

Southwestern Power Administration

GENERAL REQUIREMENTS FOR INTERCONNECTION

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Appendix 1: Application for Interconnection

1.0 INTRODUCTION

1.1 Southwestern's Facilities

Southwestern Power Administration (Southwestern) was established as a bureau of the U.S. Department of the Interior in 1943. Subsequently, the Administrator was delegated the authority to carry out major responsibilities of the Secretary under Section 5 of the Flood Control Act of 1944. The Department of Energy Organization Act of 1977 transferred Southwestern from the Interior Department to the U.S. Department of Energy (DOE).

Southwestern's mission is to market and deliver reliable, cost-based hydroelectric power in the Southwestern region from dams operated by the U.S. Army Corps of Engineers. Southwestern markets power from 24 hydroelectric plants in Arkansas, Missouri, Oklahoma, and Texas. These plants have an installed capacity of more than 2,100 megawatts. This power is marketed in Kansas and Louisiana as well as the states where it is generated, and some of Southwestern's wholesale customers distribute it beyond the borders of these six states. Southwestern's Federal power preference customers comprise 46 municipalities, 13 rural electric cooperatives, 9 generation and transmission cooperatives, 3 joint action agencies, and 3 military installations.

Southwestern operates and maintains over 1,300 total circuit-miles of 161-kV, 138-kV, and 69-kV transmission line. All lines have two overhead ground wires for lightning protection. Transmission structures are primarily wooden H-frame structures, with some steel towers (primarily for supporting double-circuited transmission lines). Southwestern also operates and maintains 24 high-voltage substations.

Southwestern's communications facilities for operation and maintenance of the transmission system and control of generation include analog and digital microwave, fiber optics, power-line carrier, and leased dial-up telephone lines. A large portion of the system includes fiber optics for communications in one of the two transmission line ground wires. Generation and transmission switching are operated from the Control Center located in Springfield, Missouri.

1.2 Purpose

This *General Requirements for Interconnection* document sets forth Southwestern's minimum requirements for interconnection with Southwestern's transmission facilities including points of contact and references and an overview of requirements for funding, reliability, safety and security, environmental, land acquisition, technical, and contractual issues. There may be additional requirements by Southwestern or the Southwest Power Pool (SPP) depending upon the location and scope of the proposed interconnection. The steps outlined in this *General Requirements for Interconnection* document may be modified when Southwestern deems appropriate. Southwestern's interconnection process is separate, but parallel to other processes, including regional studies for interconnection requests involving new generation facilities and transmission service through SPP and certain environmental review processes outlined in DOE's National Environmental Policy Act (NEPA) Implementing Procedures.

2.0 INTERCONNECTION PROCESS

Southwestern will evaluate each request for interconnection on a case-by-case basis. The evaluation will consider the reasonable needs of the requesting party and Southwestern's need to operate and maintain its transmission system in a safe and reliable manner while adhering to its Federal statutory obligations.

Direct interconnection to Southwestern's facilities neither includes nor guarantees rights to transmission capacity on any electric utility system, including the system of Southwestern. All new requests for transmission service must be submitted to SPP for study and approval.

Requests for the interconnection of transmission facilities that create a new tie between Southwestern's Balancing Authority Area and another Balancing Authority Area will be submitted to Southwestern and SPP. The requesting party, in cooperation with Southwestern, will coordinate the evaluation of such interconnection with SPP. The requesting party may be required to perform, or compensate SPP to perform, studies in addition to those performed by Southwestern to identify any regional impacts associated with such interconnections.

Requests for interconnection of new generation facilities must be made to SPP, pursuant to Southwestern's Standard Large Generator Interconnection Procedures, Standard Small Generator Interconnection Procedures, and applicable provisions of the SPP/Southwestern Agreement. SPP will coordinate all regional queuing for generation interconnection requests and will perform applicable regional impact studies. Southwestern will coordinate interconnection studies and environmental analyses for Federal facilities at the point of interconnection.

There are multiple steps in the interconnection process. The steps outlined in this document may be modified by Southwestern on a case-by-case basis depending upon the specific circumstances of the requested interconnection.

Step 1: Submit Interconnection Application

1.1 Southwestern Interconnection Application

For all interconnection requests involving transmission line tap(s), substation breaker bay additions, or new power delivery point(s), the requesting parties should contact Southwestern's Division of Customer Service and submit a formal Application for Interconnection (see attached Appendix 1 – Application for Interconnection). When submitting an Application for Interconnection to Southwestern, the requesting party should provide as much of the following information as possible to help expedite the design or review process including:

- 1) One-line diagram(s) showing the proposed interconnection, including any relaying and metering facilities.
- 2) Drawing(s) indicating the physical arrangements of existing and proposed facilities.
- 3) Geographic location of the proposed interconnection, including land ownership pattern, if available (if the interconnection is a tap, indicate the adjacent structure numbers).
- 4) Description of the proposed routing, approximate lengths and conductor size of transmission line additions or modifications, and dimensions and configurations of new structures.
- 5) Description and ratings of any proposed breakers, switches, metering, associated communications, relaying and other related equipment.
- 6) Description of transformer voltage and rating, winding connections, impedance if available, and proposed method of protection.
- 7) Proposed transmission path(s) and service arrangements between resources and associated loads, where applicable.
- 8) Description of loads.
- 9) Proposed construction schedule.
- 10) Appropriate revenue and telemetering equipment specifications. The data should include load control boundary metering, current and potential transformer ratios and register and contact initiator ratios with multipliers.
- 11) Copies of relevant planning or operational studies.
- 12) Copies of relevant environmental impact assessments, reports, projections, or description of anticipated scope of environmental review.

Southwestern may take up to 30 days to process the Application for Interconnection. If Southwestern denies the Application for Interconnection, an explanation will be provided, and Southwestern will make every reasonable effort to support the requesting party in revising the request, as applicable.

For interconnection requests involving generation interconnection or transmission service, please refer to Sections 1.2 or 1.3.

