



**MIDAMERICAN ENERGY TECHNICAL REQUIREMENTS  
FOR NEW LOAD INTERCONNECTIONS TO THE  
MIDAMERICAN ENERGY TRANSMISSION SYSTEM**

The MidAmerican Energy Technical Requirements may be accessed via the web at <http://oasis.midwestiso.org/oasis/MEC> or upon request to the Electric System Planning department at 106 E 2<sup>nd</sup> Street, Davenport, IA. 52801. Telephone contact (563-333-8162)

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## 1.0 Scope

These Technical Interconnection Requirements (“Requirements”) apply to all load interconnections (“Interconnection” or “Interconnections”), for which the point of interconnection is the MidAmerican Energy transmission system. These Requirements shall be applied on a comparable basis to all load interconnections within this scope. These Requirements specify the minimum technical requirements intended to ensure a safe, effective and reliable interconnection. The requirements outlined in this document may not cover all details in specific cases.

MidAmerican Energy reserves the right to revise these Requirements from time-to-time without advanced notice. MidAmerican Energy may revise these Requirements periodically to comply with new regulations from the Federal Energy Regulatory Commission (FERC), the North American Electric Reliability Corporation (NERC), state, or other governmental authorities. MidAmerican Energy may require that all Interconnections comply with new regulations by implementing similar procedures and / or upgrades as would be expected on the MidAmerican Energy facilities in a non-discriminatory manner. If the Interconnection does not comply, MidAmerican Energy may disconnect the Interconnection after proper notification.

## 2.0 Purpose

These Requirements are considered to be supplemental technical requirements to the procedures and requirements set forth in the Midwest ISO Open Access Transmission, Energy and Operating Reserve Markets Tariff (“Midwest ISO Tariff”) and Midwest ISO Business Practice Manual for Transmission Planning, and the procedures and requirements set forth by FERC and NERC. To the extent that there is a conflict between these Requirements and the current requirements of the Midwest ISO Tariff, FERC, or NERC, then the Midwest ISO Tariff, FERC, or NERC requirements will govern.

In addition to the technical interconnection requirements provided in this document, the Interconnection shall comply with all applicable federal, state, and local requirements, environmental regulations, siting requirements, and Good Utility Practices.

These Requirements are intended to:

- i. Document MidAmerican Energy’s requirements and procedures for load interconnections to the MidAmerican Energy transmission system.
- ii. Provide a written summary of MidAmerican Energy’s plans to achieve required system performance according to the NERC, the Midwest Reliability Organization (MRO), Midwest ISO, and MidAmerican Energy criteria.
- iii. Document procedures for coordinated joint studies of new facilities to determine Interconnection impacts on the MidAmerican Energy and adjoining bulk power systems.

- iv. Document notification procedures to other entities responsible for bulk power reliability.

### 3.0 Procedures for Obtaining a Load Interconnection

MidAmerican Energy has turned over functional control of its transmission facilities to the Midwest ISO; therefore, final approval of requests for load interconnections to these facilities will be determined by the Midwest ISO based upon Midwest ISO review of available studies of the proposed Interconnection completed by MidAmerican Energy, and as needed, Midwest ISO's own studies of the proposed Interconnection. A brief summary of the load interconnection process is provided below, and a process diagram has been attached as Appendix A.

**Interconnection Request:** End-use customers wishing to establish a load interconnection to the MidAmerican Energy transmission system should contact an economic development consultant of MidAmerican Energy. A listing of economic development consultants and their contact information can be found on the MidAmerican Energy web site at

<http://www.midamericanenergy.com/econdevConsultants.aspx>

The economic development consultants will be able to provide various resources to aid in site selection and information regarding MidAmerican Energy electric rates.

Utilities wishing to establish a load interconnection to the MidAmerican Energy transmission system should contact MidAmerican Energy Electric System Planning at

MidAmerican Energy Company  
Attn: Electric System Planning Interconnection Request  
106 E. 2<sup>nd</sup> St  
Davenport IA, 52801  
563-333-8162

Under either scenario, MidAmerican Energy Electric System Planning will require the following information to evaluate the load interconnection request and develop a proposed electric service plan:

- projected peak demand and schedule for load additions
- proposed point of interconnection (and alternative points of interconnection, if any)
- desired in-service date
- load information (i.e. motor data)

**Required Studies:** At a minimum the MidAmerican Energy will complete a study evaluating steady-state system performance of the proposed load interconnection according to NERC TPL standards and MidAmerican Energy planning criteria. If MidAmerican Energy expects potential impacts beyond steady-state impacts, MidAmerican Energy may perform additional studies to evaluate the proposed load interconnection including but not limited to transient stability, voltage stability, small signal analysis, and flicker analysis.

