
WESTERN AREA POWER ADMINISTRATION

General Requirements for Interconnection

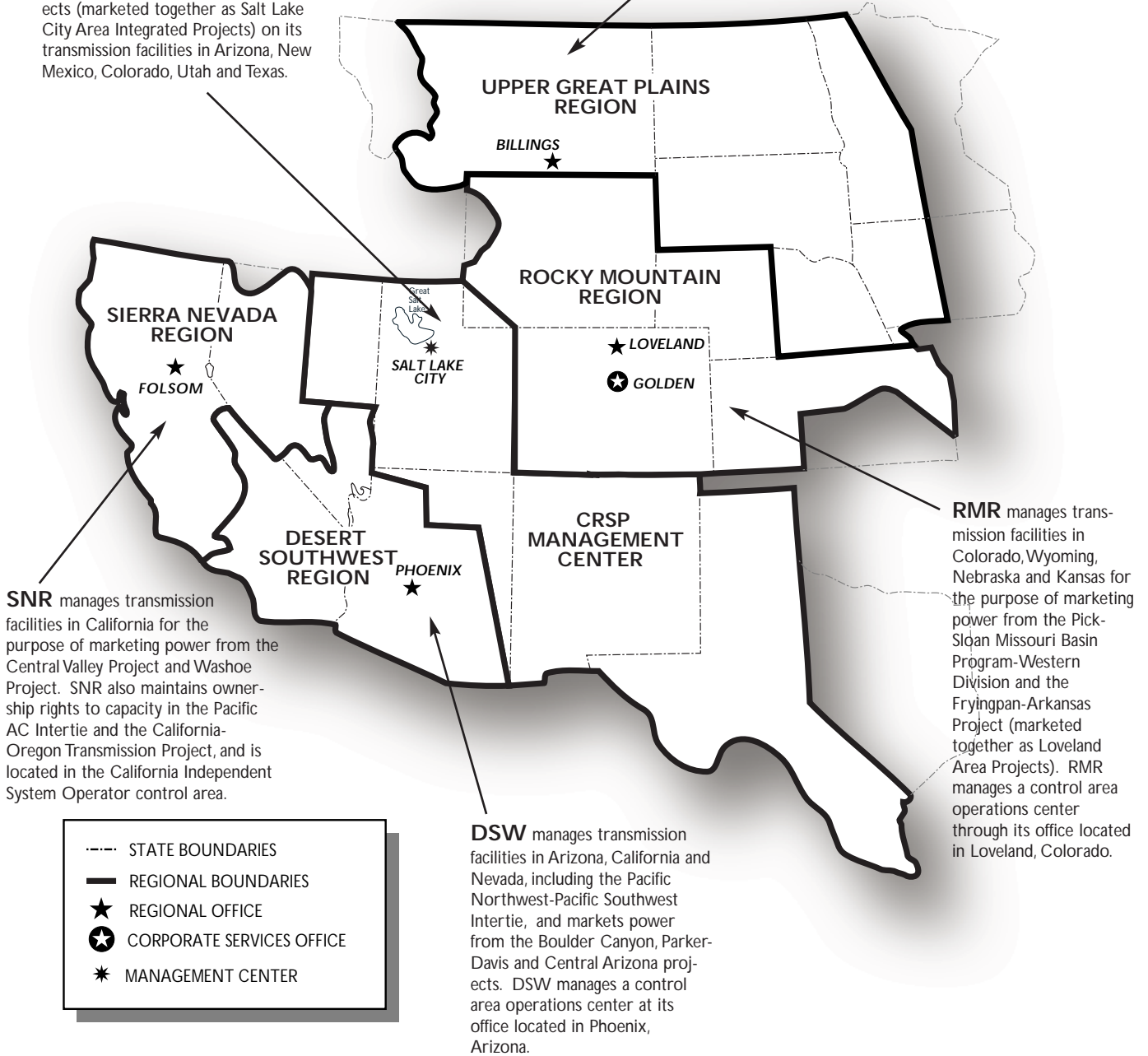


September 1999

U.S. Department of Energy

The **CRSP** Management Center markets power from the Colorado River Storage, Collbran, and Rio Grande projects (marketed together as Salt Lake City Area Integrated Projects) on its transmission facilities in Arizona, New Mexico, Colorado, Utah and Texas.

UGPR manages transmission facilities in Montana, North Dakota, South Dakota, Nebraska, Minnesota, and Iowa and markets power from the Pick-Sloan Missouri Basin Program-Eastern Division. UGPR transmission facilities are integrated with the transmission facilities of Basin Electric Power Cooperative and Heartland Consumers Power District. UGPR manages a control area operations center in Watertown, South Dakota.



The Desert Southwest Region, Rocky Mountain Region, Sierra Nevada Region, Colorado River Storage Project Management Center, and western portion of Upper Great Plains Region operate within the Western Systems Coordinating Council (WSCC). The eastern portion of the UGPR operates within the Mid-Continent Area Power Pool (MAPP).

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Administrator's Introduction

Greetings,

Western Area Power Administration (Western) welcomes your interest in our requirements for interconnecting with Western's transmission facilities, and looks forward to working with you to facilitate interconnection under the process discussed within this booklet.

These general requirements are offered as guidelines to assist in interconnecting to Western's facilities. Western reserves the right to modify these requirements at any time to meet changing conditions.



Michael S. Hacskaylo
Administrator

September 20, 1999

Western's Transmission Facilities

Western was established on December 21, 1977, pursuant to Section 302 of the Department of Energy Organization Act of 1977 (Public Law 95-91). Our mission is to market and deliver reliable, cost-based hydroelectric power and related services. Western maintains efficient, cost-effective, and reliable power system facilities for the delivery of long-term firm power to its electric service customers.

We operate and maintain more than 16,800 circuit miles (27,000 kilometers) of transmission lines, 258 substations, and other electric power facilities in a geographic area encompassing 1.3 million square miles (3.38 million square kilometers) in 15 central and western states. Western sells firm wholesale power to more than 638 customers including rural electric cooperatives, municipalities, public utility districts, Federal and state agencies, irrigation

districts, and private utilities. These power customers, in turn, provide electric service to millions of retail consumers. In addition to the Corporate Services Office in Golden, Colo., Western operates and maintains transmission facilities and markets power from its four regional offices in Billings, Mont.; Phoenix, Ariz.; Loveland, Colo.; and Folsom, Calif.; and the Colorado River Storage Project Customer Service Center in Salt Lake City, Utah.

Electric power marketed by Western is generated by the U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, and International Boundary and Water Commission, which operate 55 hydropower generating plants in our service area. Additionally, we market the United States' entitlement from the Navajo coal-fired plant near Page, Arizona. The generating capacity of the plants from which Western markets power is more than 10,600 megawatts.



Purpose

General Requirements for Interconnection is intended to be a guide for the prompt processing of interconnection requests. This document describes Western's general requirements and the process for interconnection, addition or modification to Western's transmission facilities. It provides an overview of funding, reliability, safety and security, environmental, land acquisition, technical and contractual requirements, as well as lists Western points of contact and references.