1.2 Application to SPP for Generation Interconnection

For interconnection requests involving new generation facilities, requesting parties should submit the appropriate generator Interconnection Request to SPP in accordance with Southwestern's Standard Large Generator Interconnection Procedures, Standard Small Generator Interconnection Procedures, and applicable provisions of the SPP/Southwestern Agreement. The requesting party must copy Southwestern on all submissions related to a generator interconnection request. SPP will determine if the generation interconnection request is valid and/or complete and coordinate the generator interconnection queue.

1.3 Application to SPP for Transmission Service

For interconnection requests involving new transmission service, requesting parties should submit the appropriate Transmission Service Request to SPP in accordance with applicable provisions of the SPP/Southwestern Agreement and SPP's Open Access Same-time Information System (OASIS). SPP will determine if the transmission service request is valid and/or complete and coordinate all transmission service studies. It is the responsibility of the requesting party to establish requisite contracts with SPP for all transmission service studies.

Step 2: Scoping Meeting

For interconnections involving new Balancing Authority Area ties or generation facilities, Southwestern, the requesting party, and SPP will coordinate at a scoping meeting to discuss proposed and alternate interconnection options and general requirements, answer questions, exchange data, including results from applicable previously performed interconnection studies, and assemble a coordinated schedule for completion of the interconnection process.

Step 3: Execute Initial Agreements

3.1 Southwestern Facilities Study & Environmental Documentation Agreement

For all interconnection requests, the requesting party will be required to execute a Facilities Study & Environmental Documentation Agreement with Southwestern for Southwestern to 1) develop, or review, the design of the interconnection, 2) ensure that the interconnection satisfies Southwestern's technical and property requirements, and 3) complete all required environmental review and documentation¹. During the review or development of the interconnection design, Southwestern may perform load flow analyses, short circuit analyses, and stability analyses to identify impacts to both Southwestern's system and to neighboring utilities associated with the interconnection. The requesting party is required to advance funds to compensate Southwestern for all work performed under the Facilities Study & Environmental Documentation Agreement.

If the requested interconnection will potentially affect other parties, those parties will be identified and contacted by Southwestern prior to Southwestern performing services under the Facilities Study & Environmental Documentation Agreement. Affected parties will jointly evaluate the proposed interconnection and other alternative plans, if appropriate.

The deliverables from Southwestern to the requesting party under the Facilities Study & Environmental Documentation Agreement will include:

- 1) A detailed design of the interconnection facilities at the site including a table of major equipment which delineates operation, ownership, and maintenance responsibilities of the parties;

¹ As a Federal agency, Southwestern conducts an environmental review of any action affecting Southwestern's transmission facilities. The environmental review and documentation process can range from a categorical exclusion (CX) to a local area environmental assessment (EA) or a comprehensive environmental impact statement (EIS), which includes a required public process. If it is determined that a more comprehensive environmental review is required, the requesting party will be required to advance funds to Southwestern, or a third party, to conduct the detailed environmental review. Continuation of the interconnection process at any and every step is contingent upon environmental review findings. If the environmental review determines that the interconnection will not satisfy Federal environmental criteria, Southwestern will either deny the request or work with the requesting party to revise aspects of the interconnection request to meet applicable environmental criteria.

- 2) Environmental review of the interconnection and estimated costs for further environmental review, if applicable. Southwestern may determine that either an environmental assessment (EA) or Environmental Impact Statement (EIS) is required, in which case additional funding and/or agreements may be required; and
- 3) The estimated cost and time requirements to proceed with the construction/inspection phase of the proposed interconnection. Associated regional upgrades for interconnection of new generation facilities and transmission service are not included in this agreement but are addressed by SPP.

Southwestern will use due diligence to provide the results of Southwestern's work under the Facilities Study & Environmental Documentation Agreement related to equipment at the point of interconnection within 180 days of executing the agreement.

The requesting party may perform or, upon approval of Southwestern, contract with third-parties to perform certain studies associated with interconnections; however, the requesting party, or designated representative of the requesting party, may be required to present an evaluation of the proposed interconnection to Southwestern and/or the SPP Transmission Working Group (TWG), or successor organization, for review. Submittals to the TWG or successor organization must be in accordance with the *Transmission Working Group Transmission Plan, Expansion, and Interconnect Review Process* or applicable document. The submittal to the TWG or successor organization will provide: 1) an independent review of the analysis to ensure compliance with the North American Electric Reliability Corporation (NERC) Reliability Standards, 2) an analysis of the effects of the proposed interconnection to power transfer capability on the facilities of Southwestern and neighboring utilities, and 3) a forum to inform other parties of the proposed interconnection.

3.2 SPP Study Agreements

For interconnection requests associated with new generation facilities and transmission service, the requesting party must coordinate with SPP for the performance of requisite studies to evaluate potential regional impacts and limits to transfer capability on facilities beyond the immediate point of interconnection to Southwestern's Federal facilities. It is the responsibility of the requesting party to contact SPP and establish requisite contracts for such studies, and the requesting party may request for SPP's studies to be performed prior to portions of Southwestern's work.

Step 4: Execute Southwestern's Standard Generator Interconnection Agreement or Construction Agreement

Upon Southwestern's completion of its work under the Facilities Study & Environmental Documentation Agreement, the requesting party must advise Southwestern of its desire to proceed. For interconnections not associated with new generation facilities, Southwestern will prepare a Construction Agreement to be executed between Southwestern and the requesting party. For interconnection requests associated with new generation facilities, Southwestern will prepare a Standard Large Generator Interconnection Agreement or Standard Small Generator Interconnection Agreement to be executed between Southwestern and the requesting party.

Both the Construction Agreement and Standard Generator Interconnection Agreement will include the scope, cost, and cost allocation of interconnection facilities determined pursuant to work performed under the Facilities Study & Environmental Documentation Agreement and outline specific requirements for the proposed interconnection. In addition, the Standard Generator Interconnection Agreement will include additional operational and contractual obligations of the requesting parties associated with interconnection of a generation facility.

The requesting party has 60 days from the date Southwestern tenders the final Construction or Standard Generator Interconnection Agreement to sign and return the applicable Agreement to Southwestern and provide advanced payment. Southwestern will proceed with the work under the Agreement once advanced funds are in place.

