

THE STATE CORPORATION COMMISSION OF KANSAS

Index No. 328

MIDWEST ENERGY, INC.

SCHEDULE DRIT

(Name of Issuing Utility)

Replacing Schedule Initial Sheet

Company Wide

(Territory to which schedule is applicable)

which was filed

No supplement or separate understanding shall modify the tariff as shown hereon.

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4.0 Interconnection Requirements

4.1 General Design Considerations

Interconnecting Customer shall design and construct the facility in accordance with the applicable manufacturer's recommendations and in compliance with all aspects of the Company's Interconnection Tariff. Interconnecting Customer agrees to cause facility to be constructed in accordance with applicable specifications that meet or exceed those provided under this section of the Interconnection Tariff.

a. Transient Voltage Conditions

Because of unusual events in the Company's EDS, there will be transient voltage fluctuations, which will result in voltages exceeding the limits of the stated ranges. These transient voltage fluctuations, which generally last only a few milliseconds, arise due to EDS disturbances including, but not limited to, lightning strikes, clearing of faults, and other switching operations. The magnitude of transient voltage fluctuations varies with EDS configuration, grounding methods utilized, local short circuit availability, and other parameters, which vary from point-to-point and from time-to-time on the Company's EDS.

The fluctuations may result in voltages exceeding the limits of the stated ranges and occur because of EDS disturbance, clearing of faults and other switching operations. These unavoidable transients are generally of too short duration and insufficient magnitude to have any adverse effects on general service applications. They may, however, cause malfunctions in equipment highly sensitive to voltage changes, and protective devices may operate to shut down such devices. The magnitude, duration and frequency of transient fluctuations will vary due to EDS configuration and/or circuit arrangement. In addition, disturbances of indeterminate magnitude and duration may occur on infrequent occasions due to short circuits, faults, and other unpredictable conditions. Transient voltages should be evaluated in the design of the facility.

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b. Noise and Harmonics

The introduction of abnormal noise/harmonics can cause abnormal neutral current flow, and excessive heating of electrical equipment. Harmonics may also cause distortion in television pictures, telephone interference, and malfunctions in digital equipment such as computers. The permissible level of harmonics is dependent upon the voltage level and short circuit ratio at a given location. IEEE Standard 519 provides these levels at the PCC. In requiring adherence to IEEE 519 the Company is in no way making a recommendation regarding the level of harmonics that a given piece of equipment can tolerate nor is it making a recommendation as to the permissible level in the Interconnecting Customer's facility.

c. Frequency

The interconnected electric power system in North America, which is maintained at 60 hertz ("Hz") frequency on its alternating current services, is subject to certain deviations. The usual maximum instantaneous deviation from the standard 60 Hz is $\pm 2/10$ cycle ($\pm 0.33\%$), except on infrequent occasions when the deviation may reach $\pm 1/10$ cycle ($\pm 0.17\%$). The usual normal deviation is approximately $\pm 1/20$ cycle ($\pm 0.083\%$). These conditions are subject to occur at any time of the day or night and should be considered in the design of the facility. All are measured on a 60 Hz base.

d. Voltage Level

All electricity flow across the PCC shall be in the form of single-phase or three-phase 60 Hz alternating current at a voltage class determined by mutual agreement of the parties.

e. Machine Reactive Capability

Facilities less than one (1) megawatt ("MW") will not be required to provide reactive capability, except as may be provided by the retail rate schedule and Terms and Conditions under which the Customer takes service.

Facilities greater than or equal to one (1) MW interconnected with the Company EDS shall be required to provide reactive capability to regulate and maintain EDS voltage at the PCC as per SPP requirements. The Company and/or SPP shall establish a scheduled range of voltages to be maintained by the facility. The reactive capability requirements shall be reviewed as part of the impact study and facilities study.

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4.2 Protection Requirements For New or Modified Facility Interconnections

a. General Requirements

Any facility desiring to interconnect with the Company EDS or modify an existing interconnection must meet company standards and minimum specifications, where applicable, as set forth in the following documents and standards and requirements in this section.