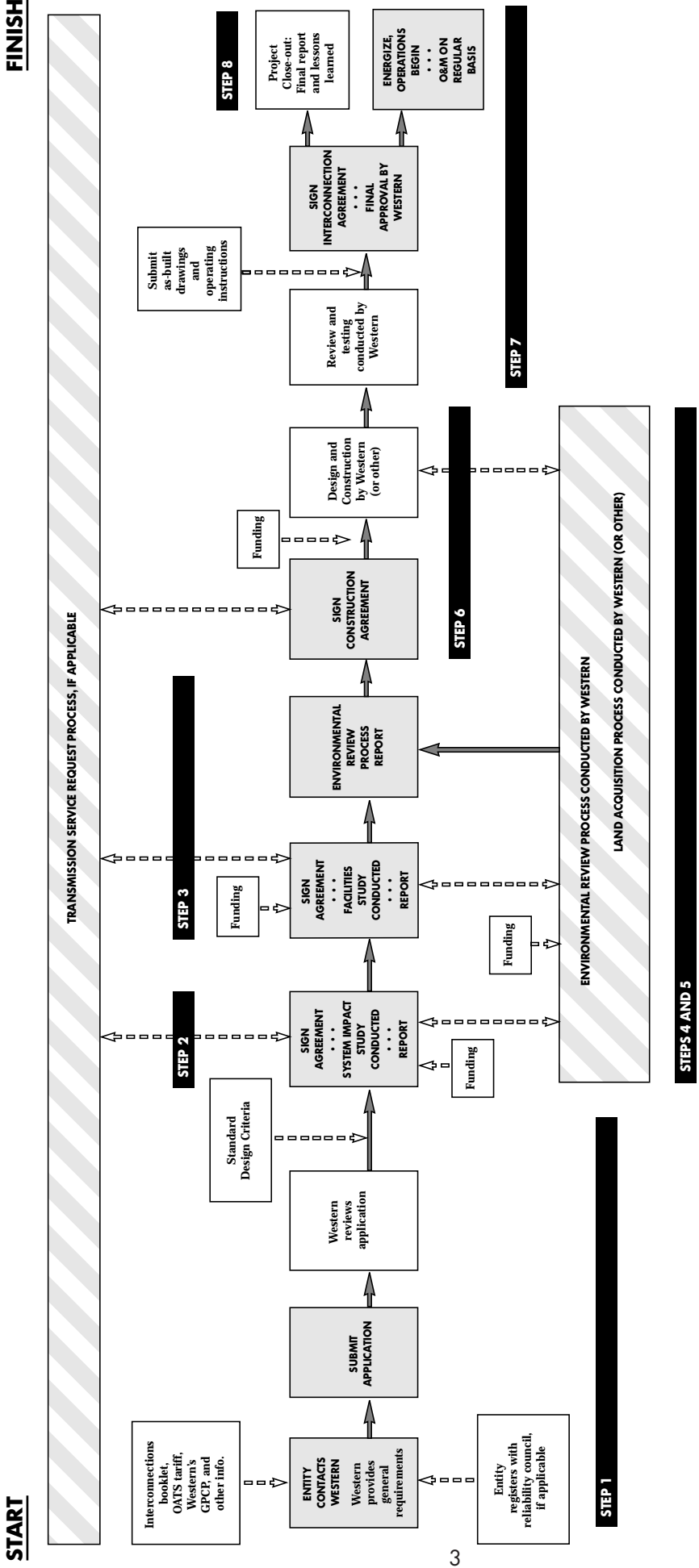
This document sets forth the minimum requirements for interconnection with Western's transmission facilities. There may be additional requirements by Western depending upon the location and scope of the

proposed interconnection. The steps outlined in the interconnection process may be further streamlined when Western deems appropriate.

Interconnection is a separate but parallel process to other processes, including the transmission service request process set forth in Western's Open Access Transmission Service Tariff (Tariff) (63 FR 521), the environmental review process outlined in the U.S. Department of Energy's National Environmental Policy Act (NEPA) *Implementing Procedures*, and Western's land acquisition process. These processes may share steps in order to ensure an efficient interconnection. It is Western's intent to make the separate processes as seamless as possible.



Interconnection Process Diagram



NOTE: This diagram shows the full standard process for interconnection in a general chronological order. In actuality, the steps may overlap, be consolidated or otherwise be expedited, when appropriate.

The interconnection process does not guarantee transmission service, which is a separate but parallel process detailed within Western's Open Access Transmission Service Tariff. It is not a substitute for formally requesting transmission service through the Tariff.

STEP 1. Contact Western and submit application

STEP 2. System impact study and agreement

STEP 3. Facilities study and agreement

STEP 4. Environmental review process

STEP 5. Land acquisition process

STEP 6. Design and construction

STEP 7. Interconnection agreement, review and testing, and energize

STEP 8. Project close-out

Interconnection Process

Each request for interconnection is evaluated on a case-by-case basis and is subject to meeting reasonable needs of the requesting entity. The requesting entity may be an electric utility, a firm-power customer, a private power developer, or an independent power generator.

Western assumes responsibilities to operate and maintain its interconnected facilities.

Direct interconnection to Western's facilities does not involve nor guarantee transmission capacity on Western's system. Transmission service requests must be made in accordance with Western's Open Access Transmission Service Tariff. The Tariff is available on Western's website at www.wapa.gov, or may be furnished to the entity requesting interconnection. It is also posted on regional Open Access Same-Time Information Systems (OASIS). Transmission service request review is a separate process from interconnection request review, though for efficiencies some steps are shared. Additional parallel processes include environmental review and land acquisition, which are discussed in more detail in this document.

There are seven general steps in the interconnection process. Within legal and technical parameters, the steps in this process may be modified by Western on a case-by-case basis depending upon the specific circumstances of the requested interconnection.

Step 1: Contact Western and submit application

Requesting entities are encouraged to discuss proposed projects with a representative at the Western office in which the interconnection will occur (see Western

Points of Contact, page 29). Discussion, and subsequent review of the request by Western, will help Western determine what studies are necessary.

Generally, the requesting entity should be registered with the appropriate reliability council before requesting interconnection with Western. After initial contact, Western will provide—or make available through Western's website at www.wapa.gov—interconnection related information, including Western's *General Requirements for Interconnection* (this booklet), the Application for Interconnection (see Appendix), the Tariff if applicable, Western's applicable *General Power Contract Provisions* and other supporting safety, environmental and operations information.

Formal requests for interconnection—using the application contained in the Appendix or through a similar written request—should be submitted at least 18 months in advance of when the equipment or construction specifications are to be issued for bid. Such lead time allows Western to develop a proposed plan and designs and specifications for Western-owned, -operated and -maintained facilities, as well as to review line taps owned by others.

Western may take up to 30 days to process the interconnections request.

When submitting an interconnection request to Western, the requesting entity should provide as much of the following information as possible to help expedite the design or review process. This information is also listed in summary form on

the Application for Interconnection.

- A. Single-line diagram(s) showing the proposed interconnection, including any relaying and metering facilities.
- B. Drawing(s) indicating the physical arrangements of existing and proposed facilities.
- C. Geographic location of the proposed interconnection, including land ownership pattern, if available. If a tap, indicate adjacent structure numbers.
- D. Description of the proposed routing, approximate lengths and conductor size of transmission line additions or modifications, and dimensions and configurations of new structures.
- E. Description and ratings of any proposed breakers, switches, metering, associated communications, relaying and other related equipment.
- F. Description of transformer voltage and rating, winding connections, impedance if available, and proposed method of protection.
- G. Proposed construction schedule.
- H. Description of the generating resources or loads to be served by the interconnection and the proposed transmission path(s) and service arrangements between resources and associated loads, where applicable. The description should include the following:
 - (1) Power output or load requirements, including 10-year projections, by delivery points, of winter and summer peaks for loads

served or generation supplied through the point of interconnection;

- (2) Size, type and ratings of large equipment;
 - (3) Reliability and special operation requirements; and
 - (4) Impedance, frequency, voltage, reactive power and protective relaying characteristics of the interconnecting resource or load.
- I. 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.
 - J. Copies of relevant planning or operational studies.
 - K. Copies of relevant environmental impact assessments, reports, or projections; or description of anticipated scope of environmental review.

The application for interconnection does not pertain to transmission service, which uses a separate application. Concurrent requests for transmission will share certain steps where appropriate, but are conducted under separate Western authorities. For transmission application information, see the Tariff.

If Western denies the request for interconnection, a summary of reasons will be provided, and Western will make every reasonable effort to support the requesting entity in revising the request, as applicable.

Step 2: System impact study

Western will conduct a system impact study. When the interconnection results from a transmission request, Western will use the study process outlined in Attachment D to the Tariff. The study will assess the capability of the transmission system to support the requested interconnection, including any special studies necessary to evaluate the need to offset potential Western control performance problems. The study will use the criteria and process detailed in Sections 4 and 5 of Western's Federal Energy Regulatory Commission Form 715 (available upon request) when the request occurs in the WSCC area, and use the MAPP system impact study methodology (available upon request) when the request occurs in the MAPP area.