Step 5: Land Acquisition

Upon completion of the environmental process and if land rights are to be owned by Southwestern, negotiations for any necessary land rights begin. Negotiations should be complete and the land rights obtained prior to the start of construction. If it is determined that Southwestern will conduct negotiations for land acquisition, requesting parties are required to provide funds to Southwestern in advance of such negotiations or land acquisition activities.

Step 6: Review, Testing, and Energization

Once construction has been completed, and before energizing the new interconnection, Southwestern will coordinate with the requesting party for review and testing of the new facilities. Southwestern will use prudent utility practice in review and testing. All work and obligations set forth in the Standard Generator Interconnection or Construction Agreement, including, but not limited to, property transfers, joint-use permits/easements, Southwestern's receipt of the appropriate as-built drawings, operating instructions, and other relevant materials shall be accomplished or provided before energizing.

3.0 GENERAL REQUIREMENTS

3.1 Funding Requirements

Unless otherwise agreed in the Standard Generator Interconnection or Construction Agreement, all of Southwestern's costs associated with facilitating the interconnection request are the responsibility of the requesting party. Advanced funds are required before Southwestern performs any studies, design, land acquisition, or construction. The contractual agreements will specify the amount of funds required to be advanced. Upon receipt by Southwestern, advanced funds will be placed in a cost account for the project. Upon request or as set forth in the applicable agreement, cost statements will be furnished as work performed by Southwestern progresses. All funds not used by Southwestern pursuant to the applicable agreements, will be returned to the requesting party without interest. Furthermore, if additional funds are required to complete the interconnection, Southwestern will invoice the requesting party and will only complete the work for which it has received advanced funds, in accordance with the applicable agreement. In addition, as specified in the applicable agreement, the agreement may be terminated if additional funding is not received.

3.1.1 Funding for Southwestern Facilities Study and Environmental Documentation

The agreement executed between Southwestern and the requesting party will clearly specify Southwestern's estimate of the cost of Southwestern's services. The charge will not exceed the actual cost of performing such services. Requesting parties will not be assessed a charge for work product from previously performed review or analyses when such analyses are applicable to the requesting party's interconnection request, but the requesting party will be responsible for charges associated with any modifications to existing reviews or analyses that are reasonably necessary to evaluate the requesting party's request.

Advanced payment to Southwestern by the requesting party is required for Southwestern to perform the necessary environmental review. Estimated costs are based on historical expenses for similar interconnections and are specifically determined on a case-by-case basis by Southwestern. Charges will not exceed the actual costs of performing the environmental review. Advanced funds for all environmental review work may be secured contractually through the Facilities Study & Environmental Documentation Agreement.

Once the agreement is executed between Southwestern and the requesting party, the requesting party will advance funds to Southwestern for performing the studies. Southwestern reserves the right to halt work at any time should advanced funds not be received from the requesting party.

3.1.2 Funding for Land Acquisition

Advanced payment to Southwestern by the requesting party is required for Southwestern to perform any land acquisition activities. Estimated costs are based on historical expenses for similar projects and are specifically determined on a case-by-case basis by Southwestern. Charges will not exceed the actual costs associated with acquiring land. Advanced funds for land acquisition may be secured contractually through the Facilities Study & Environmental Documentation Agreement and/or the Standard Generator Interconnection Agreement or Construction Agreement.

3.1.3 Funding for Construction

Based on the studies and environmental documentation and review performed by Southwestern under the Facilities Study & Environmental Documentation Agreement, Southwestern may begin construction. If the construction of new

facilities would require the expenditure of Southwestern funds, Southwestern reserves the right to halt design and/or construction at any time during its work until funds are received.

3.1.4 Funding for Equipment Replacement

Should replacement of existing equipment be required, the equipment will be removed and replaced at the sole expense of the requesting party; however, Southwestern, at its sole discretion and option, may: 1) Participate in the costs of the proposed project; and/or 2) allow ownership of replaced Southwestern equipment to be transferred to the requesting party in exchange for transfer of ownership of the new equipment to Southwestern.

3.1.5 Funding for Facilities Operations and Maintenance

The Standard Generator Interconnection Agreement, Construction Agreement, or other agreement will set forth funding required by the requesting party, if any, for long-term operations and maintenance associated with the interconnection.

3.1.6 Excess Payments

Any advanced payment made by the requesting party in excess of the actual costs incurred by Southwestern will be refunded, without interest.

3.2 Reliability Requirements

Interconnection to Southwestern's transmission facilities must be consistent with Southwestern's mission and prudent utility practices. A proposed interconnection must not degrade the reliability or operating flexibility of the existing power system and must meet NERC's *Planning Standards and Operating Manual* procedures, the SPP Criteria, and Southwestern's transmission system performance criteria.

The requesting party will be responsible for testing and reporting requirements in accordance with applicable NERC Planning Standards, SPP Criteria, or any similar standards of a successor organization to either NERC or SPP.

3.3 Safety and Security Requirements

When making an interconnection to Southwestern's facilities, the requesting party must comply with applicable safety laws, building and construction codes, provisions of Federal regulations (including the Contract Work Hours and Safety Standards Act and regulations promulgated by the Secretary of Labor pursuant to the Act), and state or local safety, health, and industrial regulations and codes. Additionally, all requesting parties must comply with the requirements outlined in Southwestern's *Power Systems Safety Manual*. In the event that the requesting party does not adhere to construction and safety procedures, Southwestern may issue an order to stop work until such time that the requesting party demonstrates compliance with the provision at issue. The requesting party cannot make a claim for compensation or damage resulting from such work stoppage. Copies of Southwestern's construction and safety procedures will be provided upon request.

Each interconnection must be constructed in accordance with Southwestern's safety and security standards. Safety related standard design features include, but are not limited to:

- 1) A ground grid that solidly grounds all metallic structures and other non-energized metallic equipment.
- 2) Modifications to ground grids of existing substations (if necessary) to keep grid voltage rise within safe levels.
- 3) Switch operating platforms for all disconnect switches, with ground conductors connected to the operating mechanisms. Switch operating platforms must be metal grates and must be installed in such a way that water will drain freely from the platform.
- 4) Disconnect switches (gang-operated) that are lockable in the open position by Southwestern.
- 5) Fall protection features permanently installed on equipment.