1. IEEE 1547 Standard for Distributed Resources Interconnected with Electric Power Systems
2. UL Standard 1741, November 1, 2002 "Inverters, Converters and Charge Controllers for Use in Independent Power Systems"
3. IEEE Standard 929-2000, "IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems"
4. IEEE Standard 142, "Grounding for Industrial and Commercial Power System"
5. IEEE Guide 80, "IEEE Guide for Safety in AC Substation Grounding"
6. IEEE Standard 519, "IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems"
7. National Electric Safety Code

The specifications and requirements listed herein are intended to mitigate possible adverse impacts caused by the facility on the Company's equipment and personnel and on other Interconnecting Customers of the Company. They are not intended to address protection of the facility itself or its internal load. It is the responsibility of the facility owner/operator to comply with the requirements of all appropriate standards, codes, statutes and authorities to protect facility and its loads.

b. Protection Responsibility

The Company shall not be responsible for the protection of the facility. The facility owner/operator shall be responsible for protection of its system against possible damage resulting from parallel operation with the Company so long as the Company adheres to good utility practice. If requested by the Interconnecting Customer, the Company will provide system protection information for the line terminal(s) directly

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related to the interconnection. This protection information contained herein is provided exclusively for use by the Interconnecting Customer to evaluate protection of the facility during parallel operation. At its sole discretion, the Company may consider approving alternatives that satisfy the intent of the requirements contained in this Section.

c. Facility Classification

To determine the protection requirements for a given facility, the following Groups have been established:

Group	Type of Interconnection
1	Facilities Qualified for Simplified Interconnection
2	All Facilities Not Qualified for Simplified Interconnection

d. IEEE 1547 Protection Requirements

All Facilities must meet performance requirements set forth in relevant sections of the IEEE 1547 Standard as it may be revised or superseded from time to time.

e. Group 1 Facilities

1. Qualified: The inverter-based facility shall be considered qualified if it meets requirements set forth in Section 3.1 Simplified Process.
2. External Disconnect Switch: For qualified inverters, the Company may require an external disconnect switch (or comparable device by mutual agreement of the Parties) at the PCC with the Company or at another mutually agreeable point that is accessible to Company personnel at all times and that can be opened for isolation if the switch is required. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The visible break requirement can be met by opening the enclosure to observe the contact separation. The Company shall have the right to open this disconnect switch in accordance with this Tariff.

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f. Group 2 Facilities

1. Non Export Power: If the Parties mutually agree that non-export functionality will be part of the interconnection protection equipment then it will include one of the following: (1) a reverse power relay with mutually agreed upon delay intervals, or (2) a minimum power function with mutually agreed upon delay intervals, or (3) or other mutually agreeable approaches, for example, a comparison of nameplate rating versus certified minimum Customer premises load.
2. SPP Relaying Requirements: The facility must meet SPP relaying requirements as they may change from time to time. Company shall notify Interconnecting Customer of any such requirements.
3. Disconnect Switch: The Interconnecting Customer shall provide a disconnect switch (or comparable device mutually agreed upon by the Parties) at the point of facility interconnection that can be opened for isolation. The switch shall be in a location easily accessible to Company personnel at all times. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The visible break requirement can be met by opening the enclosure to observe the contact separation. The Company shall exercise such right in accordance with Section 7 of this Interconnection Tariff.
4. Transfer Tripping: A direct transfer tripping system, if one is required by either the Interconnecting Customer or by the Company, shall use equipment generally accepted for use by the Company and shall, at the option of the Company, use dual channels.

g. Requirements for Induction and Synchronous Generator Facilities

1. Interconnection Interrupting Device: An interconnection interrupting device such as a circuit breaker shall be installed to isolate the facility from the Company's EDS. If there is more than one interrupting device, this requirement applies to each one individually. The interconnection interrupting device must be capable of interrupting the current produced when the facility is connected out of phase with the Company's EDS, consistent with Section 4.1.8.3 of the IEEE 1547 Standard