If the load interconnection is shown to cause portions of the MidAmerican Energy system to violate MidAmerican Energy planning criteria, MidAmerican Energy will develop and evaluate potential mitigation plans. Following the identification of the preferred upgrade plans, MidAmerican Energy will provide the interconnection customer a draft electric service proposal describing the MidAmerican Energy facilities to be constructed and the cost estimate to the customer to construct the necessary upgrades. MidAmerican Energy will then submit the proposed load interconnection and associated upgrades for inclusion in the Midwest ISO transmission expansion plan (MTEP). Depending upon the requested in-service date, the projects may be submitted to the Midwest ISO under the standard MTEP review process or through an out-of-cycle request.

Part of MidAmerican Energy's study review process will involve informing MidAmerican Energy neighboring utilities of the proposed interconnection and associated upgrades, when appropriate. Modifications to the plan may be suggested by neighboring utilities and MidAmerican Energy may choose to study additional alternatives as a result of feedback, provided that those alternatives still meet the overall need of the interconnection customer. Any modifications to the proposed load interconnection and associated upgrades will be coordinated with the interconnection customer.

**Midwest ISO Approval:** The Midwest ISO will review all studies submitted by MidAmerican Energy to ensure adequate assessment of the Midwest ISO system. The Midwest ISO may validate results using its own power flow models. If the load interconnection is shown to cause portions of the Midwest ISO system to violate planning criteria of its members, the Midwest ISO will coordinate with MidAmerican Energy and stakeholders of its planning process to identify potential mitigation plans. Following the development of upgrade plans, if necessary, the Midwest ISO will submit the proposed load interconnection and associated upgrades for approval into Appendix A of the MTEP by the Midwest ISO Board of Directors. Once approved in Appendix A of the MTEP, MidAmerican Energy has approval to construct the new MidAmerican Energy facilities or modifications to the MidAmerican Energy system necessary to accommodate the load interconnection.

**Interconnection Agreement:** Following approval of the load interconnection in MTEP Appendix A, MidAmerican Energy will finalize the electric service proposal and provide it to the interconnection customer for execution.

The interconnection customer may request an engineering & procurement agreement to allow MidAmerican Energy to begin engineering or material procurement during the Midwest ISO evaluation of the load interconnection if an expedited schedule is required. MidAmerican will not commence physical construction activities under the terms of such engineering & procurement agreement.

## 4.0 Construction and Ownership

Following the execution of the electric service agreement, engineering, design and construction activities will commence according to the schedule included in the

agreement. Throughout the implementation phase of the interconnection process, MidAmerican Energy will conduct regular status update conference calls to discuss progress on the MidAmerican Energy system upgrades and the interconnection customer's construction and to discuss any coordination of construction activities.

Unless specified otherwise in the electric service contract all facilities to be owned by MidAmerican Energy shall be constructed, owned, operated and maintained by MidAmerican Energy. MidAmerican Energy may, at its option, contract with a third party for construction of any of these facilities. The interconnection customer will normally construct, own, operate and maintain all facilities to be owned by the interconnection customer. Both MidAmerican Energy's and the interconnection customer's construction shall meet all applicable national, state and local construction and safety codes.

#### **4.1 Permitting**

The interconnection customer shall be responsible for obtaining the required permits and regulatory approvals for the facilities that it will construct, and MidAmerican Energy shall be responsible for obtaining the required permits and regulatory approvals for the facilities to be constructed by MidAmerican Energy. In addition, regulatory approvals may be required to be obtained by neighboring systems if the Interconnection requires system upgrades on third party facilities.

