

FACILITY CONNECTION STANDARDS



TRANSMISSION SERVICES DEPARTMENT
APRIL 8, 2004

Preface: All connections to the Kansas City Power & Light (KCPL) electric system, including KCPL self-built facilities, must be in compliance with all applicable KCPL Transmission Standards, Electric Service Standards, SPP Criteria, Planning Standards and Operating Policies of the North American Electric Reliability Council (NERC) or its successor, as administered by the Southwest Power Pool Reliability Council (SPP) or its successor.

The Introduction to Section I.C of the NERC Planning Standards states that:

“All facilities involved in the generation, transmission, and use of electricity must be properly connected to the interconnected transmission systems to avoid degrading the reliability of the electric systems to which they are connected. To avoid adverse impacts on reliability, generation and transmission owners and electricity end-users must meet facility connection and performance requirements as specified by those responsible for the reliability of the interconnected transmission systems.”

This Facility Connection Standard applies to any connection to KCPL electric system regardless of voltage. Additional requirements apply for load additions greater than 2,500 kVA (2.5 MVA). Separate requirements apply to generation. Addition of generation that is not directly connected to KCPL facilities, but has a measurable effect on these facilities shall also be governed by this standard.

Note:

These documents and all attachments are subject to change. The current version of this document will be posted on the KCPL web page at www.kcpl.com for public viewing. It will also be posted on the KCPL OASIS page.

KCPL Delivery Facility Connection Standards

1. General Facility Connection Requirements: These requirements shall apply to all new generation, transmission, and end-use facilities connected to the KCPL electric system. Additionally, these requirements shall apply to all modifications of existing facilities in the categories mentioned above. These shall also apply to co-generation entities that perform changes in their normal operations, which result in a change in the transmission supplier's obligation to serve. All new or modified generation, transmission, or end-use facilities shall comply with all applicable codes, standards, government regulations, environmental regulations, siting requirements, contracts, operating agreements, and tariff requirements related to the facilities identified above. Facility Connection with KCPL's electric transmission and distribution facilities may be permitted provided such connection complies with the procedures and requirements set forth herein:

1.1. Definitions:

1.1.1. Company: Company shall mean Kansas City Power & Light (KCPL).

1.1.2. Owner: Owner shall mean a person or entity responsible for ownership, operation and maintenance of facilities connected with Company.

1.1.3. Facility Connection: Facility Connection shall mean the point where Company and Owner facilities physically meet.

1.1.4. Facility Connection Agreement: Agreement executed between Company and Owner defining the terms and conditions for connected service. For Owners connecting generators larger than 20 Mw and desiring to sell electricity at wholesale, this agreement shall comply with the form and provisions of the SPP Standard Large Generator Interconnection Agreement. For Owners connecting generators 20 Mw or smaller, and desiring to sell electricity at wholesale, the agreement shall comply with the form and provisions of the small generator interconnection agreement as established by the Federal Energy Regulatory Commission (FERC). Owners connecting generators to operate in parallel with Company facilities to supply all or part of Owner's electric load may take service under the "KCPL Parallel Generation Tariff", filed with the Kansas Corporation Commission (KCC).

1.1.5. Facility Connection Procedures: Processes and requirements to be followed by Owner to obtain service from Company. Owners connecting generators larger than 20 Mw and desiring to sell electricity at wholesale, will follow the procedures for generator interconnection set out in the SPP open access transmission tariff. Owners connecting generators 20 Mw or smaller and desiring to sell electricity at wholesale, will follow the procedures for generator interconnection set out in the FERC small generator interconnection procedures. See Appendix D for a flowchart

of the KCPL facility connection process.

1.1.6. Distribution: Distribution shall mean Company facilities less than 60 kV.

1.1.7. Transmission: Transmission shall mean Company facilities 60 kV and higher.

1.1.8. Generating Source: A Generating Source is defined to exist when ANY of the following conditions are met:

- A. Owner's facilities can produce sustained watt or Var flow into Company's facilities at the closed Facility Connection.
- B. Owner's facilities can energize Company's facilities across the Facility Connection at sustained levels of fifty-one (51) volts or more during times when the Company's source is de-energized.
- C. Owner's facilities can energize the Facility Connection with sustained voltage magnitude and frequency quantities, which differ from Company values.
- D. Owner's facilities can contribute fault-current to Company's facilities at the Facility Connection.

Note: Sustained shall mean to be in excess of one (1) second duration.

1.2. All applicable Local, State, and Federal statutes shall govern connection of Owner's facilities with Company's facilities. In addition, Owner's facilities shall be installed in accordance with all provisions set forth in Company's Facility Connection Standard, Company's Electric Service Standard, and the National Electrical Safety Code (ANSIC2), National Electrical Code (NFPA70), Operating Policies of the North American Electric Reliability Council (NERC), Criteria of Regional Reliability Councils (SPP or successor), American National Standards Institute (ANSI), Institute of Electrical and Electronics Engineers (IEEE), or other Regulatory or Governing Body having jurisdiction. Any applicable statute, rule, order, provision, guide, or code of an organization, council, institute, and regulatory or governing body having jurisdiction over such matters shall further govern connection of Owner's facilities with Company's facilities.

1.3. Owner shall be responsible for the cost of all engineering studies, design, modeling data, and installation, required for connection with Company's facilities, unless otherwise provided for in Company's filed tariffs.

1.4. Owner shall be responsible for compliance with all permits, licenses, fees, rules, regulations, standards, agreements, ordinances, inspections, and other requirements imposed by Company or any regulatory or governmental body having jurisdiction. There is no obligation on the part of the Company to connect, or to remain connected whenever Owner's facilities are out of compliance. In addition, Owner shall be responsible for and Company shall require Owner facilities or the connection between Owner's facilities and Company's facilities to be modified in accordance with all applicable statutes, rules, orders, provisions, guides, or codes of an organization,

council, institute, regulatory or governing body having jurisdiction over such matters.

- 1.5.** Because of increased risks and potential hazards inherent with operating Owner's facilities connected with Company's facilities, overall safety for life, quality of service and property is paramount. Company shall disconnect Owner's facilities anytime Owner's facilities pose a dangerous condition, and such disconnection is appropriate to protect safety of Company's employees, customers, general public, or to maintain integrity of the Company's facilities. Owner agrees to comply with KCPL Safety and Hold Procedures in operation of its facilities.
- 1.6.** Owners not connecting generators shall provide Company a minimum, unless otherwise agreed to by the Company, of one hundred and twenty (120) days written notice of its intent to connect facilities with the Company's distribution system (below 60kV). Connections to Company's transmission system (above 60kV) shall require longer notice periods; 69kV, 12 months; 161kV, 18 months; 345kV, 24 months. Owners connecting generators must follow the time requirements set forth in the appropriate Facility Connection Procedures document. Failure to give such notice shall render Owner liable for all damages to Company property, other customers' property, and injury to persons, or any other damages resulting from unauthorized connection. Notice of intent shall include such information as:
 - 1.6.1.** Location
 - 1.6.2.** Connected kVA
 - 1.6.3.** Average and Peak Watt Demand
 - 1.6.4.** Reactive Power Requirements
 - 1.6.5.** Connected Generation & Type: (synchronous, induction, converter)
 - 1.6.6.** Large Motors including Type (synchronous, induction, VFD)
 - 1.6.7.** Fault Current Limits
 - 1.6.8.** Power Quality Requirements
 - 1.6.9.** Reliability Requirements
 - 1.6.10.** One-line diagram of proposed connection to Company facilities
 - 1.6.11.** Other Requirements