Within 30 days of receiving the requesting entity's application for interconnection, Western will provide a System Impact Study Agreement in which the requesting entity agrees to advance funds for Western to perform the study. The requesting entity must sign and return the agreement to Western within 15 days or the request is deemed withdrawn.

Western will make every effort to complete the system impact study within 60 days of agreement execution. The study will identify system constraints and redispatch options and any necessary additional direct assignment facilities and network upgrades.

Once the system impact study is complete, a report will be developed and provided to the requesting entity for review.

Within 30 days after receiving the results of the system impact study, an entity requesting both interconnection and trans-

mission service may request in writing an Expedited Service Agreement. The Expedited Service Agreement provides for the requesting entity to compensate Western in advance for all costs to be incurred by Western following the system impact study. These costs may include identification of facility additions or upgrades, design, construction, environmental review, land acquisition, and energization. Rather than separate contractual agreements for facilities study, construction, transmission service, and interconnection, the Expedited Service Agreement provides for one contractual agreement incorporating the full interconnection process, from facilities study to operation and maintenance, including transmission service.

Western will provide the requesting entity its best estimate of new facility costs and other charges, but the estimate is not binding and the requesting entity must agree in writing to compensate Western in advance for all costs incurred in the interconnection and transmission service processes in order for this expedited process to occur. For further information, refer to Section 19.8 of the Tariff, or contact the appropriate Western office.

Step 3: Facilities study and design

A facilities study is necessary to determine upgrades or modifications needed at the point of interconnection. Within 30 days after Western completes the system impact study, Western will provide a Facilities Study Agreement in which the requesting entity agrees to advance funds for Western to perform the study. The requesting entity must sign and return the agreement to Western within 15 days or the request is deemed withdrawn.

Western will make every effort to complete the facilities study within 60 days of

agreement execution. The study will include estimates of the cost of facilities design and construction as well as the time required to complete design and construction.

Once the facilities study is complete, a report will be developed and provided to the requesting entity for review.

Step 4: Environmental review

As a Federal agency, Western conducts an environmental review of any action affecting Western's transmission facilities. The environmental review process can range from a categorical exclusion to a comprehensive environmental impact statement, including the required public process for such a statement. The environmental review process is conducted simultaneously with other studies.

Requesting entities are required to advance funds for Western to conduct the environmental review process. See Funding Requirements (page 9) for further information.

The environmental review process uses input from the studies and construction planning processes. It may be concluded before or after completion of these technical studies, when applicable. Continuation of the interconnection process at any and every step is contingent upon favorable environmental review.

If the environmental review determines that the interconnection does not satisfy Federal environmental criteria, Western will either deny the request or work with the requesting entity to revise aspects of the interconnection request to meet environmental criteria. Such revisions may occur at various steps during the process.

Step 5: Land acquisition

Upon completion of the environmental process, negotiations for any necessary land rights begin. Negotiations should be complete and the land rights obtained prior to the start of construction. Requesting entities are required to advance funds for Western to conduct the necessary land acquisition activities. See Funding Requirements (page 9) for further information.

Western will, unless otherwise agreed to by Western and the requesting entity, perform all land acquisition activities.

Step 6: Design and construction

Once the facilities study is complete, Western will tender a Construction Agreement to the requesting entity. The requesting entity has 30 days to sign and return the agreements to Western and provide advance payment. Western cannot continue without funding in place.

Western will, unless otherwise agreed to by Western and the requesting entity, design the interconnection. See Technical Requirements, Design (page 20), for further information.

Western will also, unless otherwise agreed to by Western and the requesting entity, perform all construction. See Technical Requirements (page 16) for further information.

Step 7: Review and testing, interconnection agreement, and energize

Once construction has been completed—and before energizing the new interconnection—Western will review and test the new facilities. Western will use prudent utility practice in review and testing.

Before energizing, Western must also receive the appropriate as-built drawings, operating instructions and other relevant materials. See Technical Requirements, Operations and Maintenance (page 23), for further information.

When the facilities are found to be in conformance with *Western's Standard Design Criteria*, *Power Systems Safety Manual* and related requirements, Western will tender an Interconnection Agreement to the interconnecting entity. The Interconnection Agreement—also termed mutual services, operations and maintenance, control area, or consolidated agreement in some regions—provides for the long-term operation and maintenance of the interconnected facilities. The Interconnection Agreement generally includes sections on licensing, maintenance, operations, special instructions, and funding, as applicable. When to the benefit of Western and the interconnecting entity, the

Interconnection Agreement may be tendered at the same time as the earlier Construction Agreement.

The interconnected facilities may be energized following execution of the Interconnection Agreement. If Western does not maintain direct control of the facilities, then Western will maintain backup control of all facilities deemed to be vital to system stability. See Technical Requirements, Operations and Maintenance (page 23), for further information.

Step 8: Project close-out

Western will develop a final report with a list of lessons learned to help facilitate future interconnections. Western invites the interconnecting entity to join in developing a joint final report that benefits Western and the entity.

Funding Requirements

All Western costs associated with the interconnection request are the responsibility of the requesting entity.

Advance funds are required before Western performs any studies, design, land acquisition or construction. The contractual agreements will specify the amount of funds required to be advanced. Upon receipt by Western, advance funds will be placed in a cost account for the project. Periodic cost statements will be furnished as studies and work progress.

Application processing fee, if applicable (Step 1)

Application processing fees apply only to transmission-related interconnection requests, as part of the transmission services request process.

The application processing fees and requirements for all transmission service-related requests are provided in Attachment K to Western's Open Access Tariff.

There is no application fee for non-transmission-related interconnections.

System impact study fee (Step 2)

A System Impact Study Agreement will be executed between Western and the requesting entity which will clearly specify Western's estimate of the actual cost of the system impact study. The charge will not exceed the actual cost of the study. Requesting entities will not be assessed a charge for existing system studies when they are applicable, but the requesting entity will be responsible for charges associated with any modifications to existing planning studies that are reasonably necessary to evaluate the entity's request.

Funding is required after the System Impact Study Agreement is signed and before the system impact study is performed.

Facilities study fee (Step 3)

A facilities study is necessary to evaluate the impact of the potential interconnection. Once a Facilities Study Agreement is executed between Western and the requesting entity, the requesting entity will advance funds to Western for performing the study. The facilities study fee is determined on a case-by-case basis.

Funding for environmental review (Step 4)

Advance payment to Western by the requesting entity is required to perform the necessary environmental review. Costs are based on historical expenses for similar interconnections, are specifically determined on a case-by-case basis by Western, and will not exceed the actual costs of performing the review. Advance funding for environmental review may be secured contractually through the System Impact or Facilities Study Agreements, and/or through the Construction Agreement.

Funding for land acquisition (Step 5)

Advance payment to Western by the requesting entity is required for Western to perform any land acquisition activities. Costs are based on historical or set expenses for similar projects, are specifically determined on a case-by-case basis by Western, and will not exceed the actual costs for acquiring land. Advance funding for land acquisition may be secured contractually through the System Impact or Facilities Study Agreements, and/or through the Construction Agreement.

Funding for facilities design and construction (Step 6)

The facilities study performed by Western will include a good faith estimate of (1) the cost of direct assignment facilities to be charged to the requesting entity and (2) the requesting entity's appropriate share of the cost of any required network upgrades. The requesting entity will pay its share of the costs of new facilities or upgrades, including design, before Western can begin or allow construction. When the facilities study is complete and presented to the requesting entity, the entity has 30 days to sign and return to Western a Construction Agreement and provide the advance payment. If the construction of new facilities would require the expenditure of Western funds, Western reserves the right to halt construction until funds for construction are appropriated.

