Place the sync handle in position for the last breaker that will be opened.
2. Monitor the three potential lights located on the control panel inside the control house before and after the last breaker is opened.
   a. If one or more of the lights do not dim immediately but gets brighter immediately close the last breaker opened to reenergize the bus and investigate the ferroresonance protection
   b. If all lights dim immediately reset the targets (flags) on the ferroresonance protection relays
   c. If relay targets did not operate investigate the ferroresonance protection circuit

4.6. Terminology for Switching Orders

Time - Military time, or 24-hour clock, based on prevailing Central Time.
Check Ring for Close - Verify by visual inspection that all devices in the ring are in the closed position.
Remove / Roll Loads - Remove all loads connected to a power transformer. This may be done by tripping applicable low side breakers or by rolling load to an adjacent transformer and tripping applicable low side breakers.
Trip - Initiate and complete an opening operation on a device.
Close - Initiate and complete a closing operation on a device.
Hold Tag - A tag placed on a device to indicate the equipment shall not be allowed to change operating state. The tag shall indicate the party who placed the tag.
Trip and Hold - Trip device, physically or mechanically (e.g., affix padlock) disable device from closing, and place a Hold Tag on the device.
Check for Trip and Hold - Verify by visual inspection that a device is in the trip position and place a Hold Tag on the device.
Secure Against Operation (SAO) - Physically, mechanically, or electrically disable a device (e.g., a motor operated disconnect switch) to prevent it from operating.
Secondary Potential Fuse (SPF) - Remove and tag fuses on the secondary side of potential devices to prevent the possibility of back energizing isolated equipment.

4.7. Switching Order

SWITCHING ORDER # _____

CLEARANCE # _____

SUBSTATION _____
EQUIPMENT _____

OUT	**RESTORE**
DISP _____	DISP. _____
TIME _____	TIME _____
DATE _____	DATE _____
EXEC. BY _____	EXEC. BY _____
TIME _____	TIME _____

ISSUED	**RELEASED**
DISP. _____	DISP. _____
TIME _____	TIME _____
DATE _____	DATE _____

ISSUED TO _____

NUMBER OF MEN _____ AND GROUNDS _____

ON _____

_____

INSTRUCTIONS

SWITCHING PROCEDURES DISCUSSED
WITH ALL MEMBERS OF CREW: Y N

CREW INITIALS _____

4.8. Transmission Switching Check List

The following basic procedures are for the day of the switching after the outage has been scheduled with and authorized by the RTO System Scheduler (713-207-2196). This applies to the Customer's substation that is directly interconnected with CNP's transmission system.

- ☐ Call the RTO System Controller at 281-894-0491 and request a Switching Order
  - ☐ Provide name, company affiliation, and telephone number
  - ☐ Provide Substation ID
  - ☐ Describe reason for request
  - ☐ Fill out Switching Order
    - ☐ Record the Switching Order number
    - ☐ Record start time provided by the RTO System Controller
    - ☐ Record the RTO System Controller's name
    - ☐ Record the instructions to take equipment OUT
    - ☐ Repeat the instructions
- ☐ Execute the Switching Order placing Hold Tags where appropriate
- ☐ Call the RTO System Controller when the instructions have been completed
  - ☐ Report the actual completion time
  - ☐ Record the completion time provided by the RTO System Controller on Switching Order
  - ☐ Request a Clearance if necessary
    - ☐ Provide the number of personnel in the crew
    - ☐ Provide the number of and location of grounds
- ☐ Verify apparatus is de-energized with a hot line indicator
- ☐ Install protective grounds when required
- ☐ Perform work
- ☐ Remove protective grounds if installed
- ☐ Call the RTO System Controller to request to RESTORE equipment
  - ☐ Report whether more than one Hold Tag is on any device
  - ☐ Provide Clearance number if applicable
    - ☐ Provide the number of personnel in the crew clear of the apparatus
    - ☐ Provide the number of grounds removed
  - ☐ Provide the Switching Order number
  - ☐ Fill out Switching Order
    - ☐ Record start time provided by the RTO System Controller
    - ☐ Record the RTO System Controller's name
    - ☐ Discuss performing Switching Order instructions in reverse order
- ☐ Alert all personnel to move to a safe distance from apparatus being energized
- ☐ Execute the Switching Order removing Hold Tags where appropriate
- ☐ Call the RTO System Controller when restoration has been completed
  - ☐ Report the actual completion time
  - ☐ Record the completion time provided by the RTO System Controller on Switching Order

5. Outage Scheduling Check List

5.1. Outage Scheduling Check List

The following instructions are for scheduling transmission equipment outages.