3.4 Environmental Requirements

Southwestern is required to assess the potential environmental impacts of any proposed interconnection in accordance with the National Environmental Policy Act (NEPA) of 1969, other environmental policies and laws, and applicable DOE rules and regulations. Requesting parties are advised to consult with Southwestern as early as possible in the planning process to obtain guidance with respect to the appropriate level and scope of any studies or environmental information that Southwestern requires. DOE's NEPA Implementing Procedures (10 C.F.R. 1021) require that Southwestern begin its environmental review as soon as practicable. All proposed interconnections (actions) require Southwestern to implement provisions of the NEPA requirements. There are three possible levels of environmental review under the NEPA requirements:

- 1) A categorical exclusion (CX) can be used when no significant impact on the natural or human environment can be easily demonstrated without the use of detailed analyses. For interconnections that do not involve integration of a new source of generation into Southwestern's transmission facilities, change the operation limits of existing generation, provide service to new discrete loads, or cause major system changes (new transmission lines greater than 10 miles or reconstructing existing transmission lines greater than 20 miles) and for which no adverse impacts are identified, Southwestern may be able to prepare a CX. This process can take up to six months to complete, depending on the scope of the interconnection.
- 2) An environmental assessment (EA) can be used when analyses are required to demonstrate that the proposed action will not produce a significant impact on the natural or human environment. A finding of no significant impact (FONSI) is the final decision-making document.
- 3) An environmental impact statement (EIS) must be used when the proposed action will produce a significant impact on the natural or human environment. The final decision-making document for an EIS is a record of decision (ROD).

Southwestern may prepare the EA or, if necessary, use a contractor selected by Southwestern. Furthermore, if an EA is prepared, one result may be a determination that an EIS is necessary (in the case that significant impacts may occur), thus extending the time to complete the NEPA process.

Southwestern may participate in the environmental process of another Federal or state agency involved with a project to satisfy portions of its NEPA requirements; however, environmental reviews and related studies conducted by other agencies must meet the standards placed upon Southwestern by DOE's NEPA Implementing Procedures to be adopted for use.

The environmental process may be influenced by one or more studies conducted by SPP related to the interconnection. If the results of SPP's studies demonstrate a need for regional system additions to support the interconnection, the environmental studies must address such additions along with the interconnection. The applicable NEPA documents will be completed before Southwestern renders a final decision on the request for interconnection. Southwestern considers the environmental analysis contained in the NEPA documents in reaching its decisions for an interconnection, as stipulated in DOE's NEPA Implementing Procedures.

When the requesting party is the construction manager, the requesting party will be required to provide an environmental review of the proposed plan so that Southwestern can determine what further actions are needed to comply with the above requirements. A copy of environmental documents prepared by or for another Federal or state agency involved with the project should be furnished to Southwestern.

Generally, Southwestern will own all equipment located in a Southwestern substation; however, in the event the requesting party will own equipment located in Southwestern's substation, switchyard, or right-of-way, the requesting party will be financially responsible for all activities necessary to comply with the requirements of existing or subsequent applicable Federal or state environmental laws and regulations and Southwestern's requirements, if any. Where specific environmental mitigation, as determined through the NEPA process, is required because of construction activities, Southwestern is obligated to report annually on the status of such mitigation. The requesting

party will be required to provide Southwestern with periodic reports in sufficient detail to permit Southwestern to compile and submit its annual Site Environmental Report or other related reports.

3.5 Land Acquisition Requirements

If the interconnecting facilities are to be owned by Southwestern, then land rights necessary for the interconnection must be owned by Southwestern, and Southwestern will typically conduct all land acquisition activities, including appraisals, legal descriptions, title evidence, negotiations, title clearance, recordation, and payment. Projects may also require damage resolution with landowners following construction. All land rights will be acquired pursuant to Federal laws governing acquisition of real property, which is particularly important when other Federal and institutional lands are affected by the interconnection.

In certain circumstances, Southwestern may determine that the requesting party is capable of performing the necessary land rights activities. When this is the case, Southwestern will coordinate closely with the requesting party to ensure proper procedures are followed, and that the proper land rights are obtained. Agreements concerning land acquisition issues such as fee or easement, right-of-way width, and title acceptability must be reached between Southwestern and the requesting party before any land rights are acquired and transferred to Southwestern.

If land rights are to be owned by Southwestern land acquisition may begin as soon as the Standard Generator Interconnection Agreement or Construction Agreement is executed, initiating the research of property ownership, and continues through other interconnection process steps with appraisals, preparation of legal descriptions, and title search. The process may extend through the completion of construction. Typically, negotiations between Southwestern, the requesting party, and/or affected landowners do not begin until the environmental FONSI or ROD is complete, prior to construction. Southwestern will use the power of eminent domain only to the extent such use is authorized by the laws of the United States, and consistent with then-current Southwestern policy.

3.6 Contractual Requirements

All arrangements for technical work, environmental work, design, construction, facility ownership, land ownership, operations, maintenance, and replacement of equipment must be set forth in written agreements between Southwestern and the requesting party prior to start of any work and at appropriate intervals thereafter. Such agreements establish provisions for estimated costs, advance of funds, work to be performed, project schedule, and other work related items.

All work related to an interconnection to Southwestern's facilities is subject to Southwestern's applicable General Contract Provisions (GCPs). These GCPs will be furnished upon request.

4.0 TECHNICAL REQUIREMENTS

4.1 System Planning

For interconnection requests associated with new generation facilities or transmission service, the requesting party must coordinate with Southwestern to evaluate impacts to Federal facilities at the point of interconnection and with SPP for the performance of studies to evaluate potential regional impacts and limits to transfer capability on facilities beyond the immediate point of interconnection. It is the responsibility of the requesting party to contact SPP and establish requisite contracts for all studies performed by SPP. If either SPP or Southwestern studies indicate that additions or upgrades to the existing transmission facilities beyond the point of interconnection are necessary, Southwestern and SPP will coordinate to determine the cost of additions or upgrades and the time frame for implementing such system additions or upgrades.