Owners desiring to connect generators and make electricity sales at wholesale must contact the Southwest Power Pool (SPP) at:

Manager of Engineering
 Southwest Power Pool, Inc.
 415 N. McKinley, Suite 800
 Little Rock, AR 72205

phone: 501-614-3293

All other Owners should use the application form found in Appendix C. Requests to install Facility Connection shall be submitted to:

Connection at 60 kV or below:

Kansas City Power & Light
 Manager, Distribution Engineering
 P.O. Box 418679
 Kansas City, MO 64141-9679

Connection above 60 kV:

Kansas City Power & Light
 Manager, Transmission & Substations
 P.O. Box 418679
 Kansas City, MO 64141-9679

- 1.7.** Except for connection of wholesale generation, within thirty (30) days of submitting a written request to connect facilities, but not less than ninety (90) days prior to facility connection, the Company shall submit to Owner preliminary general equipment requirements such as breaker(s), switches, supervisory control and data acquisition (SCADA), and existing Company facility protection scheme, required for Owner to proceed with Facility Connection design. In addition, Company shall notify owner of costs to evaluate the proposed Facility Connection. Wholesale generation connections will be governed by the appropriate Facility Connection Procedures document.
- 1.8.** Except for connection of wholesale generation, within sixty (60) days of receipt of a complete copy of Owner’s detailed engineering studies, design specifications, proposed protective relaying schemes, and payment of costs for evaluation, Company shall review, perform analysis, and notify Owner of approval and/or conditions for acceptance. Should Company be unable to evaluate Owner’s request to connect as submitted, Company shall provide Owner a written explanation of information required to complete the evaluation. Wholesale generation connections will be governed by the appropriate Facility Connection Procedures document.
- 1.9.** Only written notice shall constitute acceptance by Company. Written approval by Company does not waive any requirements pertaining to Owner’s installation, which may be governed directly by other jurisdictional bodies. Company’s specifications and requirements are designed towards protecting the safety of life, quality of service and the Company’s property, and do not assume nor ensure proper protection of Owner’s facilities equipment during electrical faults.
- 1.10.** When Company is required to incur expenses necessary to make extensions or improvements of its lines or additions to its disconnecting devices, transformers, meters, breakers, relays, controls, data systems, or to make any other equipment modifications relating to its circuits, substations, or apparatus necessary to connect Owner’s facilities, and such expenses made, are attributable to Owner’s application, then all costs incurred by the Company for Facility Connection shall be borne by Owner as set forth in the connection agreement, except as otherwise provided for in Company’s filed tariffs. Such costs are due and payable prior to Company commencing construction, and are

non-refundable in whole or in part at anytime. Cost responsibility for wholesale generation connections will be governed by the appropriate Facility Connection Agreement document.

- 1.11.** Owner and Company shall execute the appropriate Facility Connection Agreement for connected service prior to installation of any equipment, unless Company waves the requirement for such agreement. Energy supplied to Company, as well as energy used by Owner, shall be compensated in accordance with applicable tariffs, rules, and regulations currently on file with the regulatory body having jurisdiction, or which may be filed and approved by the regulatory body having jurisdiction.
- 1.12.** Company may require Owner's facility design to include an appropriate automatic disconnecting device to be controlled by any or all of the following: overcurrent relays, automatic synchronizing relays, voltage relays, frequency relays, ground fault detection relays, or any other automatic relaying equipment necessary to ensure proper protection and safety of Company employees customers, equipment, and overall system integrity. The Company reserves the right to review, inspect, and approve Owner's design and shall not give approval to connect until any concerns relating to Owner's design have been remedied. Refer to Appendix A, "Relay Standard for Connected Generating Facilities", and Appendix B, "Relay Standard for Connected Load Facilities" for assistance in fulfilling the requirements of this paragraph.
- 1.13.** Company shall procure, install, and maintain all metering equipment required to measure energy exchanged between Owner and Company across the Facility Connection, unless otherwise agreed to by Company. Energy shall normally be measured at delivery voltage, however, Company reserves the right to locate its metering at a place other than the point of connection and adjust for losses as appropriate.

2. Distribution Facility Connection Requirements

- 2.1.** Company's distribution facilities operate at voltage levels of less than 60 kV. These facilities require stringent standards of security, reliability, quality, and controllability of the electrical facility.

2.1.1. Distribution Facilities - General Requirements

- A. Owner's facility design shall conform to the grounding practices of the Company.
- B. Electrical metering shall be installed and maintained using devices specified by the Company, unless otherwise agreed to by Company. Such equipment shall be proven operational before electrical operation begins.
- C. Maintenance of Facility Connection shall be coordinated with the Company. KCPL Safety and Hold Procedures will be observed in coordination of Facility

Connection maintenance.

- D. Supervisory Control and Data Acquisition (SCADA) may be required for Facility Connection.
- E. Residential and commercial customers wishing to obtain electric service from KCPL should consult KCPL's Electric Service Standards, which are posted on the KCPL's web page at www.kcpl.com.

2.1.2. Distribution Facilities - 2.4 kV through 25 kV Requirements

- A. Fuses or circuit breakers with protective relays may be required at Facility Connection. Such line-sectionalizing devices may be required to be remotely controllable.
- B. Structures at Facility Connection may be required to be of steel construction.
- C. Sectionalizing devices shall require load breaking and fault interrupting capability.
- D. Protective relay schemes of Owner shall be integrated to operate with protective relay schemes of Company facilities.
- E. Control power may be required to be from a DC supply.

2.1.3. Distribution Facilities - 34.5 kV

- A. All requirements for lower-voltage Facility Connection shall apply. In addition, the following requirements shall apply:
- B. All switching shall be done with three phase devices.
- C. Multiple remote-controllable line-sectionalizing switches or circuit breakers with protective relays may be required at the Facility Connection.
- D. Owners connecting generators will be required to install a Company specified remote terminal unit (RTU) for supervisory control and data acquisition.

3. Transmission Facilities Connection Requirements

- 3.1.** Company's electrical facilities include transmission lines operating at voltage levels of 60 kV and higher. Higher voltage levels require stringent standards of security, reliability, quality, and controllability of the electrical facilities.

3.1.1. Transmission Facilities - General Requirements

- A. Any electrical structure or equipment utilized for high-voltage service shall be connected to an earth-ground grid that measures no more than 1.0-ohm resistance to earth. Ground grid will meet or exceed IEEE standard 80 as it relates to both step and touch potential. Such value shall be measured with

equipment and techniques approved by the Company. The connectors and components of the grounding grid shall be adequate for the anticipated fault current magnitude and duration.

- B. Supervisory remote control and electrical metering shall be provided using devices and communications paths specified by the Company. Such equipment shall be proven operational before electrical operation begins.
- C. Maintenance at the Facility Connection shall be coordinated with the Company. KCPL Safety and Hold Procedures will be observed in coordination of Facility Connection maintenance.
- D. Company shall determine the acceptable minimum aggregate power factor at Facility Connection. Appropriate billings, payments, or adjustments to compensate Company shall be specified in the Facility Connection agreement.