This applies to the Customer's substation that is directly interconnected with CNP's transmission system. Please refer to the "Outage Scheduling Requirements" outlined in Section 3 (Communications with CNP) of these procedures.

- Submit the following form to OutageRequest@centerpointenergy.com
- Call 713-207-2714 (Primary) or 713-207-2196 for outage questions.
- Provide the following information:

CENTERPOINT ENERGY OUTAGE REQUEST FORM FOR TRANSMISSION CUSTOMERS									
SUBMITTAL DATE:			VERSION #			CUSTOMER NAME		Substation MNEMONIC:	
REQUESTED BY:			Office #			ON SITE CONTACT		Office #	
			Cell Ph#					Cell Ph#	
EQUIPMENT	START DATE	START TIME	END DATE	END TIME	DAILY - D CONT - C	KV	EMERGENCY RESTORE TIME	CNP TO GROUND Line Y/N	REASON FOR OUTAGE/REMARKS
All Outage Requests should be e-mailed to OutageRequest@centerpointenergy.com For Questions call 713-207-2714 (fax# 713-207-2571)									

Please make a courtesy phone call if a revision has changed the original submittal. CNP will contact the "Requestor" if additional data is required.

6. Unplanned Outages

6.1. Unplanned Outages

ERCOT Protocols require that CNP notify ERCOT of all unplanned transmission outages.

The Customer shall contact the RTO System Controller as soon as possible whenever any unplanned tripping of any high voltage (60 kV and higher) circuit breaker occurs. CNP crews will be dispatched when high voltage circuit breakers remain open in the Customer's substation that is directly interconnected with CNP's transmission system. CNP crews will reset relay targets except in emergency situations. An "Unplanned Outage Check List" form is included in this procedure.

CNP crews are not dispatched when high voltage circuit breakers remain open in a remote, non-CNP substation connected to the Customer's substation, but not directly interconnected with the CNP system. In such a case, the Customer shall discuss and evaluate the event with the RTO System Controller. The Customer shall notify the RTO System Controller prior to any switching.

In the event of an unplanned generation outage, the Customer or his designated representative shall advise CNP's RTO System Controller as soon as possible.

6.2. Unplanned Outages of 345 kV Facilities Equipped with Ferroresonance Protection

Ferroresonance protection is installed whenever a wound PT is connected to a345 kV and the possibility of a ferroresonance condition occurring exists. If applicable, the Customer shall implement specific procedures for unplanned tripping of 345 kV equipment that has ferroresonance protection installed. Procedures shall include the following:

- ☐ Visually inspect the three potential lights located on the control panel inside the control house
- ☐ If one or more of the lights are bright and not dim
  - ☐ Open all the breaker disconnect switches to isolate the potential transformers
  - ☐ Disconnect/Remove the PTs from service on the phases with the bright lights
- ☐ If one or more of the lights are dark and not dim
  - ☐ Open all the breaker disconnect switches along the affected bus
  - ☐ Disconnect/Remove the PTs from service on the phases with the dark lights
- ☐ If remote monitoring of potential transformer voltages indicated a ferroresonance condition occurred
  - ☐ Open all the breaker disconnect switches to isolate the potential transformers
  - ☐ Disconnect/Remove the PTs from service on the phases that indicated ferroresonance
- ☐ If all lights are dim
  - ☐ Reset the targets on the ferroresonance protection relays
- ☐ If relay targets do not indicate proper action
  - ☐ Investigate the ferroresonance protection circuit

6.3. *Emergency Switching*

In emergency situations, switching may be performed prior to a CNP crew arriving at the Customer's substation. A qualified person, authorized by the Customer, may operate breakers and switches based upon switching instructions provided by the RTO System Controller. Prior to switching, all relay trip targets shall be reset after the Customer has recorded them and reported them to the RTO System Controller. All personnel shall move to a safe distance from apparatus being energized prior to switching. An "Emergency Switching Check List" form is included in this procedure.