#### **4.2 Interconnection Substation Configurations**

An Interconnection to the MidAmerican Energy transmission system may be made at an existing MidAmerican Energy transmission substation or via a connection tap with breakers into an existing MidAmerican Energy transmission line. The configuration requirements of the Interconnection depend in part on the voltage level where the Interconnection is to occur. At a minimum,

- i. If the Interconnection is to a 345 kV facility on the MidAmerican Energy system, the minimum configuration will be a ring-bus. A straight bus configuration may be used if the Interconnection is to a facility rated below 345 kV.
- ii. Generally, MidAmerican Energy will not allow a straight bus configuration with greater than five breakers. Expansion beyond this level will require conversion of the station into a ring-bus design. MidAmerican Energy, at its sole discretion, may consider different configurations due to physical limitations at the site.
- iii. Generally, MidAmerican Energy will not allow a ring bus configuration with greater than eight breakers. Expansion beyond this level will require conversion of the station into a breaker-and-a-half design. MidAmerican Energy, at its sole discretion, may consider different configurations due to physical limitations at the site.
- iv. No Interconnection configuration will be allowed that creates a three terminal transmission line configuration.
- v. If the Interconnection is to an existing MidAmerican Energy transmission substation, the interconnection must conform, at a minimum, to the original designed configuration of the substation.

## 5.0 Interconnection Requirements

### 5.1 General Requirements

Throughout the remainder of the document a number of national standards and guidelines (e.g. ANSI/IEEE) are referenced, the latest revision of these standards and guidelines, or the applicable superseding standard, shall govern the requirements of the Interconnection. The Interconnection must also comply with the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements.

An Interconnection shall not violate nor cause the MidAmerican Energy electric system to violate the MidAmerican Energy Planning Reliability Criteria as documented in **Appendix B**, including those systems below 100 kV.

An Interconnection shall not violate nor cause the MidAmerican Energy electric system to violate equipment ratings as developed according to the MidAmerican Energy Company Transmission Facility Ratings Methodology as documented in **Appendix C**, including those systems below 100 kV.

An Interconnection shall not violate nor cause the MidAmerican Energy electric system to violate the applicable NERC reliability standards as documented in **Appendix D**.

An Interconnection shall not violate nor cause the MidAmerican Energy electric system to violate the applicable MRO Performance Standards as documented in **Appendix E**.

An Interconnection shall not violate nor cause the MidAmerican Energy electric system to violate MidAmerican Energy Flicker Standards as documented in **Appendix F**.

An Interconnection shall not violate nor cause the MidAmerican Energy electric system to violate MidAmerican Energy Harmonic Standards as documented in **Appendix G**.

In addition, the equipment associated with the Interconnection should be in accordance with the practices described in the latest revision of the following ANSI/IEEE Standards or Guides, or the applicable superseding standard. There may be additional special requirements imposed by MidAmerican Energy due to the specific project or application.

- IEEE Std 519, IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- IEEE / ANSI C84.1 American National Standard for Electric Power Systems and Equipment - Voltage Ratings (60 Hz)
- IEEE 1543, Recommended Practice for Measurement and Limits of Voltage Fluctuations and Associated Light Flicker on AC Power Systems
- ANSI C84.1 Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)
- ANSI / IEEE Std C37.90.1, IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems
- ANSI / IEEE Std. C37.90.2, Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers
- IEEE 80, IEEE Guide for Safety in AC Substation Grounding Document Number

- IEEE 142, Recommended Practice for Grounding of Industrial and Commercial Power Systems
- IEEE Standard 421.2 IEEE Guide for Identification, Testing, and Evaluation of the Dynamic Performance of Excitation Control Systems

## 5.2 System Protection Requirements

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for system protection.

The load interconnection shall incorporate equipment to detect system abnormalities or disturbances on either the interconnection customer's system or the MidAmerican Energy system. This equipment shall have the capability to isolate the sources of the disturbance. The interconnection customer is solely responsible for the system protection design that affects its facility; however, the interconnection customer's protective equipment must coordinate with existing MidAmerican Energy protective equipment and provide comparable levels of protection as practiced on MidAmerican Energy's System.

The interconnection customer shall provide the required one-line diagram(s) and details of its facilities. A functional one-line diagram is required, including representation of both the major components of the Interconnection (i.e. power transformers, circuit breakers, switches, reactive devices, etc) and the protective relaying including lockout relays. The protective relaying shall be shown using the following guidelines:

- i. The current and potential instrument transformer inputs of the protective relaying shall be shown in single-line format, and shall be connected to the functional element circle it is serving with a solid line.
- ii. The current and potential transformation ratios, along with polarity markings and secondary connection configuration, of all instrument transformers serving the protective relaying shall be specified.
- iii. Circuit breakers that the protective relaying trips either directly or indirectly through a lockout relay shall be indicated with a dashed line.
- iv. Circuit breakers for which the protective relaying provides supervisory synchronism checks shall be indicated with a dotted line.
- v. Each functional element of the protective relay scheme shall be shown with a circle inscribed with its IEEE device function number

The Interconnection shall be able to withstand Electromagnetic Interference (EMI) environments in accordance with latest revision of ANSI / IEEE Std. C37.90.2. The associated systems and protection systems shall not mis-operate due to EMI, including hand held communication devices.