3.1.2. Transmission Facilities - 60 kV through 138 kV Requirements

- A. Multiple line-sectionalizing switches or circuit breakers with protective relays may be required at Facility Connection. Company may require the ability to remotely control these devices by Company SCADA.
- B. Transformers capable of serving load 7500 kVA or greater shall be controlled by a primary circuit-switcher or circuit breaker with appropriate protective relaying.
- C. Structures at the Facility Connection may be required to be of steel construction.
- D. Sectionalizing devices require load breaking and/or fault interrupting capability.
- E. Protective relay schemes of Owner shall be integrated to operate with protective relay schemes on Company facilities.
- F. Protective relaying shall include both primary and backup schemes.

3.1.3. Transmission Facilities - 161 kV and Higher Requirements

- A. All requirements for lower-voltage transmission facilities shall apply. In addition, the following requirements shall apply:
- B. Substation design shall be ring-bus or breaker-and-a-half configuration, unless otherwise agreed to by Company.
- C. Control power shall be supplied from redundant DC supply systems.
- D. Protective relaying shall include dual primary schemes.

4. Generating Source(s) Facility Connection Requirements

4.1. General Requirements

- 4.1.1. Generating Source(s) 25 kVA and larger shall be three (3) phase to qualify for Facility Connection with Company's facilities.
- 4.1.2. Generating Source(s) shall not supply sustained fault current to Company facilities.
- 4.1.3. Generating Source(s) shall not close or reclose automatically onto a de-energized Company Facility Connection.
- 4.1.4. Disconnecting equipment shall have a visible break between Owner and Company facilities for connections 600 volts and above.
- 4.1.5. Owner Standby or Emergency Generating Sources will require no special relaying or metering when installation is designed to prevent "hot transfer of Owner's load" going "on" or "off" from the Standby source to the Company's facilities, provided all requirements can be handled with control circuit interlocks.
- 4.1.6. Supervisory Control and Data Acquisition (SCADA) shall be required by Company to connect Generating Source(s) to Company facilities, unless waived by Company.
- 4.1.7. Neither Company nor Owner facilities shall cause excessive voltage flicker nor introduce excessive distortion to the sinusoidal voltage or current waves as defined by ANSI Standard C84.1-1989, in accordance with IEEE Standard 519, or any applicable superseding electric industry standard. In the event of a conflict between ANSI Standard C84.1-1989, and any applicable superseding electric industry standard, ANSI Standard C84.1-1989, or the applicable superseding electric industry standard, shall control.
- 4.1.8. The appropriate Facility Connection Procedure and Facility Connection Agreement will govern Owners connecting wholesale generation as approved by the Federal Energy Regulatory Commission (FERC).

4.2. Generating Source Types

- 4.2.1. **Synchronous Generating Source(s)** - Synchronous Generating Source(s) shall meet the General Requirements of 4.1 above and shall utilize three-phase circuit breakers which meet or exceed the following requirements:

- A. Rated for 2.0 per unit or greater voltage across open contacts.
- B. Interrupt all current levels up to the maximum available fault currents between Owner's Generating Source(s) and Company's facilities.
- C. Open for frequency and voltage deviations specified by Company.
- D. Utilize synchronism check within +/- 10 degrees and +/- 5 percent of nominal voltage on each side of the breaker prior to closing the breaker between Company and Owner's facilities.
- E. Provide ground fault detection and tripping for breaker anytime an ungrounded circuit configuration exists as the result of opening the Company's source to the Facility Connection.
- F. Continuously monitor breaker control power source.

4.2.2. Induction Generating Source(s) - Induction Generating Source(s) shall meet the General Requirements of 4.1 above and shall utilize three-phase circuit breakers which meet or exceed the following requirements:

- A. Company shall specify frequency and voltage deviations to Owner for which circuit breaker shall open.
- B. Breaker control power source shall be continuously monitored.

4.2.3. Converter Generating Source(s) - Converter Generating Source(s) shall meet the General Requirements of 4.1 above and shall meet the following requirement:

- A. Converter Generating Source(s) shall cease operation for frequency and voltage deviations specified by Company.

4.3. Generating Source(s) Facility Connections - Transmission

- 4.3.1.** Generating Source(s) shall be operated and maintained in accordance with the provisions of the interconnection agreement between Company and Owner.
- 4.3.2.** Generating Source(s) shall operate with excitation systems in automatic voltage-control mode and speed governors in automatic control mode.
- 4.3.3.** Generating Source(s) shall maintain reactive power output as required by the Company within the demonstrated reactive capability of the unit.
- 4.3.4.** Generating Source(s) shall be capable of operation at over-excitation power factor of 0.95 and under-excitation power factor of 0.95 at all rated continuous power output levels as measured at the generator terminals.

- 4.3.5. In addition to the protection described in 1.12, Generating Source(s) shall have reverse power, loss of field, differential generator current, differential transformer current, negative sequence current, and inadvertent energization of the generator protection schemes.
- 4.3.6. For installations where Company provides generator step-up transformers (GSU), overexcitation protection will be required to prevent transformer damage during generator start up.
- 4.3.7. Out-of-step relaying protection will be required for generators where interconnection studies indicate potential for stability problems.

4.4. Generating Source(s) Facility Connections – Distribution

- 4.4.1. Owner shall protect Generating Source(s) from the effects of automatic reclosing of Company facilities.
- 4.4.2. Aggregate installed generation on a radial distribution circuit shall not exceed 15% of its annual peak load, nor shall it exceed 15% of a line section's rated design capacity, unless otherwise approved by Company.
- 4.4.3. Where network protectors (in lieu of circuit breakers) are utilized by Company, Owner shall not produce power onto Company's system.

4.5. Transitional Switching of Generating Source(s)

- 4.5.1. Owner may be permitted to utilize approved methods of transitional switching for the purpose of making a synchronized transfer of Owner's load between Owner's Generating Source(s) and Company's facilities. Such transitional switching shall require automatic synchronizing equipment and high speed switching devices specifically designed to synchronize Owner's Generating Source(s) to the Company for the sole purpose of "hot" transferring the Owner's load "On" or "Off the Company's facilities.
- 4.5.2. All Owner requests for transitional switching shall be approved by Company and accomplished in such a manner as not to exceed one (1) second as the maximum time Owner's Generating Source(s) operates in parallel with Company's facilities.
- 4.5.3. Owner shall be responsible for all costs associated with transitional switching.

5. Commissioning of the Facility Connection

- 5.1. Company may measure and document the harmonics present at the Facility Connection

before and after such connection is made.

- 5.2. Company reserves the right, but does not assume the duty, to inspect, test, or check Owner's equipment in any way deemed appropriate to confirm operation and verify system protection characteristics. Company does not assume any responsibility in connection with such Owner's equipment or the inspection thereof.
- 5.3. Company or its designated agent shall verify metering equipment.