Funding for equipment replacement (Step 6)

Should replacement of existing equipment be required, the equipment will be removed and replaced at the sole expense

of the requesting entity. However, Western, at its sole discretion and option, may:

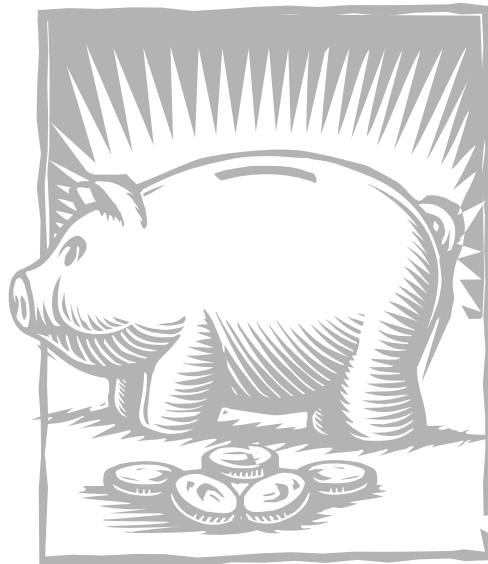
- A. Participate in the costs of the proposed project; and/or
- B. Allow ownership of replaced Western equipment to be transferred to the requesting entity in exchange for transfer of ownership of the new equipment to Western. The requesting entity would then receive a contract right for the incremental capacity in the new equipment.

Funding for facilities operations and maintenance (Step 7)

The Interconnection Agreement or other agreement will set forth funding required by the interconnecting entity, if any, for long-term operations and maintenance associated with the interconnection.

Excess payments (Step 7)

Any advance payment made by the requesting entity in excess of the actual costs incurred by Western will be refunded, without interest.



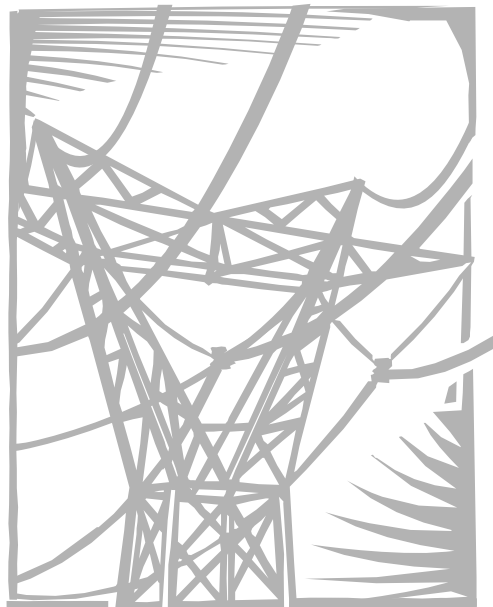
Reliability Requirements

Interconnection to Western's transmission facilities will be consistent with Western's mission, Open Access Transmission Service Tariff (when applicable) and prudent utility practices. A proposed interconnection must not degrade the reliability or operating flexibility of the existing power system, and must meet the North American Electric Reliability Council's *Planning Standards* and *Operating Manual* procedures. The interconnection must comply with the WSCC policies and procedures where the interconnection is geographically located within WSCC's boundaries and the MAPP *System Design Standards* when the interconnection is geographically located within MAPP's boundaries. When involving Western-owned, -operated and -maintained facilities, the interconnection must also comply with Western's *Standard Design Criteria*. Additionally, the interconnection must adhere

to any independent system operator reliability criteria in effect.

The interconnecting entity will be responsible for testing and reporting requirements in accordance with applicable NERC *Planning Standards*, WSCC *Reliability Management Standards*, MAPP *System Design Standards*, or any similar standards of a successor organization to either NERC, WSCC or MAPP.

Additionally, interconnecting generators in the WSCC area must comply with the *Reliability Management System Agreement* between WSCC and Western, effective June 18, 1999. The agreement requires compliance with WSCC reliability criteria and subsequent sanctions by WSCC if the generator fails to meet applicable reliability criteria when interconnected to Western's facilities.



Safety and Security Requirements

When making an interconnection to Western's facilities, the requesting entity shall comply with applicable safety laws and building and construction codes. These include provisions of applicable Federal (Contract Work Hours and Safety Standards Act and regulations promulgated by the Secretary of Labor pursuant to the Act), state, or local safety, health and/or industrial regulations or codes; Western's *Power Systems Safety Manual*; and WAPA Order 3790.1B, Occupational Safety and Health Program. Copies of the *Power Systems Safety Manual* and WAPA Order 3790.1B will be furnished upon request.

Each generating site and/or interconnecting facility must be constructed in accordance with Western's *Standard Design Criteria*. Safety-related standard design features include, but are not limited to:

- A. A ground grid that solidly grounds all metallic structures and other non-energized metallic equipment.
- B. Modifications to ground grids of existing substations (if necessary) to keep grid voltage rise within safe levels.
- C. Switch operating platforms for all disconnect switches, with ground conductors connected to the operating mechanisms.
- D. Disconnect switches (gang-operated) that are lockable in the open position by Western.
- E. Fall protection features permanently installed on equipment.

The interconnecting entity must adhere to Western's *General Power Contract Provision No. 28, Construction and Safety Procedures*. In the event that the interconnecting entity does not adhere to construction and safety procedures, Western may issue an order to stop all or any part of the work until such time that the entity demonstrates compliance with the provision at issue. The entity cannot make a claim for compensation or damage resulting from such work stoppage. A copy of Western's *General Power Contract Provisions* will be provided upon request.

Reporting of all security offenses and incidents occurring on property under the charge and control of Western is required by Title 18, United States Code, DOE Order 0470.1, Chapter VII and WAPA Order 5500.1G. Prompt and accurate reporting to the local law enforcement agency as well as the applicable dispatch center will aid in the protection of people and property.

Environmental Requirements

Western is required to assess the potential environmental impacts of any proposed interconnection in accordance with the National Environmental Policy Act of 1969 and other environmental regulations. Requesting entities are advised to consult with Western 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 Western requires. The U.S. Department of Energy's *NEPA Implementing Procedures* (10 CFR 1021) require that Western begin environmental review as soon as practicable. The nature of the interconnection request will dictate the level of NEPA compliance required.

If the interconnection request does not involve integration of a new source of generation into Western's transmission facilities, change the operation limits of existing generation, provide service to new discrete loads, or cause major system changes (new transmission greater than 10 miles or reconstructing existing transmission lines greater than 20 miles) and there are no adverse impacts identified, Western may be able to prepare a categorical exclusion for the interconnection. This process can take up to six months to complete, depending on the scope of the interconnection. If the interconnection does involve any of the actions mentioned above, the environmental review process may take at least 18 months, depending on the scope of the interconnection. If Western determines that an environmental assessment (EA) or an environmental impact statement (EIS) is required, Western may prepare the EA or EIS and, if necessary, use a contractor selected by Western. If an EA is prepared, one result may be a determination that an EIS is necessary (in the case that sig-

nificant impacts may occur or controversy is likely), thus extending the time to complete NEPA compliance.

Western may participate in the environmental process of another Federal or state agency involved with a project to satisfy portions of its NEPA requirements. Environmental reviews and related studies conducted by other agencies cannot, however, be routinely adopted. They must meet the standards placed upon Western by the U.S. Department of Energy in its *NEPA Implementing Procedures*.

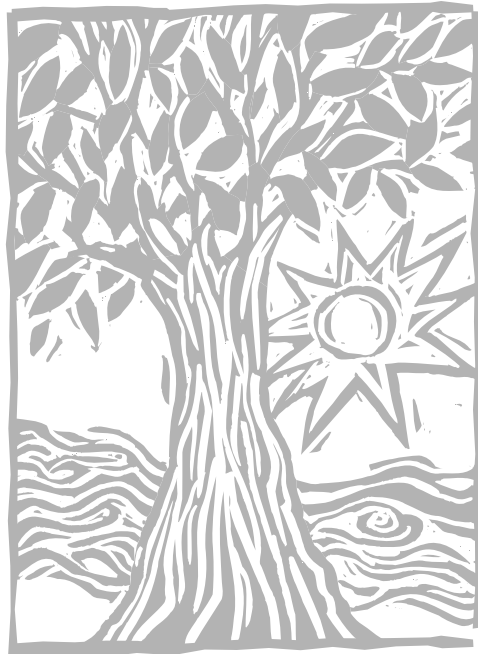
The environmental process may be influenced by system impact or facilities studies. If the results of studies demonstrate a need for system additions to support the interconnection, the environmental studies must address the additions along with the interconnection. The applicable NEPA documents will be completed before Western renders a final decision on the request for interconnection. Western considers the environmental analysis contained in the NEPA documents in reaching its decisions for an interconnection, as stipulated in the U.S. Department of Energy's *NEPA Implementing Procedures*.