The following instructions are for whenever an unplanned tripping of a transmission service voltage breaker occurs.

UNPLANNED OUTAGE CHECK LIST

- ☐ Call the RTO System Controller at 281-894-0491
- ☐ Provide the following information to the RTO System Controller
  - ☐ Your name, company affiliation, and telephone number
  - ☐ Substation ID
  - ☐ Nature of the problem
  - ☐ Time of outage
  - ☐ Status of all breakers and switches (i.e., open, closed, tagged)
  - ☐ Cause of the event if known
  - ☐ Fault location and faulted equipment if known
  - ☐ Fires and their proximity to energized equipment
  - ☐ Plant and substation entry constraints (e.g., chemical releases)
- ☐ Record the RTO System Controller's name
- ☐ Investigate and provide the following information to the RTO System Controller
  - ☐ Cause of the event if found during investigation
  - ☐ Fault location and faulted equipment if found during investigation
  - ☐ Number of trip operations for each breaker (i.e., change in breaker veeder reading)
  - ☐ Relay trip and alarm targets - Do not reset targets
- ☐ Discuss outage with CNP crews
- ☐ CNP crews record and reset relay trip targets
- ☐ CNP crews record breaker veeder readings
- ☐ Resolve outage and complete any necessary corrective action
  - ☐ Call the RTO System Controller at 281-894-0491 to request to RESTORE equipment
  - ☐ Record the instructions to RESTORE equipment
  - ☐ Repeat the instructions
- ☐ Execute the instructions
- ☐ Call the RTO System Controller when instructions have been completed

BY: _____ DATE: _____

6.4. EMERGENCY SWITCHING CHECK LIST

The following basic procedures are for emergency situations. Contact the RTO System Controller at one of the following telephone numbers.

- Call the RTO System Controller HOTLINE at 281-894-1625
- Provide the following information to the RTO System Controller
  - Your name, company affiliation, and telephone number
  - Substation ID Nature of the problem
  - Time of outage
  - Status of all breakers and switches (i.e., open, closed, tagged)
  - Cause of the event if known
  - Fault location and faulted equipment if known
  - Fires and their proximity to energized equipment
  - Plant and substation entry constraints (e.g., chemical releases)
  - Relay trip and alarm targets
- Record the RTO System Controller's name
- Record the instructions to RESTORE equipment
- Reset relay trip targets
- Execute the instructions
- Call the RTO System Controller at 281-894-0491 when instructions have been completed

BY: _____ DATE: _____.

6.5. *Other Emergency Conditions*

Customer substations are an integral part of the interconnected transmission system and disabling them has an impact on the electrical grid. In certain emergency situations, the Customer may evacuate or shut down their facility. In such cases, the Customer shall endeavor to keep the portion of their substation that is directly connected to the transmission grid in service, unless specifically directed otherwise by the RTO System Controller or ERCOT. The Customer shall not disable A/C power to the DC battery system charger or any protection system components, unless specifically directed otherwise by the RTO System Controller.

7. Generation Operation

7.1. *Applicability*

This section applies only if the Customer operates electric generating facilities and participates in the wholesale transmission market. The Customer shall follow the ERCOT Operating Guides and ERCOT Protocols or other regulatory requirements that apply to their facilities.

7.2. *Unit Operation*

Where CNP owns the interconnecting substation and there is not an in-line breaker to synchronize a generating unit, the Customer has control of CNP's substation breakers that are functioning as generator breakers. CNP has operational control of the disconnect switches associated with these breakers.

The Customer shall always have generation control personnel on duty at the generating unit site that the generating units are on-line.

The Customer or Customer's representative shall notify the RTO System Controller (281-894-0491) immediately before a unit is synchronized and connected to CNP's transmission system.

The Customer shall operate units to support the transmission system voltage by regulating reactive power output up to levels demonstrated in the ERCOT tests as required in the ERCOT Protocols. The Customer shall maintain the ERCOT specified voltage level unless otherwise directed by the RTO System Dispatcher or ERCOT.