6. Operating Requirements:

- 6.1. Owner agrees to operate in accordance with all applicable NERC Operating Policies.
- 6.2. Owner agrees to abide by KCPL Safety and Hold Procedures for coordination of Facility Connection maintenance.
- 6.3. Owner agrees to promptly respond to Company requests during abnormal conditions, except as where otherwise defined in the Facility Connection Agreement.
- 6.4. Owner shall ensure competent personnel are available to operate, maintain, and repair connected generating equipment at all times when such equipment operates in parallel with Company's facilities.
- 6.5. Company may require connected generating sources to have both normal and emergency paths for supervisory control, metering, or voice communications systems.
- 6.6. The Company may require automatic underfrequency load shedding. Load serving providers shall be required to provide the Company with a documented manual load shed plan.
- 6.7. Owner shall provide all available operating data upon request.

APPENDIX A

Relay Standards for Connected Generating Facilities

A1.0 NERC Planning Standards, Sec. 1. C:

“All facilities involved in the generation, transmission and use of electricity must be properly connected to the interconnected transmission systems to avoid degrading the reliability of the electric systems to which they are connected.”

A2.0 Requirements for generating facilities defined under KCPL Facility Connection Standards:

A2.1 “Owner’s facility design shall include an appropriate automatic disconnecting device to be controlled by any or all of the following: overcurrent relays, automatic synchronizing relays, voltage relays, frequency relays, ground fault detection relays, or any other automatic relaying equipment necessary to ensure proper protection and safety of Company employees, customers, equipment, and overall system integrity.”

A2.2 “Protective relay schemes of Owner shall be integrated to operate with protective relay schemes of Company facilities. Generating Sources shall:

A2.2.1 not supply sustained fault current to Company facilities.”

A2.2.2 open for frequency and voltage deviations specified by Company.”

A2.2.3 utilize synchronism check within +/- 10 degrees and voltage limits of +/-5 percent of nominal on each side of the disconnecting device prior to connecting Owner’s and Company’s facilities.”

A2.2.4 provide ground fault detection and tripping for disconnecting device whenever an ungrounded circuit configuration exists as the result of opening the Company’s source to the Interconnection.”

A2.2.5 continuously monitor disconnecting device control-power source.”

A2.2.6 not reclose automatically.”

A2.2.7 accept transferred-tripping initiated from Company facilities”

A2.2.8 be capable of transferring data to and from Company SCADA system.

A3.0 Outline of generating facility protective-relay features:

A3.1 Protective relay features shall include:

A3.1.1 alternate modes of operation for generating and non-generating conditions. Voltage, frequency, synchronism and backfeed requirements may differ between modes.

A3.1.2 tripping for all faults on Company source while in generating mode. This protects Company equipment from inadvertent energization and non-synchronous reclosure, and other Company customers from unpredictable electrical quality.

A3.1.3 acceptance of direct-trip signal from Company source while in generating mode.

A3.1.4 closure of the interconnecting device through direct or indirect supervision of the protective relay for all modes of operation. This assures that the interconnection will be protected by a viable relay before closure.

A3.1.5 closure of the interconnecting device through permissive synchronism-checking supervision of the protective relay. Hot-source / dead-bus supervision should be utilized in the non-generating mode.

A3.1.6 waveform and event-capture of all opening and closing events.

A3.1.7 remote terminal unit (RTU) digital communication compatibility with Company SCADA system. This is presently CDC, Type 1. Relays will use DNP protocol to communicate with substation RTU.

A3.1.8 alarm capability to Company dispatch for DC- or relay failure.

A3.1.9 real-time telemetry capability of interconnection watt and var flows when generating.

A3.1.10 protection scheme should conform to one of the schemes shown in the attached figures 1 through 7.

A4.0 Required generic protective-relay functions:

A4.1 Inputs:

- ◇3-phase AC potentials and currents
- ◇Close command
- ◇Trip command
- ◇Transferred-trip command
- ◇Synchronism-check permissive
- ◇Alternate-settings mode
- ◇Breaker trip-coil monitor
- ◇Breaker-indication contact

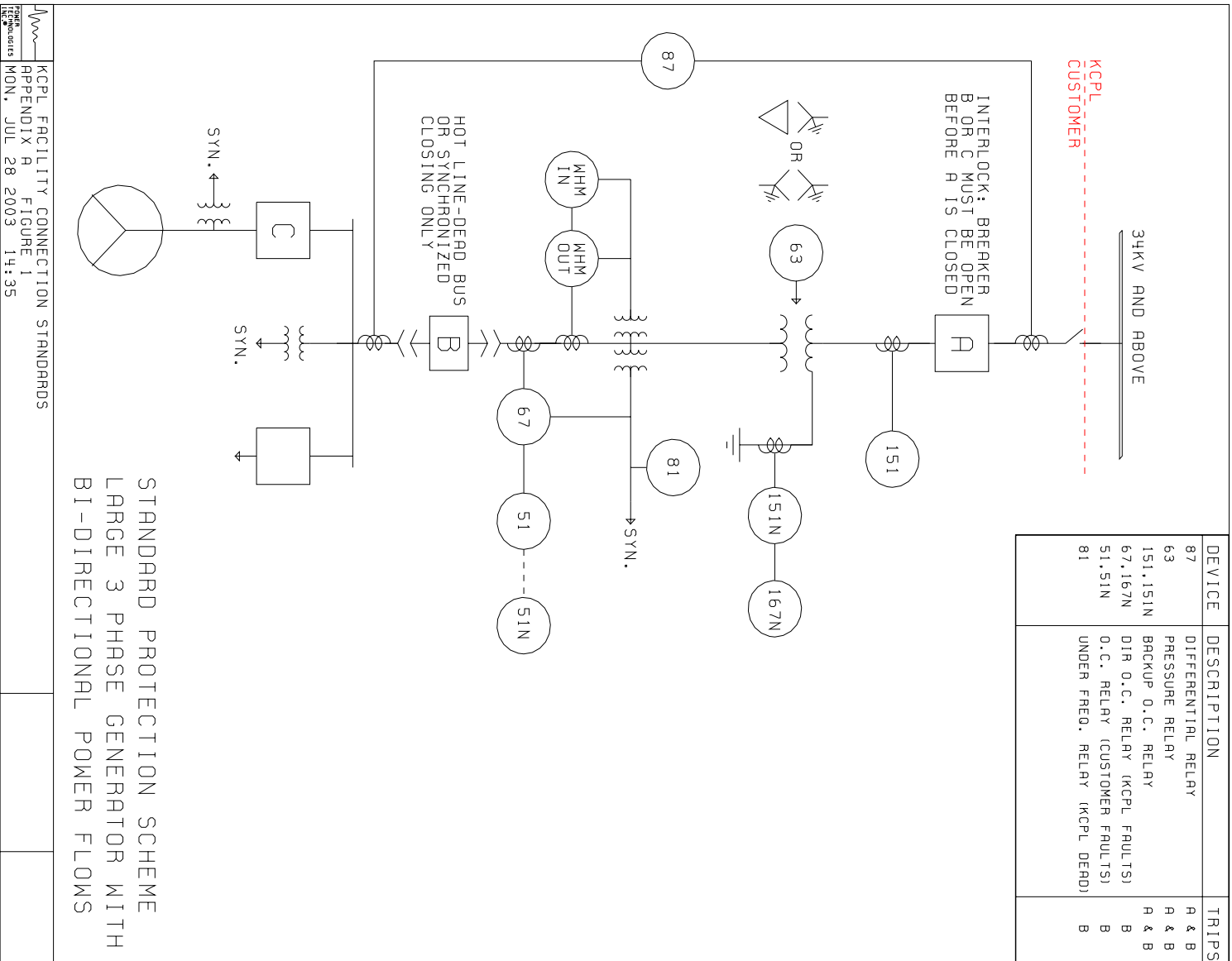
A4.2 Algorithms:

- ◇Breaker state
- ◇Nondirectional overcurrent trip
- ◇Directional overcurrent trip
- ◇Negative-sequence overcurrent trip
- ◇3-phase over- and under-voltage trip
- ◇3-phase over- and under-frequency trip
- ◇Breaker failure-to-trip alternative protection scheme
- ◇Breaker trip-circuit “open” alarm
- ◇Malfunctioning or inoperative protective-relay alarm
- ◇Loss of control power alarm
- ◇Synchronism-check of breaker “close” command

- <>Event-capture of each breaker operation
- <>Waveform-capture of each breaker operation
- <>DNP communication protocol with RTU

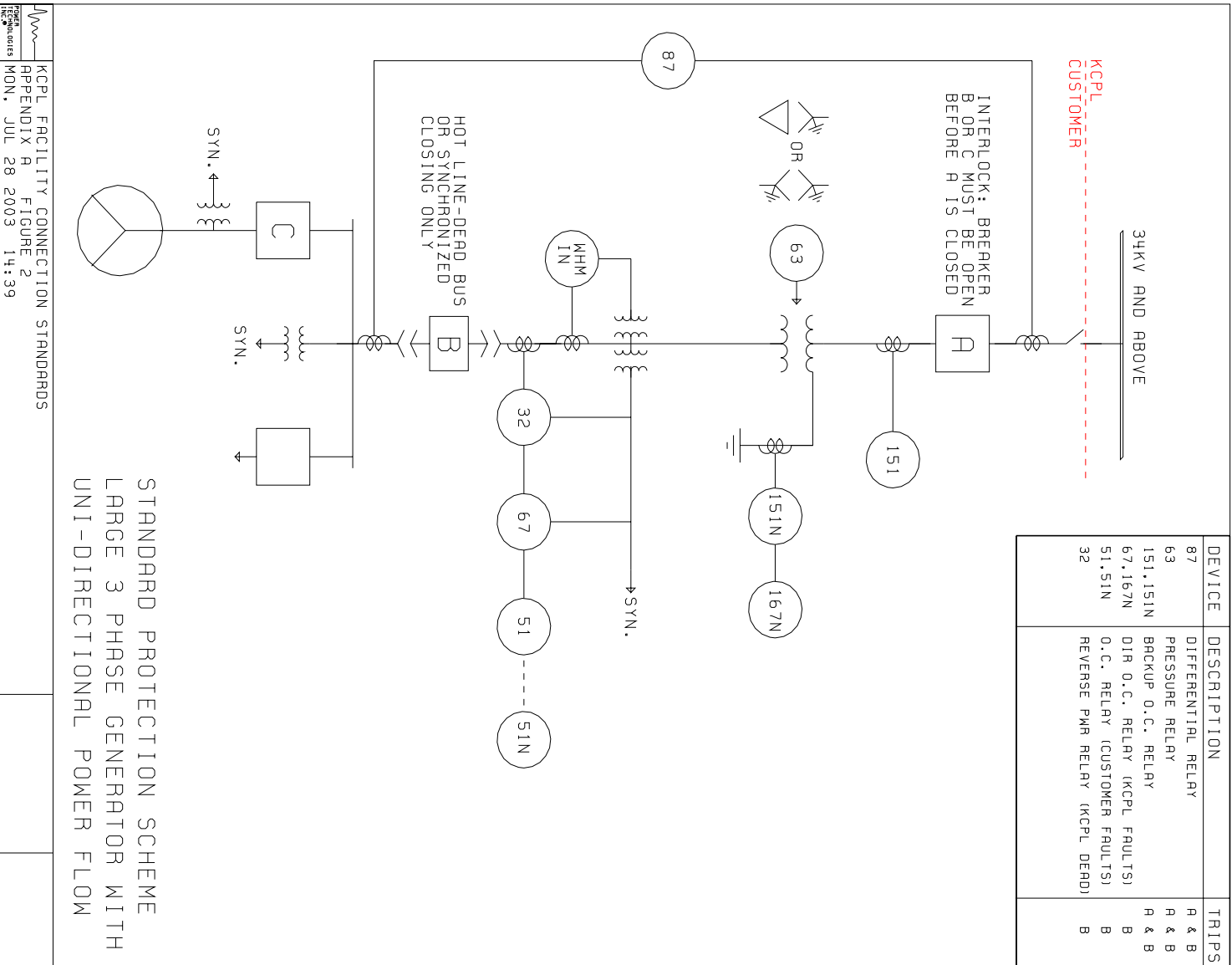
A4.3 Outputs:

- <>TRIP command
- <>CLOSE command or synchronism-check permissive
- <>LOCKOUT command for failure-to-trip or malfunction
- <>Alarms defined in section A4.2
- <>Metering values for voltage and frequency
- <>RS-232 or RS-485 communications port



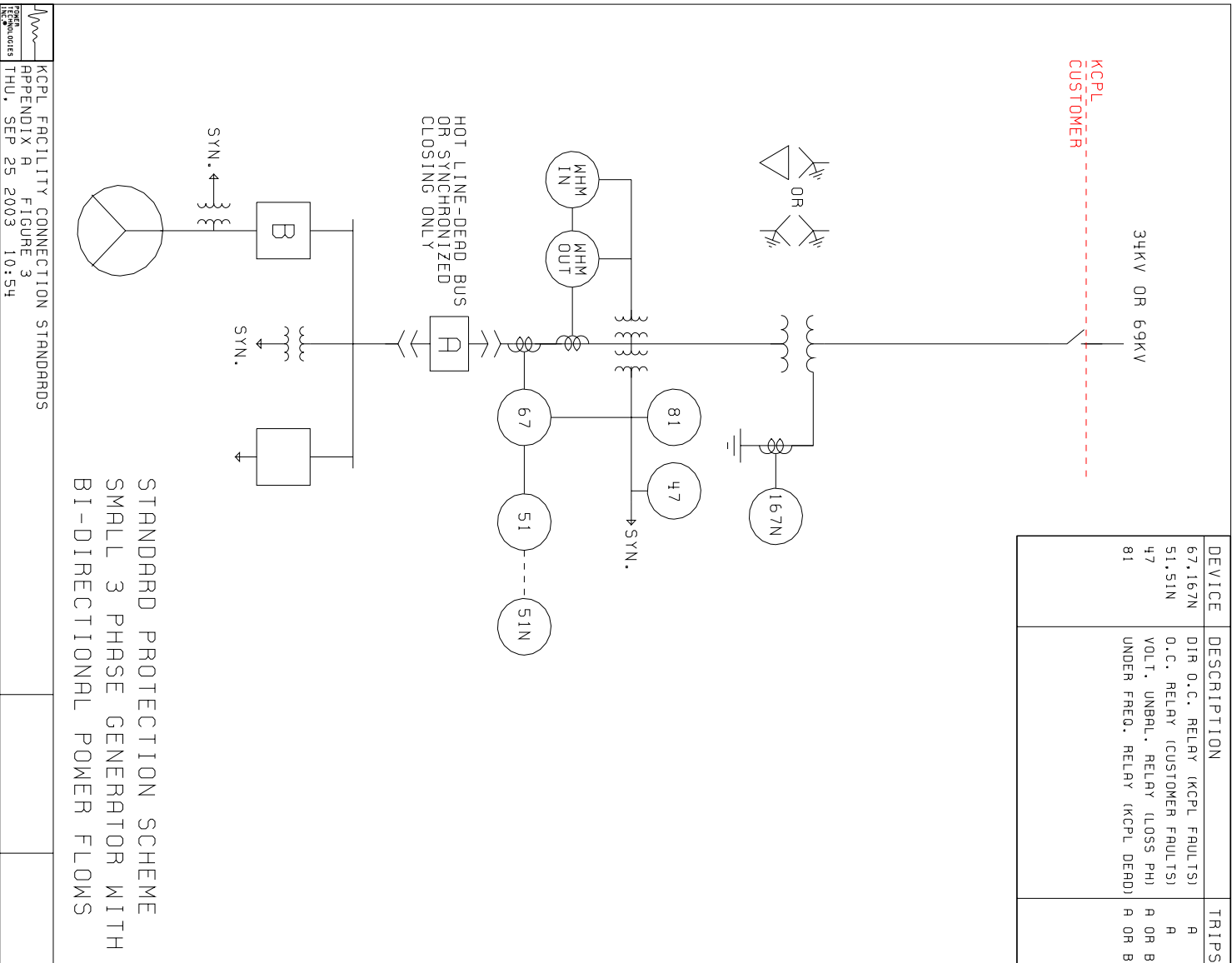
KCPL FACILITY CONNECTION STANDARDS
 APPENDIX A FIGURE 1
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STANDARD PROTECTION SCHEME
 LARGE 3 PHASE GENERATOR WITH
 BI-DIRECTIONAL POWER FLOWS