The following interconnection relays would be required at a minimum:

- Two zone Distance, Phase and Ground, (21). On short transmission lines or installations where the MidAmerican Energy interconnection substation and the customer's interconnection substation are adjacent differential relay(s) may be substituted.

- Power transformer differential or overcurrent relaying

The following additional protection functions may be suggested or required to coordinate with the protective systems of MidAmerican Energy:

- Breaker Failure Relay (50BF).
- Over/Under Frequency (81O/81U).

All protective relays shall be “Utility Industry Grade” protective relays. These relays have more stringent tolerances and more flexible, widely published characteristics than “industrial quality” relays.

All protective devices supplied to satisfy the requirements of this section shall be equipped with operation indicators (targets) or shall be connected to an annunciator or event recorder so that it will be possible to determine, after the fact, which devices caused a particular trip.

MidAmerican Energy facilities serving the interconnection facilities may be equipped with high speed reclosing to expedite returning the facilities to service following a fault of temporary nature. The protective devices installed by the interconnection customer and acceptable to MidAmerican Energy are intended to disconnect the generation from faulted or isolated lines before reclosing occurs. Depending on the installation, MidAmerican Energy may require “Hot Line Reclose Blocking” to be installed at the necessary points on MidAmerican Energy’s system. If desired by the interconnection customer, a breaker auxiliary contact may be provided, at the customer’s expense, to initiate transfer trip to protect the Interconnection from out-of-phase reclosing on the MidAmerican Energy system.

### **5.2.1 Redundant/Backup Relaying**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for redundant relaying.

Relays protecting the MidAmerican Energy system shall be designed to ensure that the failure of a single protective relay will not result in failure to clear the fault. The design shall provide the necessary backup that will meet the MidAmerican Energy standards and regional protection requirements.

MidAmerican Energy requires primary and secondary protective relaying, including independent primary and secondary communications paths for transmission lines operated at 345 kV.

### **5.2.2 Coordination & Testing of Protective Devices**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for coordination and testing of protective devices.

MidAmerican Energy shall review the interface equipment protection schemes and the setting and certified test records for these protective devices. The proposed settings for these devices shall be submitted no less than 60 days prior to implementation. Acceptance will not be unreasonably withheld. Any changes required by MidAmerican

Energy shall be made prior to final acceptance, and MidAmerican Energy shall be provided with final copies of the reviewed drawings and settings.

The interconnection customer shall not make any substantial modifications or alterations to its facility or any modifications to the protective devices or setting of the devices without written notice and acceptance from MidAmerican Energy at least 60 days before the proposed change is to be made. All relaying equipment shall be kept under seal, which shall be broken only when the relays are to be tested or adjusted, or subject to inspection by MidAmerican Energy.

All protective devices supplied to satisfy the requirements of this section shall be tested by qualified personnel at intervals at least as frequent as those used by MidAmerican Energy for the relays protecting the facilities serving the interconnection facilities. Special tests may also be requested by MidAmerican Energy to investigate apparent misoperations. Each routine or special test shall include both a calibration check and an actual trip of the circuit breaker from the device being tested. A report of each test shall be prepared and sent to MidAmerican Energy listing the tests made and the “as found” and “as left” calibration values.

### **5.2.3 Synch-Check Requirements**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for synchronization of generators to the transmission system.

If the load interconnection includes back-up generation that will operate in parallel for longer than 100 ms, the Interconnection design shall incorporate adequate facilities to enable the on-site generation to be synchronized with the MidAmerican Energy electric system. The interconnection customer shall be solely responsible for synchronizing the generator to the system.

All points at which the generator can be paralleled with the MidAmerican Energy electric distribution system must be clearly defined as synchronization points in the submittal documentation. A given installation may be designed such that there are several synchronization points. Every circuit opening or closing device such as circuit breakers or disconnect switches in the circuit path between MidAmerican Energy and the on-site generation shall be either:

- i. Designated as a synchronization point and be equipped with its own dedicated synchronizing equipment or
- ii. Electrically or mechanically interlocked with the synchronizing device at the clearly defined synchronization point such that the synchronizing device will be automatically tripped and blocked from closing any time the interlocked circuit opening or closing device is opened.