For interconnection requests associated with load served from Southwestern's system or a new Balancing Authority Area tie requiring a new tap to a Southwestern transmission line or substation interconnection, the requesting party must coordinate with Southwestern to evaluate impacts to Federal facilities at the point of interconnection to Southwestern. If the studies indicate that additions or upgrades to the existing transmission facilities are necessary, Southwestern will determine the cost of additions or upgrades and the time frame for implementing system additions or upgrades.

Studies conducted or required by SPP and/or Southwestern will typically include power flow, transfer capability analysis, and short circuit studies. It is the responsibility of the requesting party to provide any special modeling data. Power flow analysis will include long-term load and resource growth data and planned facilities needed to satisfy such requirements.

Should replacement of existing equipment be required because of the interconnection, Southwestern will retain equivalent capacity and operational control as previously existed, unless otherwise evidenced in one of the applicable agreements.

4.1.1 Power Quality

Unbalanced phase voltages and currents can affect protective relay coordination and cause high neutral currents and thermal overloading of transformers. To protect electrical equipment, the interconnected generator's or load's contribution at the point of interconnection must not cause a voltage phase unbalance greater than 1 percent or a current phase unbalance greater than 5 percent (phase unbalance is the percent deviation of one phase from the average of all three phases).

Harmonics can cause telecommunication interference and thermal heating in transformers, disable solid state equipment, and create resonant over voltages. To protect equipment from damage, harmonics must be mitigated. The interconnected generator or load must not create voltage and current harmonics on Southwestern's facilities that exceed the limits specified in the Institute of Electrical and Electronics Engineers (IEEE) Standard 519, Recommended Practices and Requirements for Harmonic Control in Electric Power Systems (harmonic distortion is defined as the ratio of the root mean square value of the harmonic to the root mean square value of the fundamental voltage or current). Harmonic distortion measurements may be conducted at the point of interconnection, generation, or load site or other locations on Southwestern's facilities to determine whether the project is the source of excessive harmonics.

Many methods may be used to restrict harmonics. The preferred method is to install a transformer with at least one delta connection between the generator or load and Southwestern's facilities. This method significantly limits the amount of voltage and current harmonics entering the transmission system.

Voltage fluctuations associated with equipment or loads at the point of interconnection may be noticeable as visual lighting variations (flicker) and can damage or disrupt the operation of electronic equipment. IEEE Standard 519 provides definitions and limits on acceptable levels of voltage fluctuation. All generators/loads connecting to Southwestern's transmission facilities must comply with the limits set by Standard 519.

4.1.2 Generation Interconnections

Generating sources must be three phase to qualify for connection with Southwestern's transmission system. Generating sources must be connected using a wye-delta generator step up transformer, and the transformer must be connected wye on the high side.

Automatic synchronization must be supervised by a synchronizing check relay IEEE Device 25. This assures that no generator is connected to the power system out of synchronization. Generating sources must not close or reclose automatically onto a de-energized transmission facility connection.

Generators must meet all applicable American National Standards Institute (ANSI) and IEEE standards. The prime mover and the generator should be able to operate within the full range of voltage and frequency excursions that may exist on the transmission system without incurring damage.

The excitation system of synchronous generators is required to be fast-responding (i.e., voltage response is 0.5 seconds or less). The excitation system should be equipped with protective devices (volts/hertz protection, overexcitation protection, etc.).

A voltage regulator with a transformer-drop compensation circuit may be required to control voltage at a point beyond the generator terminals. The compensator is typically set to account for 50 to 80 percent of the transformer impedance.

Voltage schedules may be established by Southwestern for interconnection facilities to ensure efficient and reliable electrical power transmission and for adequate service to loads. The voltage schedules will establish operating requirements, which may vary on a seasonal, daily, or hourly basis. All interconnected synchronous generators are required to participate in voltage regulation by adhering to prescribed voltage schedules.

Synchronous generators are required to produce or absorb reactive power between 0.95 leading and 0.95 lagging power factor for steady state conditions to meet voltage schedules. They are also required to produce or absorb reactive power up to the temporary thermal capability of the generator during disturbances. The generator's voltage regulator is generally set to maintain constant voltage rather than constant power factor. The regulator set point is coordinated with voltage schedules in the area. The voltage regulator must be capable of maintaining the voltage at the generator terminal, without hunting, within 0.5 percent of any set point. The operating range of the regulator must be at least plus or minus 5 percent of the nominal voltage rating of the generator.

Induction generators must provide, at a minimum, sufficient reactive power capability to deliver the generator output at unity power factor at the point of interconnection. Adding equivalent reactive power in the form of shunt capacitors at locations other than the point of interconnection may be an acceptable alternative, as determined by Southwestern. Power factor correction capacitors may need to be switched to participate in voltage regulation.

A speed governor system is required on all synchronous generators. The governor regulates the output of the generator as a function of the system frequency. That function (called the governor's "droop" characteristic) must be coordinated with the governors of other resources to assure proper system response to frequency variations. The speed governor system must have a droop characteristic that may be set between 3 and 7 percent and typically set to 5 percent.

Southwestern's system protection requirements are designed and intended to protect Southwestern's facilities only. Additional protective relays are typically needed to protect an interconnected generator. It is the generation owner's responsibility to install the proper protective relaying needed to protect the generator and associated equipment.

Power system disturbances caused by faults or forced outages of equipment expose connected generators to oscillations in voltage and frequency. It is important that generators remain in service to help ensure that any dynamic or transient oscillations are stable and damped. Therefore, each generator must be capable of continuous operation at 0.95 to 1.05 per unit voltage and 59.5 to 60.5 Hertz and for even larger deviations for short periods. Nearly all generators have inherent capability for off-nominal operation; however, over/under voltage and over/under frequency relays are normally installed to protect the generators from such off-nominal operation for extended periods of time. To ensure that the interconnected generators do not trip prematurely, the time delays for these relays must be coordinated with Southwestern.

Generation integration may substantially increase fault current levels at nearby substations. Modifications to the ground grids of existing substations may be necessary to keep grid voltage rises within safe levels. Ground grids must be designed to ANSI/IEEE Standard 80-1986, IEEE Guide for Safety in AC Substation Grounding. Interconnecting new generation resources can also change equipment duty of existing breakers and other equipment. System impact and/or facilities studies will include the evaluation of the impact of the interconnected generator on equipment duties.