When the requesting entity is the construction manager, the entity shall provide an environmental review of the proposed plan so that Western can determine what further actions, if any, 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 Western.

When the requesting entity will own equipment located in Western's substation, switchyard or right-of-way, the requesting entity shall

be financially responsible for all activities necessary to comply with the requirements of existing or subsequent applicable Federal or state environmental laws and regulations. Where specific environmental mitigation, as determined through the NEPA process, is required as a result of construction activities, Western is obligated to report annually on the status of such mitigation. The requesting entity shall provide Western with periodic reports in sufficient detail to permit Western to compile and submit its site environmental annual report.

The requesting entity must comply with Western's *General Power Contract Provisions* No. 29 and 30, Environmental Compliance and Responsibility for Hazardous Materials, respectively. A copy of Western's *General Power Contract Provisions* will be provided upon request.



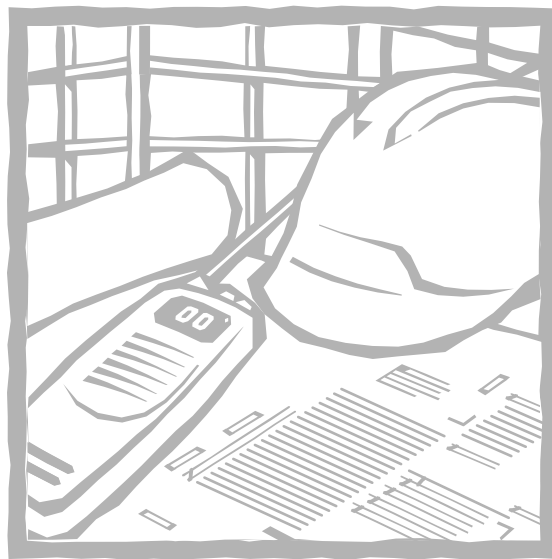
Land Acquisition Requirements

Land acquisition is a process that can begin as soon as the Application for Interconnection is received—initiating research of property ownership—and continue 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 Western, the interconnecting entity, and/or affected landowners do not begin until the environmental record of decision or finding of no significant impact is complete, prior to construction.

If the interconnecting facilities are to be owned by Western, then any new land rights necessary for the interconnection must be owned by Western. Western typically conducts 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 must 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, Western may determine that the requesting entity is capable of performing the necessary land rights activities. When this is the case, Western will coordinate closely with the interconnecting entity 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 Western and the interconnecting entity before any land rights are acquired and transferred to Western.



Technical Requirements

SYSTEM PLANNING

Western will conduct or review studies needed to substantiate system impact, reliability and capability of the transmission facilities given the addition of the proposed interconnection. The studies will include, but not be limited to, powerflow, system stability and short circuit studies. Subsynchronous resonance studies may also be required. It is the responsibility of the requesting entity to provide any specialized modelling data—compatible with Institute of Electrical and Electronics Engineers (IEEE), WSCC, or MAPP formats—for either power flow or dynamic simulations. Evaluation of alternatives to the proposed interconnection, such as lower voltage construction, reactive support facilities, or upgraded facilities, may be requested or conducted. Powerflow analysis will include 10-year load or resource growth projections and the planned facilities needed to satisfy such requirements. If the studies indicate that additions or upgrades to the existing transmission facilities are necessary, Western will conduct or review facilities studies to determine the cost of additions or upgrades and the time frame for implementing system additions or upgrades.

When Western considers integrating a new resource into transmission facilities, additional studies within the system impact or facilities studies may also be required. Operational problems on Western's facilities, either during normal or emergency conditions, may affect Western's control performance; and under certain conditions, the interconnecting entity may have to relinquish unit load and voltage control to Western's system dispatcher. The power factor for both the generating units and loads shall be measured at the interconnection point. Special region-specific operational studies will evaluate the transmission system and

reliability considerations. The North American Electric Reliability Council's *Planning Standards and Operating Manual* will be used by Western to evaluate system operating considerations.

Should replacement of existing equipment be required as a result of the interconnection, Western will retain equivalent capacity and operational control as previously existed.

Power Quality

Unbalanced phase voltages and currents can affect protective relay coordination and cause high neutral currents and thermal overloading of transformers. To protect Western and customer equipment, the interconnected generator's or load's contribution at the point of interconnection shall not cause a voltage unbalance greater than 1 percent nor a current 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, disabling solid state equipment and creating resonant over voltages. To protect equipment from damage, harmonics must be managed and mitigated. The interconnected generator or load shall not create voltage and current harmonics on Western's facilities that exceed the limits specified in 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. Single frequency and total harmonic distortion measurements may be conduct-

ed at the point of interconnection, generation or load site or other locations on Western'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 Western's facilities. This method significantly limits the amount of voltage and current harmonics entering the transmission system.

Voltage fluctuations 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 Western's transmission facilities shall comply with the limits set by this Standard.

Generation

Automatic synchronization shall be supervised by a synchronizing check relay IEEE Device 25. This assures that no synchronous generator is connected to the power system out of synchronization.

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

Voltage schedules are necessary for efficient and reliable electrical power transmission and for adequate service to loads. The voltage schedules establish hourly operating requirements and may be set for seasons, holidays, days of the week and time of day. All interconnected synchro-

nous generators are required to participate in voltage regulation by meeting voltage schedules.

Western may require additional reactive capability or voltage regulation to integrate the generation. It is the generator owner's responsibility to mitigate any unacceptable reactive or voltage regulation problems created from integrating the generation. If Western requires additional reactive or voltage regulation to solve other problems in an area, Western will negotiate with the generator owner for any additional capability beyond the minimum requirements stated above.

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. Within the Sierra Nevada Region, Western recommends the generating units conform to the California ISO's minimum specified power factor range (0.90 lag-producing VARs, and 0.95 lead-absorbing VARs). They are also required to produce or absorb reactive power up to the 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 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 shall be at least plus or minus 5 percent of the rated voltage of the generator.

The excitation system of synchronous generators is required to be fast-responding; i.e., the voltage response time is 0.5 seconds or less. A power system stabilizer uses auxiliary stabilizing signals to control the excitation system to improve power system dynamic performance. A power system stabilizer is required with the exci-

tation system for all interconnected synchronous generators 50 megavolt-ampere (MVA) and larger (75 MVA and larger for the MAPP region). However, it may be necessary to use a power system stabilizer on a smaller generator, depending on where the generator is interconnected to Western's facilities.

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, all located within the same control area, to assure proper system response to frequency variations. The speed governor system shall have a droop characteristic settable between 3 and 7 percent and typically set to 5 percent.

Western's system protection requirements are designed and intended to protect Western'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 generation equipment.

Western does not assume any responsibility for protection of the interconnected generation. The owner of the generator is solely responsible for protecting interconnected equipment in such a manner that faults, imbalances, or other disturbances on Western's transmission facilities do not cause damage to the generation facilities. A study of system protection requirements, funded by the interconnecting entity, may be necessary.

Induction generators or other generators—including wind turbines—without VAR control absorb VARs and therefore require reactive power support from Western's facilities. For generators larger than 40

kilowatts, Western will require power factor correction. Power factor correction capacitors must be installed either by the owner of the generation or by Western at the owner's expense. Switched capacitors supplied by the generation owner shall be switched on and off at the request of Western. Owners of interconnected induction generators shall provide, at a minimum, sufficient reactive power capability to deliver the generator output at unity power factor at the point of interconnection.

Induction generators are usually not required to participate in voltage regulation; however, they must not adversely affect voltage schedules. Integration studies may be necessary to determine the reactive power capability necessary to ensure that these schedules are maintained.

Power system disturbances initiated by faults and forced equipment outages 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 of time. Nearly all generators have inherent capability for off-nominal operation. Over/under voltage and over/under frequency relays are normally installed to protect the generators from extended off-nominal operation. To ensure that the interconnected generators do not trip prematurely, the time delays for these relays must be coordinated with Western.