## **5.3 Frequency Control**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for frequency control.

The Interconnection Customer shall conform with MidAmerican Energy and any regional Under Frequency Load Shed (UFLS) plans as necessary. This may include the installation of relays with UFLS elements that would trip load during under frequency events according to MidAmerican Energy and regional guidelines.

## **5.4 Insulation Requirements**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for equipment insulation levels.

The interconnection customer shall design the Interconnection such that it is adequately protected from surges. Industry standard Basic Insulation Level (BIL) ratings shall be used for the Interconnection and electric system interface equipment. The interconnection customer shall install additional surge protection devices (e.g. surge arresters) to achieve proper insulation coordination. The electric equipment shall meet surge withstand requirements identified in the latest revision of IEEE C62.41 or C37.90.1.

## **5.5 Grounding Requirements**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for substation and equipment grounding.

The Interconnection must be designed to provide adequate grounding. The ground grid must be designed according to the latest revision of IEEE 80. The interconnection customer shall provide MidAmerican Energy data on soil resistivity and a ground grid design prior to the construction of the ground grid. The Interconnection shall provide a ground current path that is acceptable to MidAmerican Energy. Where required, the ground path shall be effectively grounded according to the latest revision of IEEE 142 which specifies that the positive zero sequence reactance is greater than the zero sequence resistance ( $X1 > R0$ ) and zero sequence reactance is less than or equal to three (3) times the positive sequence reactance ( $X1 \leq 3 * X0$ ).

The Interconnection grounding scheme shall not cause overvoltages that exceed MidAmerican Energy equipment ratings or interconnection equipment ratings, and shall not disrupt ground fault protection coordination.

The Interconnection design shall be such that MidAmerican Energy will be able to ground and test any MidAmerican Energy owned or serviced equipment. This may require the interconnection customer to pay for and install approved grounding equipment at the facility.

## **5.6 Communications Requirements**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for communications.

Communication facilities to implement the protective systems at the load interconnection will be installed as necessary.

If required due to configuration of the interconnection substation, the Des Moines Control Center shall be provided with breaker control to allow the load interconnection to be disconnected from MidAmerican Energy transmission facilities. As necessary, during emergencies, MidAmerican Energy reserves the right to disconnect the load interconnection from the MidAmerican Energy electric system without prior notification.

## **5.7 Metering and Indication Requirements**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for metering and supervisory control and data acquisition (SCADA).

Suitable SCADA (metering and telemetering) equipment shall be provided to meter and to transmit real-time information at the point of interconnection to the MidAmerican Energy Des Moines Control Center. Such metering typically includes all watthour meters, VAR hour meters, energy recorders, current and potential transformers and associated equipment at each point of interconnection for system control. Additional SCADA data that may be required includes but is not limited to breaker status, bus voltage, transmission line and/or transformer MW, MVAR, and Amp flows, alarms, etc

All metering equipment shall be maintained and tested periodically as specified by the more restrictive of NERC or MidAmerican Energy criteria. Accuracy of registration shall be maintained in accordance with prudent utility practices and accepted industry standards. Modern solid-state meters should be calibrated to at least +/- 0.3% and hold that accuracy. Installation of electro-mechanical meters is not allowed. On request of either party, a special test may be made at the expense of the party requesting such special test. Representatives of both parties shall be afforded the opportunity to be present at all routine and special tests. If, as a result of any test, any meter is found to be registering more than one half of one percent (0.5%) above or below one hundred percent (100%) of accuracy, the registration of such meter shall be corrected for a period equal to one-half (1/2) of the elapsed time since the last prior test and adjustment, according to the percentage of inaccuracy so found, except that if the meter shall have become defective or inaccurate at a reasonably ascertainable time since the last prior test and adjustment of such meter, the correction shall extend back to such time. Should metering equipment fail to register, the electrical energy delivered shall be determined from the best available data. All metering equipment shall be kept under seal, which shall be broken only when the metering is to be tested, adjusted, or inspected by MidAmerican Energy.