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- which states, "the interconnection system paralleling-device shall be capable of withstanding 220 percent of the interconnection system rated voltage."
2. Synchronizing Devices: The Interconnecting Customer shall designate one or more synchronizing devices such as motorized breakers, contactor/breaker combinations, or a fused contactor (if mutually agreeable) to be used to connect the facility generator to the Company's EDS. This synchronizing device could be a device other than the interconnection interrupting device. The synchronizing device must be capable of interrupting the current produced when the facility is connected out of phase with the Company's EDS, consistent with Section 4.1.8.3 of the IEEE 1547 Standard which states, "the interconnection system paralleling-device shall be capable of withstanding 220 percent of the interconnection system rated voltage."
 3. Transformers: The Company reserves the right to specify the winding connections for the transformer between the Company's voltage and the facility's voltage ("Step-Up Transformer") as well as whether it is to be grounded or ungrounded at the Company's voltage. In the event that the transformer winding connection is grounded-wye/grounded-wye the Company reserves the right to specify whether the generator stator is to be grounded or not grounded. The Interconnecting Customer shall be responsible for procuring equipment with a level of insulation and fault-withstand capability compatible with the specified grounding method.
 4. Voltage relays: Voltage relays shall be frequency compensated to provide a uniform response in the range of 40 to 70Hz.
 5. Protective Relaying Redundancy: For induction generators greater than one-fifteenth (1/15) of on-site minimum verifiable load that are not equipped with on-site capacitors or that are greater than 200 KW, and for all synchronous generators, protective relays utilized by the facility shall be sufficiently redundant and functionally separate so as to provide adequate protection, consistent with Company standards and practices, upon the failure of any one component.

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- 6. Protective Relay Hard-Wire Requirement: Unless authorized otherwise by the Company, protective relays must be hardwired to the device they are tripping. Interposing computer or programmable logic controller or the like is not permitted in the trip chain between the relay and the device being tripped.
- 7. Protective Relay Supply: Where protective relays are required in this section, their control circuits shall be DC powered from a battery/charger system or an uninterruptible power supply (UPS). Solid-state relays shall be self-powered, or DC powered from a battery/charger system or a UPS. If the facility uses a Company-acceptable non-latching interconnection contactor, AC powered relaying shall be allowed provided the relay and its method of application are fail safe, meaning that if the relay fails or if the voltage and/or frequency of its AC power source deviate from the relay's design requirements for power, the relay or a separate fail-safe power monitoring relay acceptable to the Company will immediately trip the generator by opening the coil circuit of the interconnection contactor.
- 8. Current Transformers (CT)s: CT ratios and accuracy classes shall be chosen such that secondary current is less than one hundred (100) amperes and transformation errors are consistent with Company standards and practices. CTs used for revenue class metering must have a secondary current of twenty (20) amperes or less.
- 9. Voltage Transformers (VT)s and Connections: The facility shall be equipped with a direct voltage connection or a VT, connected to the Company side of the interrupting device. The voltage from this VT shall be used in an interlock scheme, if required by the Company. For three-phase applications, a VT for each phase is required. All three phases must be sensed either by three individual relays or by one relay that contains three elements. If the voltage on any of the three phases is outside the bounds specified by the Company, the unit shall be tripped. If the facility's step-up transformer is ungrounded at the Company voltage, this VT shall be a single three-phase device or three single-phase devices connected from each phase to ground on the Company's side of the

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facility's step-up transformer, rated for phase-to-phase voltage and provided with two secondary windings. One winding shall be connected in open delta, have a loading resistor to prevent ferroresonance, and be used for the relay specified in these requirements.

10. Communications Channels: The Interconnecting Customer is responsible for procuring any communications channels necessary between the facility and the Company's stations, and for providing protection from transients and over-voltages at all ends of these communication channels. The Interconnecting Customer will also bear the ongoing cost to lease these communication channels. Examples include, but are not limited to, connection to a line using high-speed protection, transfer tripping, generators located in areas with low-fault currents, or back up for generator breaker failure.

h. Additional Requirements for Induction Generator Facilities

Self-Excitation: A facility using induction generators connected in the vicinity of capacitance sufficient to self-excite the generator(s) shall meet the requirements for synchronous machines. The capacitors that enable self-excitation may actually be external to the facility. The Company will not restrict its existing or future application of capacitors on its lines nor restrict their use by other Interconnecting Customers of the Company to accommodate a facility with induction machines. If self-excitation becomes possible due to the installation of or presence of capacitance, the protection requirements of the facility may need to be reviewed and revised, if applicable.