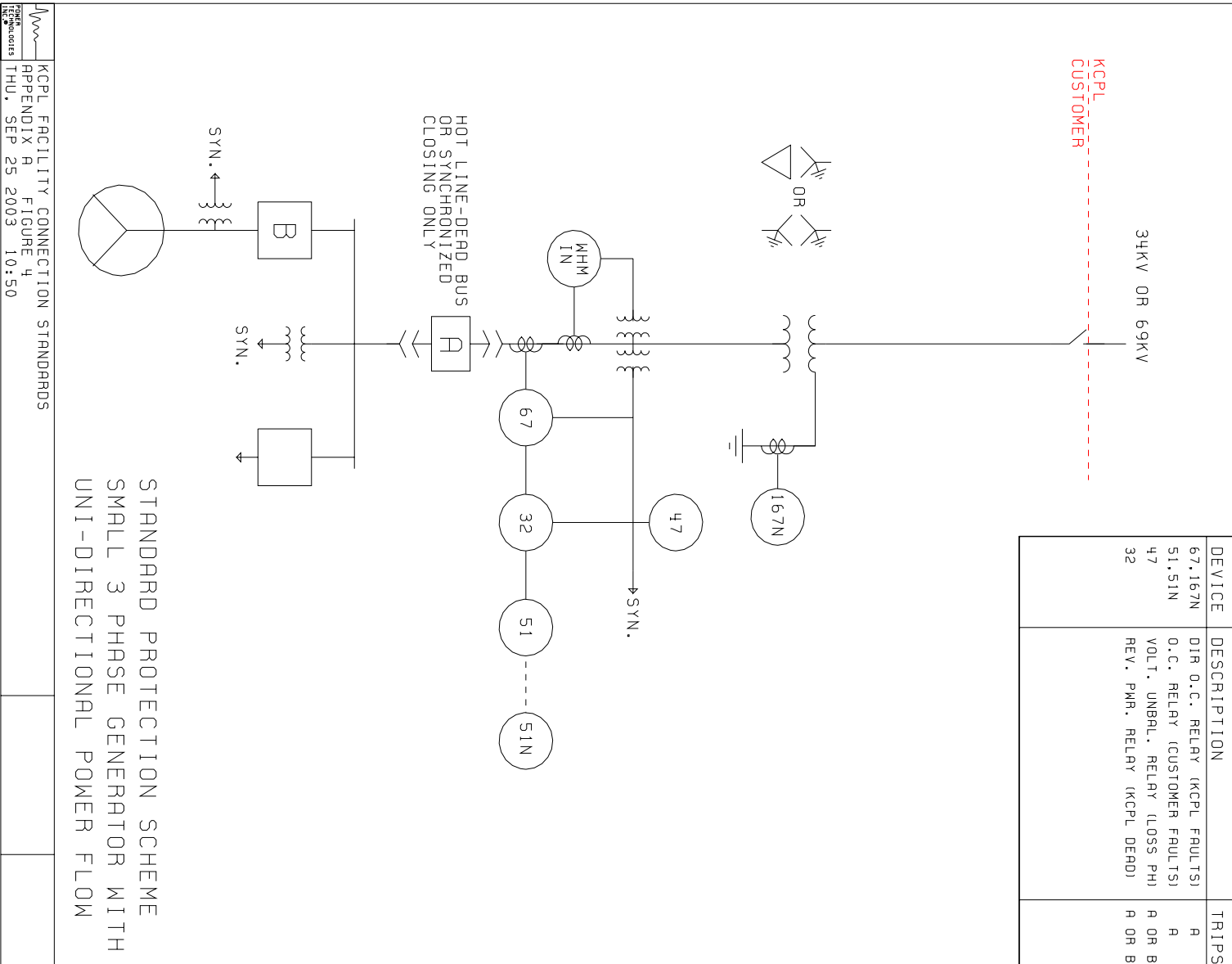
KCPL FACILITY CONNECTION STANDARDS
 APPENDIX A FIGURE 2
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STANDARD PROTECTION SCHEME
 LARGE 3 PHASE GENERATOR WITH
 UNI-DIRECTIONAL POWER FLOW