## **5.8 Voltage Requirements**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for voltage performance.

### **5.8.1 Steady State Voltage**

The interconnection shall not cause the MidAmerican Energy electric system to violate the MidAmerican Energy voltage criteria or voltage ranges defined in the latest revision of ANSI Std C84.1 Range A (plus or minus 5% of nominal). If real-time voltage measurements violate the MidAmerican Energy voltage criteria, and the interconnection

is causing or contributing to the violation, the interconnection will be disconnected if approved by the Midwest ISO. The interconnection will remain disconnected until it can be verified through real-time studies by MidAmerican Energy and Midwest ISO that the restoration of the Interconnection would not cause violation of the MidAmerican Energy voltage criteria.

The interconnection shall be designed such that VAR load is minimized between the two systems under normal system conditions. This may require installation of switchable shunt capacitors.

The interconnection customer shall interconnect to the MidAmerican Energy electric system at the nominal voltage at the agreed upon point of interconnection. MidAmerican Energy, at its sole discretion, may elect to upgrade or change the voltage level of the MidAmerican Energy electric system serving the Interconnection. Any costs to upgrade or change the interconnection customer's facilities to maintain an interconnection with MidAmerican Energy shall be paid by the interconnection customer unless stated otherwise in the electric service agreement.

## **5.9 Power Quality/Harmonics Requirements**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for power quality and harmonics.

The harmonic content of the voltage and current wave forms of both the Interconnection and MidAmerican Energy's system, when not interconnected, shall comply with the latest revision of the IEEE Std 519, IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems. MidAmerican Energy may install a power quality meter at the point of interconnection to monitor compliance with IEEE 519.

If high- or low-voltage complaints, transient voltage complaints, and/or harmonic (voltage distortion) complaints result from the Interconnection, the Interconnection shall be disconnected from MidAmerican Energy's system with approval by the Midwest ISO until the interconnection customer resolves the problem.

## **5.10 Fault Current**

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for fault currents.

The facilities study will identify the level of available fault current at the point of interconnection. The interconnection customer's facilities should be designed to accommodate reasonable increases in the available fault current, which may occur over time due to changes on the MidAmerican Energy transmission system.

Where the new load interconnection results in fault currents on the MidAmerican Energy electric system that are in excess of breaker or other interrupting device maximum rated interrupting capability, the interconnection customer shall be required to install and pay for fault limiting equipment or pay for circuit breaker or other interrupting device replacements.

## **5.11 Operating Requirements**

The generator shall be operated in accordance with the latest requirements of NERC, MRO, Midwest ISO, and MidAmerican Energy.

In addition to the voltage and harmonics operating requirements described previously, the interconnection customer shall control the electrical real power (MW) output such that it will not exceed the capacity of the interconnection facilities. The interconnection customer shall also operate its facilities in compliance with the latest revision of the National Electric Safety Code and applicable state codes. Failure to comply with said safety policies or failure to limit the output of the Interconnection to the approved level will result in the interconnection being opened. The interconnection will not be re-established until compliance has been determined.

The Interconnection shall also adhere to NERC and MRO Operating Standards, any Midwest ISO or MidAmerican Energy Operating Guides, and any additional operating requirements either stated herein or mutually agreed to elsewhere.

MidAmerican Energy and the interconnection customer shall each identify one representative to serve as a coordination contact to be the initial point of contact and coordinate communications between the parties for both normal and emergency conditions. MidAmerican Energy and the interconnection customer shall notify each other in writing of the personnel that it has appointed as its coordination contact.

MidAmerican Energy and the interconnection customer shall abide by their respective switching and tagging rules for obtaining clearances for work or for switching operations on equipment. Such switching and tagging rules shall be developed in accordance with OSHA standards. MidAmerican Energy and the interconnection customer shall develop mutually acceptable switching and tagging rules for MidAmerican Energy's and the interconnection customer's facilities that involve common clearance requirements. The interconnection customer shall not be permitted to energize a de-energized MidAmerican Energy circuit and will follow lockout / tagout procedures.

The interconnection customer will follow all MidAmerican Energy and Midwest ISO defined outage processes.

### **5.11.1 Abnormal/Emergency Conditions**

If required by Good Utility Practice to do so, MidAmerican Energy or Midwest ISO may require that the Interconnection be disconnected if the Interconnection could adversely affect the ability of MidAmerican Energy and/or Midwest ISO to safely and reliably operate and maintain the electric system. The interconnection customer shall be provided with advance notice if possible, or in the absence of advance notice the interconnection customer shall be informed as soon as soon as practicable of the reasons for the curtailment, interruption, or reduction, and, if known, its expected duration. The interconnection customer shall comply with all operating instructions provided by the Midwest ISO under emergency conditions to the extent that such actions are within the capabilities of the Interconnection.