A Remedial Action Scheme (RAS) is a special protection system that automatically initiates one or more pre-planned correc-

tive measures to restore acceptable power system performance following a disturbance. RAS application mitigates the impact of system disturbances and improves system reliability.

A typical disturbance, as it is considered in the planning and design of the electrical transmission facilities, is the sudden loss of one or more critical transmission lines or transformers. A widely applied corrective measure is to instantaneously drop a sufficient amount of generation on the sending end of the lost transmission facility. This is known as generator “dropping,” and a participating generation facility may be disconnected from the transmission by the automatic RAS controller, in much the same way as by a transfer-trip scheme. A generation facility should therefore have full load-rejection capability as needed both for local line protection and RAS.

Whether a RAS shall be required depends on the overall location and size of the generator and load on the transmission system; the nature, consequences and expected frequency of disturbances; and the nature of potential alternative transmission reinforcements.

If Western requires RAS participation for a particular generation facility, the generator owner shall be responsible for all related costs.

All generators connected to Western’s facilities must meet the power quality standards set forth in Technical Requirements, Power Quality (page 16). The generator owners must pay for any mitigation efforts necessary to meet those standards. Additionally, interconnecting generators in the WSCC area must comply with the *Reliability Management System Agreement* between WSCC and Western, which requires compliance with WSCC reliability criteria and subsequent sanc-

tions by WSCC if the generator fails to meet applicable reliability criteria when interconnected to Western’s facilities.

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. The ground grid should be designed to ANSI/IEEE Standard 80-1986, *IEEE Guide for Safety in AC Substation Grounding*.

Power system equipment is designed to withstand voltage stresses associated with expected operation. Interconnecting new generation resources can change equipment duty, and may require that equipment be replaced or switchgear, communications, shielding, grounding and/or surge protection added to restrict voltage stress to acceptable levels. System impact and/or facilities studies will include the evaluation of the impact of the interconnected generator on equipment insulation coordination. Western will identify any additions required to maintain an acceptable level of transmission facility availability, reliability, equipment insulation margins and safety.

Load

Typically, all loads connected directly to Western’s facilities are to maintain a power factor between 0.95 lag and 0.95 lead as measured at the point where the load interconnects with Western-owned equipment. If this power factor requirement is not met, Western may, after giving notice to correct the condition, install power factor correction equipment at the contracting entity’s expense. If Western is required to pay for delivery system improvements associated with power factor correction on the systems of its transmission agents—that are attributable to

conditions on the system of the interconnecting entity—the entity shall pay for the cost of such improvements. The appropriate Western office can provide specific requirements.

Western 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. Voltage regulation at transmission voltage levels is different from distribution voltage levels. Load owners are strongly urged to install their own voltage regulation equipment. Check with the appropriate Western office for specific requirements.

All loads connected to Western’s facilities must meet the power quality standards set forth in Technical Requirements, Power Quality (page 16). The load owner is responsible for any mitigation efforts necessary to meet those standards.

Western’s system protection requirements are designed and intended to protect Western’s system only. Additional protective relays are typically needed to protect an interconnected load. It is the load owner’s responsibility to install the proper protective relaying needed to protect the load facilities. Western does not assume any responsibility for protection of the interconnected load. The load owner is solely responsible for protecting interconnected equipment so that faults, imbalances or other disturbances on the transmission system do not cause damage to the load facilities.

To meet the reliability requirements of the WSCC and MAPP systems, under frequency and/or under voltage load shedding schemes may be required. Any load connected to Western’s facilities will be expected to participate in under frequency

and/or under voltage load shedding if Western determines such action is necessary to maintain system reliability.

If Western requires load shedding participation for a particular load facility, the load owner shall be responsible for all related costs.

A participating load may be disconnected from the transmission by the automatic RAS controller, in much the same way as by a transfer-trip scheme. The load owner should therefore have full load-rejection capability as needed both for local line protection and RAS.

Whether RAS shall be required depends on the overall location and size of the load on the transmission system; the nature, consequences and expected frequency of disturbances; and the nature of potential alternative transmission reinforcements.

If Western requires RAS participation for a particular load, the load owner shall be responsible for all related costs.

DESIGN

Western will provide for design, specification and construction of the proposed interconnection for Western owned, operated and maintained facilities. Non-Western design may be allowed on a case-by-case basis provided initial approval and subsequent review by Western. For transmission line taps owned by others, prints of applicable facility drawings will be furnished by Western upon request. All work performed by Western, including revisions to existing Western drawings, will be at the expense of the requesting entity.

Modifications to Western’s facilities to accommodate the proposed interconnection shall adhere to Western’s *Standard Design Criteria*

and *System Design Guide for Tap Stations* (Engineering Manual 6430.1). Any variation from the *Standard Design Criteria* may be considered on a case-by-case basis. Copies of these documents are available upon request.

Drawings for facility additions must conform to Western's *Drafting Standards* and be approved by Western. The requesting entity must supply drawings on a magnetic medium or in an electronic file, compatible with Western's computer-aided design system, AutoCAD. The requesting entity must also reimburse Western for drawing costs. Drawings become or remain the property of Western. Copies of Western's *Drafting Standards* will be furnished to the entity requesting the interconnection if the design is not produced by Western. "As-built" drawings must be provided prior to operation of the Interconnection Agreement. Three complete sets of accurate substation drawings shall be provided to Western for non-Western-owned substations. These drawings shall include, but not be limited to, station plot plans, equipment layouts, single-line diagrams, control circuit schematics and wiring diagrams. Updated copies of these drawings shall be furnished to Western within 60 days of any modification to non-Western owned equipment or substations within Western's facilities.

Power current breakers, disconnecting switches, and other equipment installed in Western's facilities shall adhere to Western numbering schemes. Breaker and switch operating numbers will be assigned by Western. All switches to be operated by Western will be locked with locks furnished by Western. All switches to be operated by Western shall be designed in accordance with Western's *Standard Design Criteria*.

Substations

Generally, power circuit breakers must be installed at all interconnections. Typical specifications covering circuit breaker requirements are available from Western

upon request. A review of the surrounding area power system characteristics, including system stability studies, will be made for a final determination when the need for out-of-step switching capability is questionable.

Installation of equipment in substations must conform to Western's requirements and must be approved by Western. Oil-filled equipment, including bushings, shall not contain polychlorinated biphenyls (PCB). In addition, oil-filled equipment shall be permanently labeled by the manufacturer as non-PCB. Certification shall be provided to Western 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 equipment costs due to these requirements will be borne by the entity requesting the equipment.

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

Transmission Line Taps

Proposed taps to Western's facilities are subject to approval on a case-by-case basis. Additional 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, system intact.

N-1 outage criteria means the interconnected power system shall 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.

Taps to lines of 138-kV, 115-kV and 69-kV 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.
- (2) A proposed interconnection to a transmission line, whenever possible as determined by Western, will be connected to the line at the high-side or low-side of an existing 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 by Western or the interconnecting entity.
- (3) Normally, no more than one connection, without sectionalizing circuit breakers, is permitted between 115-kV and 138-kV transmission line breakers. Western may, at its discretion, allow two or more connections between transmission line breakers if (a) there is no degradation of system reliability, and (b) there is no impact to safety or maintenance activities, or such impacts are mitigated.
- (4) New lines of 69-kV and above will 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) Interrupter switches or equivalent capable of interrupting load and charging current shall be installed in the line sectionalizing positions for all tap substations. These interrupters will be used to de-energize line sections without interruption of the tapped loads, if necessary. Line sectionalizing switches installed in transmission lines shall be furnished with grounding blades, and must have a visible air gap. Normally, Western assumes ownership of the sectionalizing switches. If Western does not assume ownership, however, Western will still maintain operational control.

- (6) An ungrounded high voltage winding is the preferred transformer connection on the tapped line; however, no more than one grounded transformer will be permitted to tap a 138-kV, 115-kV or 69-kV line.