Requesting parties should contact SPP to determine if additional operational and/or communications requirements will apply to the interconnection of new generation facilities within SPP.

Southwestern has a statutory duty to fulfill its obligations under Section 5 of the 1944 Flood Control Act, and Southwestern has limited ability to provide Balancing Authority Area services to accommodate the inclusion of generation in Southwestern's Balancing Authority Area. Southwestern shall have the discretion to determine whether each generating facility will electrically reside within the Balancing Authority Area of Southwestern based on

Southwestern's review of the operational characteristics of such facility in conjunction with the capabilities of Southwestern's resources and authorities.

4.1.3 Load Interconnections

Typically, all loads connected directly to Southwestern's facilities are required to maintain a power factor between 0.95 lagging and 0.95 leading measured at the point where the load interconnects with Southwestern-owned equipment. If the specified power factor requirement is not met, Southwestern, after giving the requesting party a reasonable period in which to correct the condition, may install power factor correction equipment at the customer's expense. Southwestern also includes power factor penalties in its rate schedule.

Southwestern maintains transmission voltages at levels required for economic and reliable transmission of electricity. Regulation to keep voltage variations within limits acceptable to end-use customers is typically provided on distribution. Load owners are strongly urged to install their own voltage regulation equipment. The requesting party must verify specific requirements with the appropriate Southwestern office.

Southwestern's system protection requirements are designed and intended to protect Southwestern's system only. Additional protective relays are typically needed to protect an interconnected load. The load owner must install the proper protective relaying needed to protect the load facilities.

To meet the reliability requirements of SPP and NERC, under frequency and/or under voltage load shedding schemes may be required. Any load connected to Southwestern's facilities will be expected to participate in under frequency and/or under voltage load shedding if Southwestern determines such participation is necessary. Any cost associated with load shedding equipment is the responsibility of the requesting party.

4.2 Design

Southwestern will typically provide for design, specification, and construction of taps to Southwestern transmission lines or interconnections within existing Southwestern owned substations; however, design and construction by others may be allowed on a case-by-case basis. All design and construction by others is subject to review and approval by Southwestern. All work performed by Southwestern, including revisions to existing Southwestern drawings and review of work by others, will be at the expense of the requesting party.

Modifications to Southwestern's facilities to accommodate the proposed interconnection must adhere to Southwestern's *Design Manual* (Standard 330-04). Any variation from the *Design Manual* may be considered on a case-by-case basis. Copies of the *Design Manual* are available upon request.

Drawings for facility additions must conform to Southwestern's *CAD Drafting Standards Reference Manual* and be approved by Southwestern. The requesting party must supply drawings in electronic format(s) compatible with Southwestern's computer aided design systems. The requesting party must also reimburse Southwestern for drawing costs associated with creating or revising drawings. Drawings become or remain the property of Southwestern. Copies of Southwestern's Drafting Standards will be furnished to the requesting party if the design is not produced by Southwestern. "As-built" drawings must be provided prior to operation of the interconnection. Three complete sets of accurate substation drawings must be provided to Southwestern for non-Southwestern owned substations. These drawings must include, but not be limited to, station plot plans, equipment layouts, one-line diagrams, control circuit schematics and wiring diagrams. Updated copies of these drawings must be furnished to Southwestern within 60 days of any modification to non-Southwestern owned equipment or substations within Southwestern's facilities.

Power circuit breakers, disconnecting switches, and other equipment installed in Southwestern's facilities must adhere to Southwestern's standard equipment identification schemes. Breaker and switch operating identifiers will be assigned by Southwestern. All switches to be operated by Southwestern will be locked with locks furnished by Southwestern. All switches to be operated by Southwestern must be designed in accordance with Southwestern's *Design Manual*.

4.2.1 Substations

Generally, power circuit breakers must be installed for interconnections at substations. Typical specifications covering circuit breaker requirements are available from Southwestern upon request.

Installation of equipment in substations must conform to Southwestern's requirements and must be approved by Southwestern. Oil-filled equipment, including bushings, must not contain polychlorinated biphenyls (PCB). In addition, oil-filled equipment must be permanently labeled by the manufacturer as non-PCB. Certification must be provided to Southwestern at or before the time of installation. Oil-filled equipment may require an oil spill containment system to comply with U.S. Environmental Protection Agency or state regulations. Any increased environmental costs associated with such compliance identified during or after construction will be borne by the requesting party.

All interconnecting substations must have a ground grid that solidly grounds all metallic structures and other non-energized metallic equipment. This grid must limit the ground potential gradients to voltage and current levels that will not endanger the safety of people or damage equipment located in, or immediately adjacent to, the substation under normal and fault conditions.

4.2.2 Transmission Line Taps

Proposed taps to Southwestern's facilities are subject to approval on a case-by-case basis. Taps can be placed on existing lines as long as N-1 outage criteria is not violated and all loads can be fed radially from either terminal (N-1 outage criteria means the interconnected power system must be operated at all times so that general system instability, uncontrolled separation, cascading outages and/or voltage collapse will not occur as a result of the loss of a single system element). Upon review of the proposed tap, Southwestern may require equipment in addition to that described below to maintain reliability, reduce duration of outages, and facilitate maintenance of transmission facilities.

Taps to lines must meet the following minimum criteria:

- 1) A line section protected by circuit breakers may have a mileage maximum for tap lines that are not protected by circuit breakers, determined on a case-by-case basis. In general, the total tap line lengths of all tap lines on a single transmission circuit should be no more than ten miles or 20 percent of the length of the tapped transmission circuit.
- 2) Whenever possible, and as determined by Southwestern, a proposed interconnection to a transmission line will be connected to the line at an existing tap. The interconnection may be connected on either the high side or low side of transformation at the tap. Two or more connections at the high side of an existing tap are considered multiple taps and may require sectionalizing circuit breakers. Connections at the low side of an existing tap may require appropriate compensation to the owner of an existing transformer for use of the tap substation facilities.
- 3) Normally, no more than one connection, without sectionalizing circuit breakers, is permitted between transmission line breakers. Southwestern, at its discretion, may allow two or more connections between transmission line breakers if there is no degradation of system reliability, and there is no impact to operations or maintenance activities.
- 4) New 69-kV and higher voltage lines must have overhead ground wire shielding over the entire length of the tap line. A breaker may be required for the tap line due to relaying or specific reliability criteria.
- 5) Circuit breakers or circuit switchers, as determined by Southwestern, must be installed in the line sectionalizing positions for all tap substations. These circuit interrupting devices will be used to de-energize line sections without interruption of the tapped loads, when necessary. Circuit switchers, if used, must have an integral disconnect switch with a visible air gap. Normally, Southwestern assumes ownership of all line sectionalizing devices; however, even if Southwestern does not assume ownership, Southwestern will still maintain operational control.