The Customer's voltage regulators, speed governors, and power system stabilizers, if required by ERCOT, shall be in service whenever generating units are on-line. The Customer shall immediately notify ERCOT whenever a voltage regulator, speed governor, or power system stabilizer is taken out of service or placed back in service. The Customer shall maintain settings as close as practical to five percent speed regulation.

The Customer shall maintain generating units on-line during system frequency and voltage excursions per ERCOT Operating Guides:
www.ercot.com/mktrules/guides/noperating/cur .

8. Protective Relaying and Control

8.1. Settings for Relays Installed for the Protection and Automatic Reclosing of CNP Transmission Lines

CNP calculates and implements all settings for the Customer's relays installed for the protection and automatic reclosing of CNP transmission lines and for the Customer's relays installed to prevent back-energizing CNP's system from generation installed on the low side of the Customer's power transformers. On a case-by-case basis, CNP may issue settings for other relays owned by the Customer. The relay settings implemented by CNP for the Customer's relays will be provided to the Customer upon request.

8.2. Applicable Relay Settings

The Customer shall provide CNP with the settings of the Customer's relays that trip or close the Customer's high voltage (60 kV and higher) circuit breakers. The Customer shall provide to the Transmission Accounts representative any proposed settings changes for such relays for CNP's review.

8.3. Communications Connections to Electronic Devices

An electronic device that can directly or indirectly trip a circuit breaker connected to a CenterPoint Energy transmission circuit (i.e., transmission line protective relay, transformer bus protective relay, local breaker failure relay, etc.) is not allowed to be monitored via routable protocol communication (i.e., Ethernet), serial or dial-up communication by customers connection directly to the device. Data from these electronic devices can be provided to the customer via the CenterPoint Energy SCADA RTU (CenterPoint Energy 007-400-02 Specification for Remote Telemetry of a Customer-Owned Facility) or the customer may install separate devices for monitoring purposes.

8.4. Maintaining Levels of Protection

The Customer shall not disable a single level, or multiple levels, of protection that results in no protection for an energized element, such as, a transmission line, high voltage bus, or transformer.

The Customer shall immediately notify the RTO System Controller whenever the Customer becomes aware of an energized element that has no protection.

The Customer shall immediately notify the RTO System Controller of a protective relay "CPU Failure" alarm or when a protective relay is found powered down, or out of service.

9. Equipment Additions, Replacement, Upgrades and Removal

9.1. Equipment Changes

The Customer shall notify the Transmission Accounts representative with sufficient notice to meet the timeline and data reporting requirements in Table 2 below when equipment additions or removals are planned or when high voltage equipment or associated equipment requires modification or replacement. The Customer shall notify the Transmission Accounts representative prior to performing functional testing and allow CNP to witness the testing.

The Customer shall provide equipment and installation, including testing and inspections, per applicable CNP specifications and bill of materials. The Customer shall provide necessary details, such as drawings, specifications, and manufacturer type and catalog number, for CNP's review. All CNP comments shall be incorporated or resolved before any equipment or materials are procured or any work is begun.

ERCOT Protocols require that all changes to equipment rated at 60 kV and above be communicated by CNP to ERCOT prior to the in-service date as specified in Table 2 below.

ERCOT only approves energization requests when the transmission element is satisfactorily modeled in the ERCOT Network Operations Model.

9.2. Modification, Repair, and Replacement of Customer Equipment

CNP notifies the Customer of problems in their facilities of which CNP becomes aware. The Customer shall provide any needed equipment modifications, repairs, or replacement as soon as practicable. The Customer shall replace equipment that CNP demonstrates is no longer maintainable. On a case-by- case basis, the Customer and CNP shall develop the responsibilities for the modification, repair, and replacement of this equipment.

Industry experience may dictate that certain equipment be modified, repaired, or replaced due to manufacturing defects or unacceptable failure rates and consequences. The Customer shall, as soon as practicable, modify, repair, or replace equipment based on product service advisories issued by manufacturers or advisories issued by CNP.