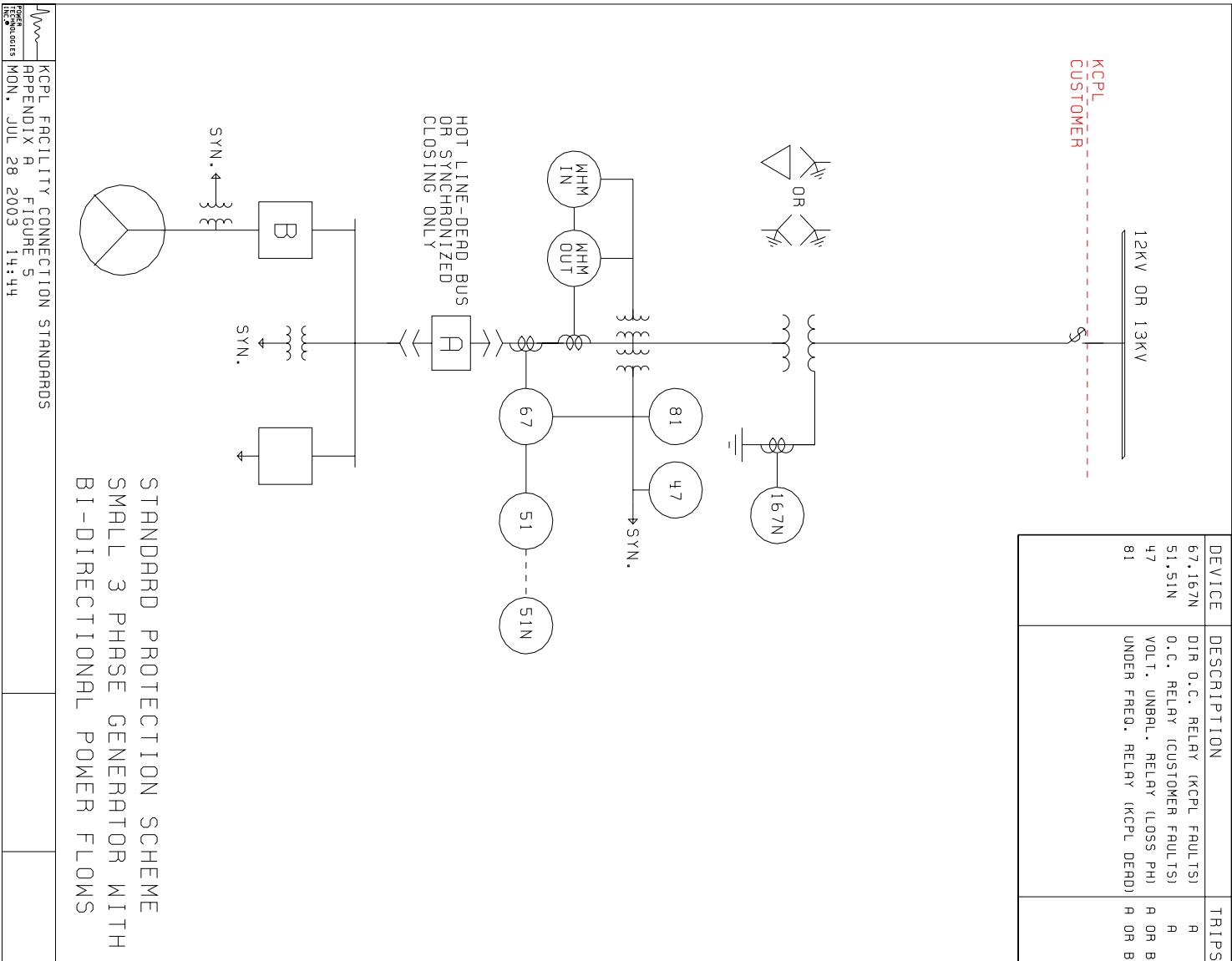
KCPL FACILITY CONNECTION STANDARDS
 APPENDIX A FIGURE 3
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STANDARD PROTECTION SCHEME
 SMALL 3 PHASE GENERATOR WITH
 BI-DIRECTIONAL POWER FLOWS