- 6) For taps serving load, an ungrounded high voltage winding is the preferred transformer connection. No more than one grounded transformer will be permitted to tap a line.
- 7) For taps connecting generation, a grounded high voltage winding is the preferred transformer connection.
- 8) All Southwestern 138-kV and 161-kV lines are protected by high speed relaying schemes utilizing protective relay communications. Relaying installed to clear tap line circuit faults must not measurably degrade the line relaying or interfere with the capability of high speed reclosing of the tapped transmission line. High speed clearing of all tap line faults from the tap station will be required under normal operating conditions if the tap station is a source of positive sequence fault current to faults on the tapped line.

The tap should not adversely affect the relay protection scheme on existing tap(s). Additional taps can be placed on existing lines where delta-wye transformers are used. Autotransformers or three-winding transformers are sources of zero sequence current and can complicate coordination of directional ground over current and ground distance relaying. Southwestern strongly recommends sectionalizing transmission lines whenever autotransformers or three-winding transformers are installed.

The proximity of the tap to either line terminal may affect the protective relaying scheme on the transmission line. The tap transformer impedance and relative location of the tap on the transmission line may necessitate installation of high speed relaying schemes utilizing protective relay communications on 69 kV lines in order to prevent tripping of the line for faults on the low voltage side of the tap.

- 9) Line sectionalizing devices must be capable of Supervisory Control and Data Acquisition (SCADA) system control. A remote terminal unit (RTU) must be installed at all tap substations including all associated equipment to provide for SCADA control. Southwestern has installed optical ground wire (OPGW) on most of its transmission lines. If available, the tap will make use of the existing OPGW as a communication medium to accomplish SCADA control and metering and for high-speed piloted relaying if necessary.
- 10) Parties requesting non-Southwestern designed transmission line taps must submit designs, calculations and drawings demonstrating that the structures and foundations have been designed in accordance with Southwestern's *Design Manual*.

4.2.3 System Protection

Protective relaying requirements for each interconnection will be determined by Southwestern after receipt of a preliminary one-line drawing of the proposed interconnection and a one-line drawing and maps of the requesting party's facilities or system in the area. The requesting party should provide recloser and fuse ratings, relaying data and line and transformer impedances. Southwestern's lines are normally protected with two high-speed piloted direction comparison blocking schemes, with ground overcurrent and step-distance backup. The relaying channel is usually through fiber optic ground wire or power line carrier.

4.3 Operations and Maintenance

Operation and dispatching authority of the circuit breakers, disconnects, interrupters and motor operated disconnect switches that are an integral part of Southwestern's facilities will remain with Southwestern. Southwestern's operations staff will order switching and issue all clearances and hot-line orders on the transmission portion of the interconnection or substation. This will involve use of Southwestern's switching and clearance procedures, including the use of Southwestern locks and tags.

The owner of installed equipment will be responsible for its proper operation and maintenance unless otherwise approved by Southwestern. Equipment must be operated and maintained in accordance with the manufacturer's recommendations, prudent utility practices, and applicable environmental and safety standards.

If construction is done by others, Southwestern may require at least one Southwestern representative be present to coordinate and provide for switching, clearances, special work permits and inspections during construction work on Southwestern's right-of-way. The Southwestern representative will also conduct operability checkout on equipment, including metering, relay settings and tests, and protective device operation (circuit breakers, motor operated

disconnects, etc.). Final electrical connections to Southwestern's facilities will be made by Southwestern or under Southwestern's supervision.

Southwestern must be notified and have the right to witness settings and testing of relays, meters, and controls that could affect the integrity and security of Southwestern's facilities. Southwestern must also have the right of unescorted entry to interconnected facilities for emergency operation and maintenance of equipment or structures Southwestern deems necessary to maintain a reliable power system.

4.3.1 System Control

Supervisory control by Southwestern of transmission line power circuit breakers, interrupters, or motor operated disconnects will be required on all interconnections where breaker, interrupter, or disconnect switch operations can, in Southwestern's opinion, directly affect the security of Southwestern's power system. The RTU for SCADA control must be compatible with the SCADA system used by Southwestern and modified if necessary to accommodate Southwestern's replacements and upgrades. Installation of the RTU at a new location or modification of an RTU at an existing facility will generally be performed by Southwestern, at the expense of the requesting party. Southwestern will perform the necessary expansion, including hardware and software changes, to the SCADA master station equipment at the requesting party's expense for that portion attributed to the new interconnection. Transducers, interface hardware, and appropriate communication channels compatible with existing SCADA system requirements must be furnished by the requesting party. Specifications for such equipment will be provided upon request. The requesting party must provide necessary auxiliary and control relays, hot-line indication, local-supervisory switches, hotline order lamp, and all other equipment necessary to interface with Southwestern's supervisory control equipment.

4.3.2 Ownership and Maintenance

Ownership of installed facilities is determined on a case-by-case basis. However, Southwestern generally retains operation and dispatching authority of those facilities considered to be integral to Southwestern's transmission system regardless of ownership.

The owner of equipment installed on Southwestern property is financially responsible and liable for the proper maintenance of such equipment in accordance with manufacturer's recommendations and prudent utility practices. Southwestern will operate and perform routine maintenance on facilities located in its substations unless otherwise agreed to by Southwestern. Southwestern reserves the right to perform all maintenance on equipment installed on Southwestern property. Furthermore, ownership of all equipment or personal property placed on Southwestern's land or in Southwestern's facilities must be clearly marked on the equipment or property; otherwise, Southwestern assumes ownership of such equipment or property.