9.3. Customer Substation Equipment Additions, Relocations, Upgrades and/or Removal

When installing, relocating, or upgrading transmission system equipment, Customers must contact their appropriate CNP Transmission Accounts representative with sufficient notice to meet the timelines and data requirements shown below. ERCOT Nodal Protocols Section 3.10.1 requires that all changes to transmission equipment energized at 60 kV and above be communicated by CNP to ERCOT using the Network Operations Model Change Request ("NOMCR") process as summarized below:

Table 2

Target Physical Equipment In-Service Month	Deadline to Submit to RTO	Timeline to Submit initial information to Transmission Accounts Rep
Month of January	**Sept. 1**	June 1 (prior year)
Month of February	**Oct. 1**	July 1 (prior year)
Month of March	**Nov. 1**	August 1 (prior year)
Month of April	**Dec. 1**	September 1 (prior year)
Month of May	**Jan. 1**	October 1 (prior year)
Month of June	**Feb. 1**	November 1 (prior year)
Month of July	**Mar. 1**	December 1 (prior year)
Month of August	**Apr. 1**	January 1
Month of September	**May 1**	February 1
Month of October	**June 1**	March 1
Month of November	**July 1**	April 1
Month of December	**Aug. 1**	May 1

(1) Pursuant to the ERCOT Nodal Protocols, CNP requires the following information to meet the deadlines shown above. The NOMCR data requirements include, but are not limited to:

- Completed project expected in-service date
- Equipment ratings
- Device nomenclature will be provided by CNP
- Engineering drawings showing the final configuration.
- Construction sequence with expected energization dates for each piece of equipment.
- Identification of SCADA data points
- Additional data as may be determined by ERCOT

(2) Known outage requests shall be submitted by Real Time Operations with the NOMCR's for each expected energization date.

(3) ERCOT only approves energization requests when the Transmission Element is satisfactorily modeled in the ERCOT Network Operations Model.

10. Equipment Maintenance and Testing

10.1. CNP Testing

CNP will perform periodic testing of certain Customer-owned equipment if the equipment is installed for the protection of CNP transmission lines. This includes power line carrier tuning and testing of wave traps, tuners, and carrier sets and calibration and testing of relays and fiber optic communication equipment. CNP will perform testing of SCADA transducers that provide real time data to CNP. CNP may designate additional equipment of the Customer for testing by CNP. CNP will label equipment tested by CNP. The test results for the Customer's equipment tested by CNP will be provided to the Customer upon request.

CNP will endeavor to coordinate CNP testing with the Customer's maintenance outages.

CNP transmission line outages are required for CNP to perform testing of applicable wave traps of the Customer.

Outages of approximately ten hours duration for certain Customer facilities are required for CNP's periodic testing of CNP-owned high voltage metering instrument transformers. Transformer outages are required for metering instrument transformers installed on the high side of transformers. A total separation from CNP's system may be required for certain substation configurations.

10.2. Customer Maintenance and Testing

The Customer shall perform maintenance on all structures and equipment owned by the Customer. The Customer shall perform testing on all equipment owned by the Customer except for equipment designated by CNP for testing by CNP as noted in Section 10.1 (CNP Testing). The Customer shall maintain equipment logs and test reports, which shall be provided to CNP upon request.

Depending upon ownership, equipment maintained and tested by the Customer may include the following: line surge arresters, potential and current transformers, coupling capacitors, coupling capacitor potential devices, switches (including auxiliary contacts and motors if installed), breakers (bushings, mechanism, tanks), transformers (bushings, surge arresters, main tank, load tap changer, alarms), relays not tested by CNP, and DC battery system equipment.

The Customer shall notify the RTO System Scheduler at least ten (10) business days in advance before performing maintenance and testing on potential or current transformers connected to CNP meters.

10.3. Monthly Inspections

The Customer shall perform monthly inspections to include the following as applicable.

- Visual inspection of outdoor equipment including inside control cabinets

- Verify oil levels
- Verify transformer nitrogen blanket pressure
- Verify transformer fan operation
- Verify breaker compressor or hydraulic pump operation
- Drain condensate from breaker mechanism air tanks
- Verify operation of control house heating and air conditioning

10.4. Quarterly, Semi-annual Testing, and Inspection

CNP recommends Total Combustible Gas (TCG) testing once every three months on transformers equipped with a nitrogen blanket.