The facility may be required to install capacitors to limit the adverse effects of drawing reactive power from the EDS for excitation of the generator. Capacitors for supply of reactive power at or near the induction generator with a kVAR rating greater than thirty (30) percent of the generator's KW rating may cause the generator to become self-excited. (If self-excitation can occur, the facility shall be required to provide protection as specified in synchronous machines requirements.)

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i. Additional Requirements for Synchronous Generator Facilities

1. Ungrounded Transformers: If the facility's step-up transformer connection is ungrounded, the facility shall be equipped with a zero sequence over-voltage relay fed from the open delta of the three-phase VT specified in the Voltage Transformers and Connections Section 4.2.g.9.
2. High-Speed Protection: The facility may be required to use high-speed protection if time-delayed protection would result in degradation in the existing sensitivity or speed of the protection systems on the Company's EDS.
3. Breaker Failure Protection: The facility may be required to be equipped to provide local breaker failure protection which may include direct transfer tripping to the Company's line terminal(s) in order to detect and clear faults within the facility that cannot be detected by the Company's back-up protection.

4.3 Protection System Testing and Maintenance

a. Protection System Commissioning Test

The Company shall have the right to witness the commissioning testing as defined in IEEE 1547 Standard Section 5.4 at the completion of construction and to receive a copy of all test data. The facility shall be equipped with whatever equipment is required to perform this test.

Testing typically includes, but is not limited to:

- CT and CT circuit polarity, ratio, insulation, excitation, continuity and burden tests,
- VT and VT circuit polarity, ratio, insulation and continuity tests,
- Relay pick-up and time delay tests,
- Functional breaker trip tests from protective relays,
- Relay in-service test to check for proper phase rotation and magnitudes of applied currents and voltages,
- Breaker closing interlock tests, and
- Paralleling and disconnection operation.

Prior to final approval by the Company or anytime thereafter, the Company reserves the right to test the generator relaying and control related to the protection of the Company's EDS.

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b. Protection System Maintenance

The Interconnecting Customer has the full responsibility for the proper periodic maintenance of its generating equipment and its associated control, protective equipment and interrupting devices. The Interconnecting Customer is responsible for the periodic maintenance of those relays, interrupting devices, control schemes, and batteries that involve the protection of the Company's EDS. A periodic maintenance program, mutually agreeable to both the Company and to the Interconnecting Customer, is to be established in each case. The Company shall have the right to monitor the periodic maintenance performed.

c. Protection System Monitoring

The Company reserves the right to install special test equipment as may be required to monitor the operation of the facility and its control or for evaluating the quality of power produced by the facility at a mutually agreed upon location. The cost of this testing will be borne by the Company unless there is shown to be a problem associated with the facility or if the test was performed at the request of the Interconnecting Customer.

Each routine check shall include both a calibration check and an actual trip of the circuit breaker or contactor from the device being tested. Visually setting a calibration dial, index or tap is not considered an adequate calibration check.

Inverters with field adjustable settings for their internal protective elements shall be periodically tested if those internal elements are being used by the facility to satisfy the requirements of this section.

4.4 Protection Requirements – Momentary Paralleling of Standby Generators

Protective relays to isolate the facility for faults in the Company EDS are not required if the paralleling operation is automatic and takes place for less than one-half of a second. An interrupting device with a half-second timer (30 cycles) is required as a fail-safe mechanism.

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Parallel operation of the facility with the Company EDS shall be prevented when the Company's line is dead or out of phase with the facility. Three-phase generation must disconnect from the EDS for loss of balanced three-phase voltage or a single-phasing condition within ten (10) cycles.

The control scheme for automatic paralleling must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the facility being allowed to interconnect with the Company EDS.

4.5 Protection System Changes

The Interconnecting Customer must provide the Company with reasonable advance notice of any proposed changes to be made to the protective relay system, relay settings, operating procedures or equipment that affect the interconnection. The Company will determine if such proposed changes require re-acceptance of the interconnection per the requirements of this section.

Should the Company implement subsequent changes to the EDS to which the facility is interconnected, the Interconnecting Customer will be responsible at its own expense for identifying and incorporating any necessary changes to its protection equipment. These changes to the facility's protection equipment are subject to review and approval by the Company.

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