Southwestern reserves the right to maintain operational control of all facilities that interconnect with Southwestern's transmission facilities that may be vital to system stability and telemetry values.

Southwestern reserves the right to approve transmission system changes at the tap, substation, or interconnection that affect operation of Southwestern's facilities, including interconnecting with facilities of a third party.

Southwestern will perform maintenance on relaying and control equipment and other associated equipment for which Southwestern has operational responsibility, unless otherwise agreed.

Requirements for operations, maintenance, ownership and replacement of equipment associated with an interconnection facility will be specified in a new or amended contract with the requesting party.

4.4 *Communications and Metering*

4.4.1 Communications

Southwestern or the requesting party must provide communications facilities sufficient to meet Southwestern's telephone, radio, system protection, remote meter reading, and SCADA requirements solely at the expense of the requesting party. Unless otherwise agreed to by Southwestern and the requesting party, Southwestern will design, furnish, install, and own all communications that are an integral part of Southwestern's facilities.

The communication equipment will be provided by the requesting party. Southwestern will specify the type, speed, and characteristics of the communication equipment so that compatibility with existing communications, SCADA control, relaying, and telemetering equipment is maintained. The specific type of communication equipment to be furnished by the requesting party will be reviewed and approved by Southwestern. The requesting party will reimburse Southwestern for the costs of any additional facilities provided by Southwestern.

Fiber optic additions to new or existing Southwestern transmission lines will be considered on a case-by-case basis. Technical analyses of clearances, structural loads, and electrical field effects may limit applications. Outage restrictions and maintenance responsibilities may also impact potential paths. Southwestern reserves the right to negotiate the acquisition of individual optical fibers on the circuit, per agreement between the requesting party and Southwestern.

4.4.2 Metering

Current transformers used for revenue metering circuits must meet the accuracy standards, as specified under IEEE Standard Requirements of Instrument Transformers, ANSI/IEEE C57.13, for an accuracy class of 0.3 percent at all burdens. The thermal current rating of current transformers must exceed the maximum current capacity of the circuit involved by a factor of 1.5 to 2.0.

Capacitive coupled voltage transformers are not acceptable for revenue or interchange metering. Voltage transformers used for revenue or interchange metering circuits must meet the accuracy standards, as specified under ANSI/IEEE C57.13, of 0.3 percent accuracy with the following burdens:

- “W” through “Y” burden for 25-kV and below; and
- “W” through “ZZ” burden for above 25-kV.

Revenue metering with mass memory storage must be used. Such revenue metering must be compatible with the metering requirements and practices of Southwestern in the region where the revenue meter will be located.

Meters must be installed on the primary side of the system on Southwestern-owned facilities, or, subject to Southwestern’s approval, meters may be installed on the low side of the system and correction factors will be applied to account for transformer losses.

Interconnections that establish additional or new Balancing Authority Area boundaries require the requesting party to furnish all necessary Balancing Authority Area metering equipment.

5.0 POINTS OF CONTACT

Contracts and customer service:

Director, Division of Customer Service
One West Third Street
Tulsa, OK 74103-3502
(918) 595-6600
interconnection@swpa.gov

Planning, studies, engineering design, and cost estimates:

Director, Division of Engineering and Planning
One West Third Street
Tulsa, OK 74103-3502
(918) 595-6600
systemeng@swpa.gov

Operations, scheduling, and maintenance of communications facilities:

Director, Division of Scheduling and Operations
2858 South Golden
Springfield, MO 65807-3207
(417) 881-2600
systemops@swpa.gov

Maintenance of transmission facilities, Gore, Oklahoma and Jonesboro, Arkansas areas:

Director, Division of Maintenance
RR 3, Highway 10, 74435-9802
P.O. Box 728
Gore, OK 74435-0728
(918) 489-5582
maintenance@swpa.gov

Appendix 1: Application for Interconnection

To be completed by the requesting party.

APPLICATION FOR INTERCONNECTION

Thank you for your interest in interconnecting to Southwestern Power Administration's (Southwestern) transmission facilities. Please complete this application and return it to Southwestern to ensure the most expedient and thorough response. Completing this application for interconnection does not qualify the requesting party for receipt of transmission service. Transmission service requires a separate application under the Southwest Power Pool Open Access Transmission Service Tariff. ***This application is not applicable to generator interconnections.***

Date of Application:	Proposed/Estimated Date of Interconnection:
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APPLICANT INFORMATION	APPLICANT'S AGENT/REPRESENTATIVE INFORMATION (If applicable)
Name and Title:	Name and Title:
Company/Organization Name:	Company/Organization Name:
Full Street Address (include State and ZIP):	Full Street Address (include State and ZIP):
Telephone Number:	Telephone Number:
Fax Number:	Fax Number:
E-mail Address:	E-mail Address:

Type of Interconnection:

Transmission line tap(s)
 New power delivery point(s)
 Substation breaker bay additions

Description of Requested Interconnection (include as much of the following information as possible on attached sheets; **label all information clearly**):

1. One-line diagram(s) showing the proposed interconnection
2. Drawing(s) indicating physical arrangements of existing and proposed facilities
3. Geographic location of proposed interconnection and structure numbers, if available
4. Description of proposed routing and dimensions and configurations of new structures and facilities
5. Description and ratings of proposed transformers, circuit breakers, switches, metering, associated communications, and relaying and other equipment
6. Proposed transmission path(s) and service arrangements between resources and associated loads, where applicable
7. Appropriate revenue and telemetering equipment specifications
8. Copies of relevant planning or operational studies
9. Description of generating resources or loads
10. Proposed construction schedule
11. Copies of relevant environmental impact assessments, reports, or projections, or description of anticipated scope of environmental review

Please submit the completed application for interconnection to Southwestern as described below. A Southwestern representative will contact you when the application is received. Please allow up to 30 days for processing of the application once it is received by Southwestern.

Submit Application by facsimile or e-mail: Attn: Director, Division of Customer Service 918-595-6656 interconnection@swpa.gov	Submit Application by mail or overnight courier: Attn: Director, Division of Customer Service Southwestern Power Administration One West Third Street Tulsa, OK 74103-3502
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For more information, contact the Director of the Division of Customer Service at 918-595-6600.