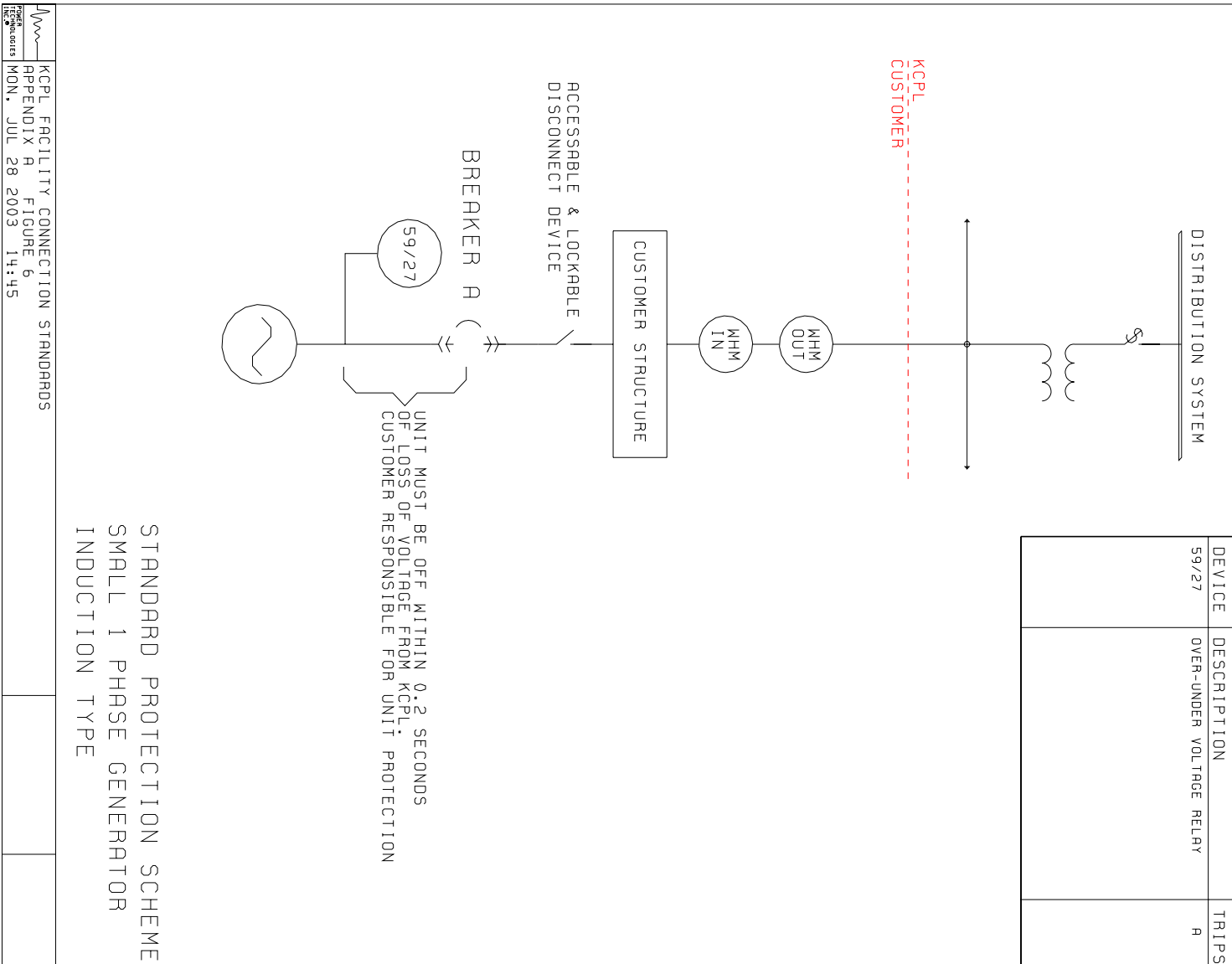


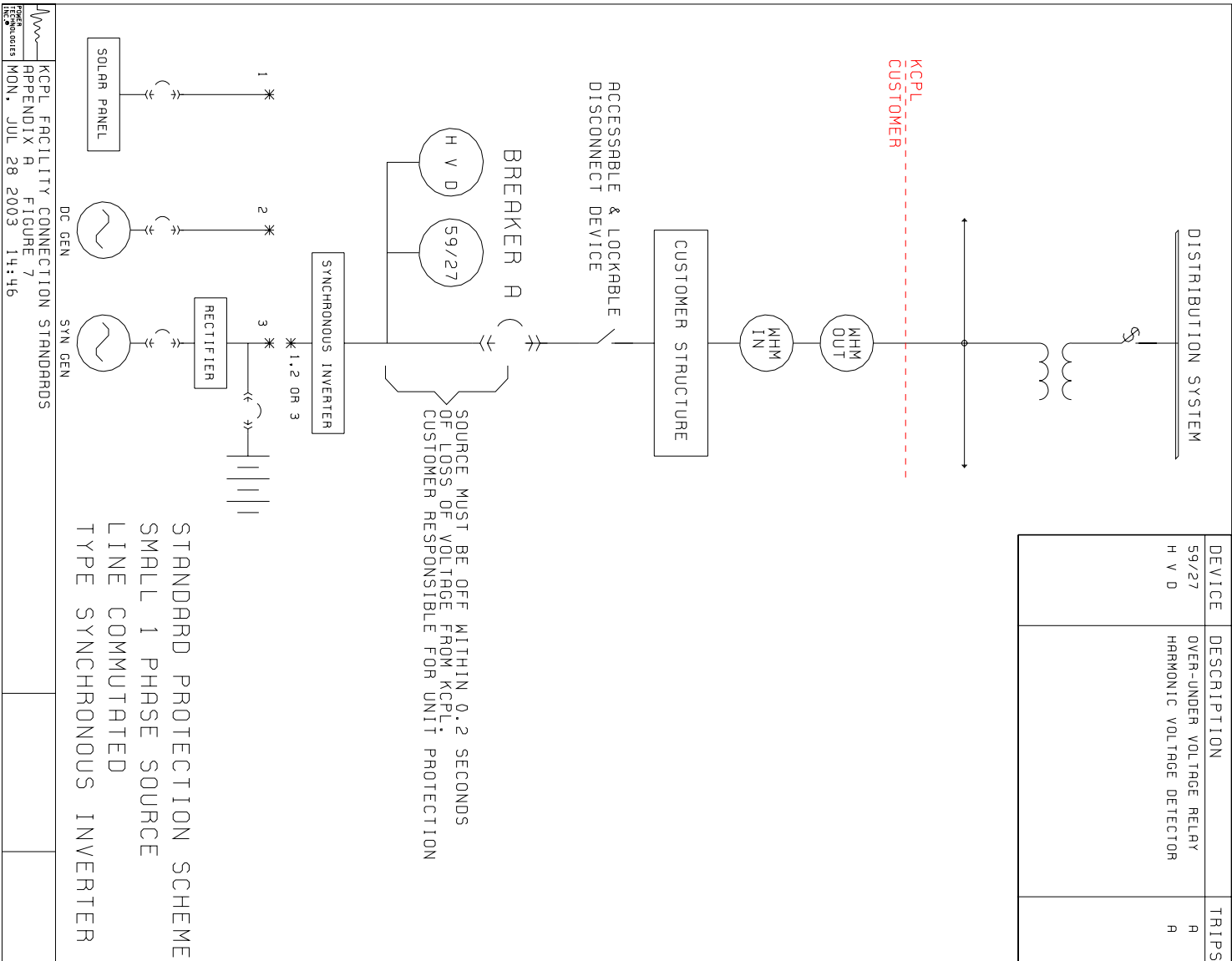
KCPL FACILITY CONNECTION STANDARDS
 APPENDIX H FIGURE 4
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STANDARD PROTECTION SCHEME
 SMALL 3 PHASE GENERATOR WITH
 UNI-DIRECTIONAL POWER FLOW



KCPL FACILITY CONNECTION STANDARDS
APPENDIX A FIGURE 5
MON. JUL 28 2003 14:44





APPENDIX B

Relay Standards for Connected Load Facilities

B1.0 NERC Planning Standards, Sec. I.C:

“All facilities involved in the generation, transmission and use of electricity must be properly interconnected to the transmission systems to avoid degrading the reliability of the electric systems to which they are connected.”

B2.0 Requirements for facilities defined under KCPL Connection Standards:

B2.1 “Protective relay schemes of Owner shall be integrated to operate with protective relay schemes of Company facilities.”

B2.2 Owner equipment shall be capable of transferring data to and from Company SCADA system.

B2.3 Residential and commercial customers wishing to take electric service from KCPL should consult KCPL’s Electric Service Standards document, posted on KCPL’s web page at www.kcpl.com.

B3.0 Outline of connection protective-device features:

B3.1 Connection with Company electrical system shall be appropriate for the requirements of the electrical-system protective schemes. Such connection may utilize fuses, circuit-switchers or circuit-breakers with appropriate control schemes.

B3.2 Fuse ratings shall be in accordance with Company standards.

B3.3 Protective-relay response shall not exceed transformer-damage specifications.

B3.4 Protective relay characteristics shall coordinate with Company schemes.

B3.5 RTU digital communication protocol shall be compatible with Company SCADA system. This is presently CDC, Type 1.

B4.0 Required generic protective relay functions:

B4.1 Inputs:

- ◇3-phase AC potentials and currents
- ◇Close command
- ◇Trip command
- ◇Breaker trip-coil monitor
- ◇Breaker-indication contact

- B4.2 Algorithms:**
- ◇ Breaker state
 - ◇ Nondirectional overcurrent trip
 - ◇ Breaker failure-to-trip
 - ◇ Breaker trip-circuit “open” alarm
 - ◇ Malfunctioning or inoperative protective-relay alarm
 - ◇ Loss of control power alarm
 - ◇ Event-capture of each breaker operation
 - ◇ DNP communication protocol with RTU

- B4.3 Outputs:**
- ◇ TRIP command
 - ◇ CLOSE command or synchronism-check permissive
 - ◇ LOCKOUT command for failure-to-trip or malfunction
 - ◇ Alarms defined in section B4.2
 - ◇ RS-232 or RS-485 communications port

APPENDIX C
ELECTRIC OPERATIONS
FACILITY CONNECTION STANDARDS APPLICATION

Preface: This Facility Connection Standard applies to any connection to the KCPL electric system regardless of voltage. Additional requirements apply for load additions greater than 2,500 kVA (2.5 MVA).

Owner shall provide Company a minimum, unless otherwise agreed to by the Company, of one hundred and twenty (120) days written notice of its intent to connect facilities with the Company’s distribution system (<60 kV). Connection at transmission voltages (>60 kV) shall require longer notice periods as noted in section 1.6. Failure to give such notice shall render Owner liable for all damages to Company property, other customers’ property, and injury to persons, or any other damages resulting from unauthorized connection. Notice of intent shall include the following information:

Location _____

Connected kVA _____

Average and Peak Watt Demand _____

Reactive Power Requirements _____

Connected Generation & Type
(synchronous, induction, converter). _____

Large Motors Including Type
(synchronous, induction, converter). _____

Fault Current Limits _____

Power Quality Requirements _____

Reliability Requirements _____

Other Requirements _____

Owner’s name & phone # _____

Requests to install Facility Connection shall be submitted to:

Connection at 60 kV or below;

Kansas City Power & Light
 Manager, Distribution Engineering
 P.O. Box 418679
 Kansas City, MO 64141-9679

Connection above 60 kV;

Kansas City Power & Light
 Manager, Transmission & Substations
 P.O. Box 418679
 Kansas City, MO 64141-9679

APPENDIX D

KCPL FACILITY CONNECTION PROCESS