## 5.12 Maintenance/Inspection Requirements

The Interconnection shall adhere to the latest revision, if any, of NERC, MRO, Midwest ISO, and MidAmerican Energy standards and requirements for maintenance and inspection.

The interconnection customer must complete field-testing of all their electrical equipment prior to energization. Testing of equipment must be completed by qualified personnel according to manufacturer's recommendations and shall include testing of all protective relays and control systems according to manufacturer's recommendations. MidAmerican Energy reserves the right to inspect the interconnection customer's facilities and witness test any equipment or devices associated with the Interconnection. The interconnection customer shall submit a written, detailed procedure with specific requirements for initial commissioning its interconnecting facilities for MidAmerican Energy approval.

The interconnection customer shall maintain its interconnecting facilities in good working order. MidAmerican Energy reserves the right to inspect the interconnection customer's facilities on a periodic basis or whenever it appears that the Interconnection is operating in a manner hazardous to MidAmerican Energy's system integrity

MidAmerican Energy and the interconnection customer may, in accordance with good utility practices, remove from service facilities or network upgrades as necessary to perform maintenance, test, and install or replace equipment. MidAmerican Energy and the interconnection customer will use reasonable efforts to coordinate outages for maintenance on dates and times mutually acceptable to both parties.

## 6.0 Procedures for Coordinated Joint Studies and Notifications

The Midwest ISO transmission expansion planning process includes multiple opportunities for stakeholder input prior to approval of a load interconnection project into Appendix A of the MTEP. Similarly, the MidAmerican Energy will coordinate with neighboring utilities as appropriate. Between the two processes, and coordination with the interconnection customer, who may also participate in the Midwest ISO planning processes, a coordinated plan for the load interconnection will be developed and reviewed by both interested and potentially affected parties.

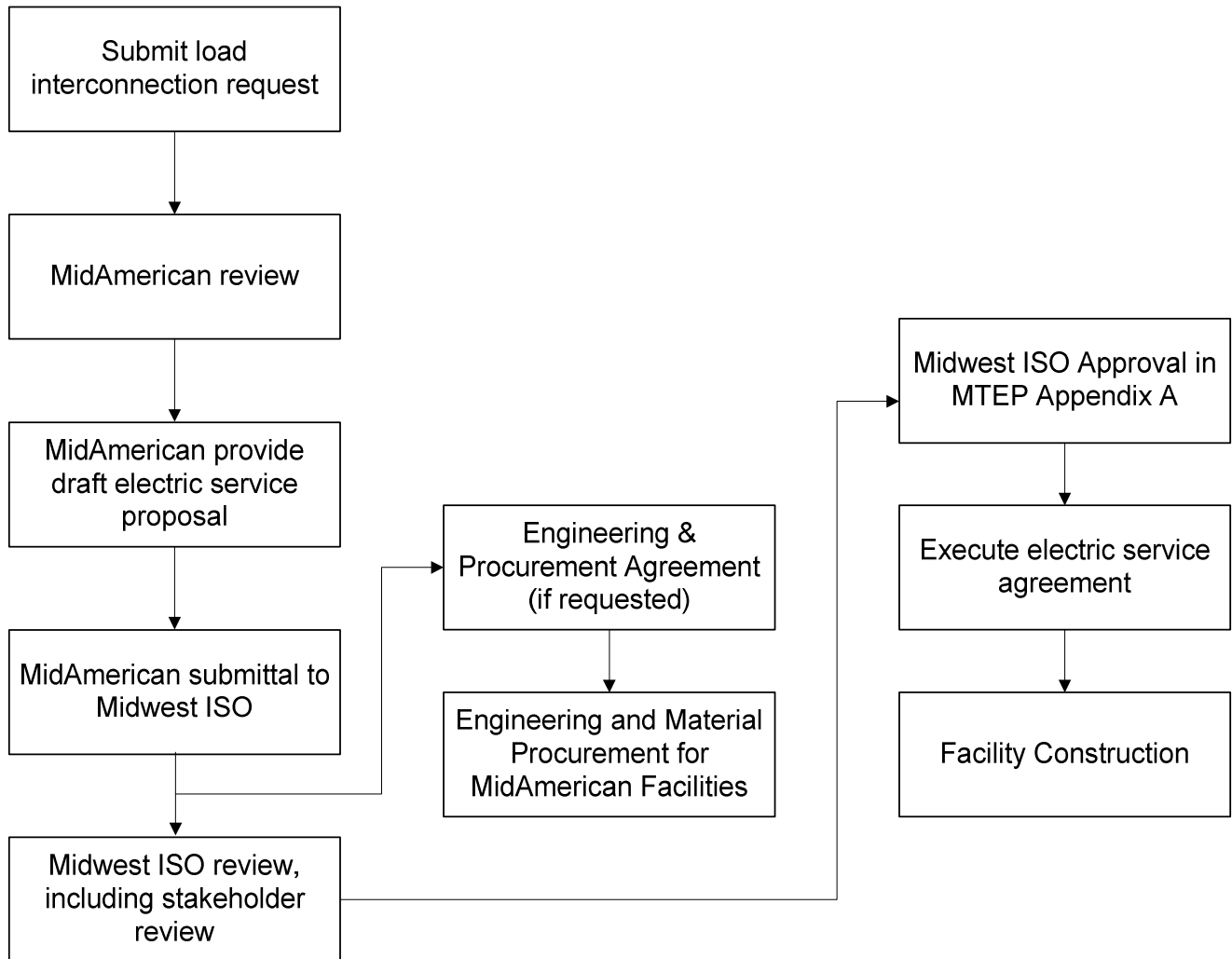
Upon completion of new facilities or upgrades to the MidAmerican Energy system associated with new load interconnections, MidAmerican Energy will inform the Midwest ISO as soon as practical for inclusion in its state estimator model. To the extent that the MidAmerican Energy upgrade or new facility is part of a tie line to an adjacent transmission owner or transmission service provider, that third party shall be notified of the completion of the upgrade or new facility as soon as practical upon completion.