Infrared thermography of high voltage equipment is recommended once every six months.

10.5. DC Battery System

The Customer shall perform periodic DC battery system equipment inspections and maintenance to include the following as applicable.

Every Month

- Visually inspect batteries (corroded connections, leaks, cracked cases)
- Visually inspect chargers
- Verify and correct water levels
- Record and verify float voltage
- Record and verify ground reference voltage

Every Six Months

- Clean battery surfaces
- Check charger ventilation
- Record and verify cell voltages
- Perform internal cell resistance testing
- Measure inter-cell connection resistance
- Record and verify specific gravity reading
- Verify float and equalize voltage settings
- Verify proper operation of chargers and alarms
- Verify proper operation of high voltage shutdown circuits

10.6. Functional Testing

The Customer shall perform functional trip testing of each high voltage circuit breaker by tripping and closing the breaker from the breaker control switch at least once every year. This breaker tripping may be coordinated with the switching required for maintenance outages.

High voltage circuit breakers equipped with dual trip coils that use a common actuating shaft (e.g., Allis Chalmers, Westinghouse) require special functional testing. The Customer shall perform a test on each breaker by applying trip voltage simultaneously to both trip coils. If the breaker does not immediately trip, the voltage must be quickly removed to avoid damaging the coils. After verifying the wiring, the Customer shall appropriately label the control wiring. The Customer's maintenance procedures shall include tagging and properly

reconnecting trip coil wiring. The Customer shall perform this test whenever a trip coil is replaced, or breaker control wiring is modified.

10.7. Special Inspection and Testing

Industry experience may dictate that certain equipment requires special inspection and testing due to manufacturing defects or unacceptable failure rates and consequences. The Customer shall perform special inspection and testing based on product service advisories issued by manufacturers and advisories issued by CNP.

11. Plant Design Considerations

11.1. Emergency Systems

Continuous electric service from utility power systems cannot be guaranteed even for facilities that are connected to a large number of transmission lines. The possibility exists that a total power outage or separation from the utility system may occur. It is important to consider this when plant emergency systems are designed.

11.2. Automatic Reclosing

CNP utilizes automatic reclosing of high voltage circuit breakers following unplanned tripping of CNP transmission lines. CNP endeavors to intentionally delay the initial reclose attempt by at least one second. The Customer is responsible for the separation of necessary motors or other equipment within one second of the tripping.

11.3. System Voltage

Electric service from a utility power system cannot be guaranteed against fluctuations. Voltage sag is a common fluctuation that occurs during the time of a fault. The large majority of faults on a utility transmission system are single line-to-ground faults. With automatic reclosing of circuit breakers, several voltage sags can occur within a one-minute period. Most voltage sags from faults on transmission systems have a very short duration of less than ten cycles with high-speed fault clearing. Another common fluctuation is a transient voltage oscillation that occurs each time a capacitor bank is energized. Equipment, such as motor contractors, adjustable speed drives, programmable logic controllers, and high intensity discharge lamps, can be sensitive to these short duration voltage sags and transient voltage oscillations.

11.3.2 It is important to consider voltage sag "ride-through" for equipment applied to critical processes where nuisance tripping can cause a whole process to shut down. Plant power systems and equipment control systems can be designed or modified to ride-through the most common voltage sags and transient voltage oscillations on utility power systems. CNP will provide additional information upon request.

11.4. Electrical Protection Coordination Studies

If the Customer performs plant electrical protection coordination studies, the Customer may contact a Transmission Accounts representative to request the available CNP system fault current and system impedance at the Customer's facility.

11.5. Substation Design Specifications

The Customer can contact a Transmission Accounts representative to request current CNP specifications and applicable bills of material for new substations and substation equipment additions and replacement.

REVISION HISTORY

VERSION	DATE	ACTION TAKEN	CHANGE TRACKING
1	10/13/2020	Added section 3.1. Operating Personnel Communications.	Kevin Tanzi
2	10/14/2020	Updated section 3.5 Substation and Equipment Identification	Marcos Garza
3	10/15/2020	Updated Contacts.	Greg DonCarlos