Taps to transmission lines of 161-kV and higher voltages will not normally be allowed since lines at these voltage levels require the highest reliability. If exceptions are made, approved taps to transmission lines of voltages 161-kV and 230-kV (no taps for 345-kV or higher will be allowed) must meet the following criteria:

- (1) Only one tap between sectionalizing circuit breakers will be allowed. The requesting entity, at its cost, will be responsible for adding necessary circuit breakers when the requested tap exceeds one connection between circuit breakers.
- (2) A section of line 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.

- (3) All tap lines will have overhead ground wire over their entire length.
- (4) Nearly all Western high-voltage lines are protected by high-speed pilot relaying. Relaying for tap-line circuit faults must not measurably degrade the line relaying or interfere with the capability of high-speed re-closing of the tapped transmission line.
- (5) 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.
- (6) Interrupter switches or equivalent capable of interrupting load and charging current shall be installed in the line sectionalizing positions for all tap substations. These interrupters will be used to de-energize line sections without interruption of the tapped loads, if necessary. Line sectionalizing switches installed in transmission lines shall be furnished with grounding blades, and must have a visible air gap. Normally, Western assumes ownership of the sectionalizing switches. If Western does not assume ownership, however, Western will still maintain operational control.

The tap should not adversely affect the protection scheme or outage number on the present tap(s). Additional taps can be placed on existing lines where delta-wye transformers are used. Auto-transformers or three-winding transformers present sources of zero sequence current and can make both directional ground over current and ground distance relaying complicated. It is best to sectionalize whenever auto- or three-winding transformers are needed.

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 pilot relaying be installed on the line in order to prevent tripping of the line for faults in the low voltage tap system.

Entities requesting non-Western designed transmission line taps shall submit designs, calculations and drawings demonstrating that the structures and foundations have been designed in accordance with Western's *Standard Design Criteria*.

Taps to transmission lines with insulated overhead ground wires shall not degrade the capability of the existing overhead ground wires.

System Protection

Protective relaying requirements for each interconnection will be determined by Western after receipt of a preliminary single-line drawing of the proposed interconnection and a single-line drawing and maps of the requesting entity's facilities or system in the area. The entity should provide re-closer and fuse ratings, relaying data and line and transformer impedances. High-speed pilot, backup, breaker failure and out-of-step relaying are normal requirements for 230-kV voltage interconnections. Specialized relaying may be required to provide automatic load or generation shedding, or interconnected system separation.

New design requirements for system control are included within the Operations and Maintenance Section.

OPERATIONS AND MAINTENANCE

Operation and dispatching authority of the circuit breakers, disconnects, interrupters and motor-operated disconnect switches that are an integral part of Western’s facilities shall remain with Western. The appropriate power system operations office 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 Western’s switching and clearance procedures, including use of Western locks and tags. Issuance of clearances, hot-line orders, or general switching may be in the form of an inter-company clearance to a dispatching agent of the entity owning the facility rather than directly to a job supervisor. Switching on the equipment that is connected to and/or associated with Western’s facilities will be directed by the Western dispatcher according to Western’s *Power Systems Switching Procedures*.

The owner of installed equipment will be responsible for its proper operation and maintenance. Equipment must be operated and maintained in accordance with manufacturer’s recommendations, prudent utility practices and applicable environmental and safety standards. This may include fall protection requirements (design and maintenance). Western may require additional equipment to assure a reliable interconnection and to safeguard the proper operating conditions of its power system. Western prefers, in many cases, to provide required operation and maintenance services when funds have been advanced to cover these costs through the Interconnection Agreement. Costs may include training on maintenance procedures for unfamiliar equipment.

The interconnecting entity will write Standard Operating Procedures in coordination with Western for the interconnected facility.

Five sets of instructions and manufacturer’s drawings shall be furnished to Western for each piece of equipment that Western operates.

System margins allow for operational flexibility in the areas of (1) power flow, for impedance concerns; (2) fault duty, for reliability during switching and line fault tripping; (3) sub-synchronous resonance, affecting new equipment through ground paths on existing equipment; and (4) stability, relating to overloads or VAR support on existing system components.

If the interconnection uses system margin reliability in Western’s facilities other than at the specific interconnection, the entity shall:

- (1) Refund those components of margin used to the owners of the margin;
- (2) Rebuild facilities affected to add or replace the margin consumed; or
- (3) Meet other such requirements as agreed to by Western and the entities.

Western will demonstrate the margin impact using systems planning models for power flow, fault duty, sub-synchronous resonance and stability.

If construction is done by others, Western may require at least one Western representative be present to coordinate and provide for switching, clearances, special work permits and inspections during construction work on Western’s right-of-way. The Western 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 Western’s facilities will be made by Western or under Western’s supervision.

Maintenance will normally be performed by

and at the expense of the entity that owns the equipment or facility when the proposed interconnection involves a tap or substation sectionalizing one of Western's transmission lines, in accordance with the Interconnection Agreement. Western shall be notified and have the right to witness settings and testing of relays, meters and controls that could affect the integrity and security of Western's facilities. Western shall also have the right of entry to interconnected facilities for emergency operation and maintenance of equipment or structures Western deems necessary to maintain a reliable power system.

System Control

Supervisory control by Western of line power circuit breakers, interrupters or motor-operated disconnects will be required on all interconnections where breaker, interrupter or disconnect switch operations can, in Western's opinion, directly affect the security of Western's power system. The remote terminal units (RTU) for supervisory control and data acquisition (SCADA) shall be compatible with the SCADA system used within the Western region in which the interconnection is located. Installation of the RTU at a new location or modification of an RTU at an existing facility will generally be performed by Western, at the expense of the requesting entity. Western will perform the necessary expansion, including hardware and software changes, to the SCADA master station equipment at the requesting entity's expense for that portion attributed to the new interconnection.

Transducers, interface hardware and appropriate communication channels compatible with existing SCADA system requirements shall be furnished by the requesting entity. Specifications for such equipment will be provided upon request. The requesting entity shall provide necessary auxiliary and control relays, hot-line indication, local-supervisory switches, hot-

line order lamp and all other equipment necessary to interface with Western's supervisory control equipment.

Interconnections that establish additional or new control area boundaries require the requesting entity to furnish all necessary control area metering equipment. These requirements may include, but are not limited to:

- (1) Analog and/or digital telemetering at the point of interconnection;
- (2) Analog to digital conversion equipment and tone gear, as required, at both the point of interconnection and Western's power system control center;
- (3) Totalizing equipment at the point of interconnection or some intermediate point on the communications link. A multipoint RTU may be substituted in some cases. If a multipoint RTU is used, a points list identifying alarms, events and telemetered quantities will be jointly developed between the requesting entity and Western. The service agreement implementing the multipoint RTU will include operating/dispatch jurisdiction, primary and backup service control protocol, SCADA tagging and control design, switching procedures and definitions of terms used by the system operators;
- (4) Communications links to both Western and the other organization's power system control center; and/or
- (5) Automatic generation control hardware and software changes or additions at the power system control centers.

Western's telemetering, scheduling and interconnection metering are performed on a megawatt or whole megawatt-hour basis; therefore, interconnection metering and totalizing equipment shall meet this criterion. In some of Western's load control areas, a dynamic schedule to the appropriate automatic generation controller may be a consideration for radial tap lines to Western's facilities whenever the load is supplied from a source outside the Western control area. Similarly, internal generating resources supplying loads outside Western's load control area may require special equipment at Western's and other organizations' power system control centers.

Ownership and maintenance

Ownership of installed facilities is determined on a case-by-case basis. However, Western generally retains operation and dispatching authority of those facilities that Western does not own but considers to be an integral part of Western's facilities.

The owner of equipment installed on Western property is financially responsible for proper maintenance of the equipment in accordance with the manufacturer's recommendations and prudent utility practices. Western reserves the right to perform all maintenance on equipment installed on Western property.

Western reserves the right to maintain backup control on all facilities that interconnect with Western's transmission facilities and that may be vital to system stability and telemetry values.