### Program Document Change History

<b>Version Date</b>	<b>Action</b>	<b>Change Date</b>
<b>10/15/10</b>	<b>Separated Transmission Interconnection Requirements from previous document containing</b>	<b>10/15/10</b>

	<b>generation, transmission, and load interconnection requirements</b>	
<b>03/09/11</b>	<b>Corrected footer</b>	<b>03/09/11</b>

**Appendix A**  
**MidAmerican Energy Load Interconnection Process Diagram**



## **Appendix B**

### **MidAmerican Energy Planning Reliability Criteria**

The MidAmerican Energy Planning Reliability Criteria may be accessed via the MidAmerican Energy page of the Midwest ISO OASIS at <http://oasis.midwestiso.org/oasis/MEC> or upon request to the Electric System Planning department at 106 E 2<sup>nd</sup> Street, Davenport, IA. 52801. Telephone contact (563-333-8162)

## Appendix C

### **MidAmerican Energy Company Transmission Facility Ratings Methodology**

The MidAmerican Energy Company Transmission Facility Ratings Methodology may be accessed via the MidAmerican page of the Midwest ISO OASIS at <http://oasis.midwestiso.org/oasis/MEC> or upon request to the Electric System Planning department at 106 E 2<sup>nd</sup> Street, Davenport, IA. 52801. Telephone contact (563-333-8162)

## **Appendix D**

### **NERC Reliability Standards**

The NERC Reliability Standards may be accessed via the web at  
<http://www.nerc.com/>

## **Appendix E**

### **MRO Planning Standards**

The MRO Planning Standards may be accessed via the web at  
[http://www.midwestreliability.org/STA\\_approved\\_mro\\_standards.html](http://www.midwestreliability.org/STA_approved_mro_standards.html)

## **Appendix F**

### **MidAmerican Energy Voltage Flicker Criteria**

The MidAmerican Energy Voltage Flicker Criteria may be accessed upon request to the Electric System Planning department at 106 E 2<sup>nd</sup> Street, Davenport, IA. 52801. Telephone contact (563-333-8162)

## **Appendix G**

### **MidAmerican Energy Harmonic Criteria**

The MidAmerican Energy Voltage Harmonic Criteria may be accessed upon request to the Electric System Planning department at 106 E 2<sup>nd</sup> Street, Davenport, IA. 52801. Telephone contact (563-333-8162)