Contractual agreements implementing interconnection by others to Western's facilities will normally allow Western or Western's customers the right to connect to either the high-side or low-side bus of

the substation in which Western maintains ownership rights, at the incremental cost of the additions. Appropriate compensation for use of the tap substation facilities by Western or its customer will be arranged if the low-side bus of the substation is being tapped. Embedded costs are not reimbursed.

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

Western will operate and perform routine maintenance on facilities located in its substations unless otherwise specified in the Interconnection Agreement. When the proposed replacement or additions are at a Western substation, contractual arrangements will include provisions for an advance of funds for the costs of labor and other expenses, including allocable overhead costs, associated with operation and routine maintenance work performed by Western.

When an existing Western transformer is replaced, maintenance costs attributed to the new transformer will be shared on the basis of the ratio of the capacity retained by Western to the capacity of the new transformer. When an additional transformer is involved, maintenance costs attributed to the new transformer normally will be the responsibility of the equipment owner. Periodic advances of funds may be required to cover the estimated cost of operation and maintenance work to be performed by Western on equipment owned by others, as set forth in the Interconnection Agreement. If Western is required by reliability concerns to upgrade a facility or add an interconnection, the requesting entity shall fund its part of the power facilities changes.

Western will perform maintenance on relaying and control equipment and other associated equipment for which Western has operating 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 (Interconnection Agreement) with the requesting entity.

COMMUNICATIONS AND METERING

Communications

Western or the requesting entity shall provide communications facilities sufficient to meet Western's telephone, radio, system protection, remote meter reading and Energy Management System/SCADA requirements. Western shall, unless otherwise agreed to by Western and the interconnecting entity, design, furnish, and install all communications that are an integral part of Western's facilities.

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

Fiber optic additions to new or existing Western transmission lines will be considered on a case-by-case basis. Technical

analysis of clearances, structural loads and electrical field effects may limit applications. Outage restrictions and maintenance responsibilities may also impact potential paths. Western reserves the right to negotiate the acquisition of individual optical fibers on the circuit, per agreement between the interconnecting entity and Western.

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 shall exceed the maximum current capacity of the circuit involved by a factor of 1.5 to 2.0.

Voltage transformers used for revenue metering circuits must meet the accuracy standards, as specified under ANSI/IEEE C57.13, of 0.3 percent accuracy with the following burdens:

- (1) "W" through "Y" burden for 25-kV and below; and
- (2) "W" through "ZZ" burden for above 25-kV.

Revenue metering with mass memory storage shall be used if the estimated maximum demand is 500 kilovolt-amperes or greater, or if maximum simultaneous demand billing is contractually required. Such revenue metering shall be compatible with the metering policy established by Western in the region where the revenue meter will be located.

On Western-owned facilities, meters shall be installed on the primary side of the system.

Contractual Requirements

All arrangements for system studies, design and construction, ownership, operations, maintenance, and replacement of equipment must be set forth in written contractual agreements between Western and the requesting entity prior to start of any work and at appropriate intervals thereafter (see Interconnections Process, page 4).

All work related to interconnecting to Western's facilities is subject to Western's applicable *General Power Contract Provisions* in effect at the time of contract negotiations. These *Provisions* will be furnished upon request.

When Western determines that an interconnection is consistent with the requirements in this document and Western's Tariff (if applicable), contractual agreements will be prepared by Western and furnished to the requesting entity. Western requires interconnection to any facilities adhere to the requirements and specifications of the contractual agreements unless specifically waived by Western.

Contractual agreements establish estimated costs, advance of funds, work to be performed, projected time frames and all other cost- and work-related items.



Western Points of Contact

Questions or concerns regarding these requirements and related interconnections issues can be addressed to the following Western offices:

Colorado River Storage Project Customer Service Center

P.O. Box 11606
Salt Lake City, UT 84147-0606

(801) 524-6372
www.wapa.gov/crsp/crsp.htm

Desert Southwest Customer Service Region

P.O. Box 6457
Phoenix, AZ 85005-6457

(602) 352-2522
www.wapa.gov/dsw/dsw.htm

Rocky Mountain Customer Service Region

P.O. Box 3700
Loveland, CO 80539-3003

(970) 490-7201
www.wapa.gov/rm/rm.htm

Sierra Nevada Customer Service Region

114 Parkshore Drive
Folsom, CA 95630-4710

(916) 353-4418
www.wapa.gov/sn/snr.htm

Upper Great Plains Customer Service Region

P.O. Box 35800
Billings, MT 59107-5800

(406) 247-7405
www.wapa.gov/ugp/ugp.htm



References

Drafting Standards, Engineering Manual 6403.4, Western Area Power Administration, updated 1999.

General Power Contract Provisions, Western Area Power Administration, 1999.

Guide for Safety on AC Substation Grounding, Standard 80-1986, Institute for Electrical and Electronics Engineering.

Institute for Electrical and Electronics Engineering Standard Requirements for Instrument Transformers, ANSI/IEEE C57.13.

National Environmental Policy Act Implementing Procedures, U.S. Department of Energy, 10 CFR 1021.

North American Reliability Council Operating Manual, Updated. (1999).

North American Reliability Council Planning Standards, Updated. (1997).

Open Access Transmission Service Tariff, Western Area Power Administration, 63 FR 521.

Order 3790.1B, Occupational Safety and Health Program, Western Area Power Administration.

Power Systems Safety Manual, Western Area Power Administration, 1999.

Power Systems Switching Procedures, Western Area Power Administration.

Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems, Standard 519, Institute for Electrical and Electronics Engineering.

Reliability Management System Agreement, between Western Systems Coordinating Council and Western Area Power Administration, June 18, 1999.

Standard Design Criteria, Western Area Power Administration, 1999.

System Design Guide for Tap Stations, Engineering Manual 6430.1, Western Area Power Administration.





Western Area Power Administration Application for Interconnection

For Western Use

Date of receipt: _____

By whom: _____

Project manager: _____

Office: _____

Thank you for your interest in interconnecting to Western Area Power Administration's (Western) transmission facilities. This application should be used in conjunction with Western's *General Requirements for Interconnection*. Please complete this application and return it to Western to ensure the most expedient and thorough response. Completing this application for interconnection does not qualify the requesting entity, or otherwise pertain to, the receipt of transmission. Transmission service requires a separate application under Western's Open Access Transmission Service Tariff (63 FR 521).

1. Date of Application: _____ 2. Proposed/Estimated Date of Interconnection: _____

3. Name of Contact: _____ 4. Title of Contact: _____

5. Company/Organization Name: _____

6. Full Street Address (include State and ZIP): _____

7. Telephone and Fax Numbers: _____ 8. E-mail: _____

9. Name, Title, Company/Organization, Address, Phone, Fax and E-mail address of Authorized Interconnecting Contractor/Representative, if applicable: _____

10. Type of Interconnection (mark all that apply):

- Transmission line tap(s)
- Substation breaker bay additions
- Additional delivery point(s) to existing customer(s)
- Generation tie-line(s)
- Other (please specify) _____

11. Description of Requested Interconnection (include as much of the following information as possible on attached sheets; mark all that apply):

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

12. Name and Title of Applicant: _____

13. Signature of Applicant: _____ Date: _____

Please send the completed application for interconnection to the appropriate Western office (see reverse). A Western 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 Western. For further information, see Western's *General Requirements for Interconnection*, available upon request or at Western's Website at www.wapa.gov; or contact the appropriate Western office.



Western Points of Contact

Colorado River Storage Project Customer Service Center

P.O. Box 11606
Salt Lake City, UT 84147-0606
(801) 524-6372
www.wapa.gov/crsp/crsp.htm

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P.O. Box 6457
Phoenix, AZ 85005-6457
(602) 352-2522
www.wapa.gov/dsw/dsw.htm

Rocky Mountain Customer Service Region

P.O. Box 3700
Loveland, CO 80539-3003
(970) 490-7201
www.wapa.gov/rm/rm.htm

Sierra Nevada Customer Service Region

114 Parkshore Drive
Folsom, CA 95630-4710
(916) 353-4418
www.wapa.gov/sn/snr.htm

Upper Great Plains Customer Service Region

P.O. Box 35800
Billings, MT 59107-5800
(406) 247-7405
www.wapa.gov/ugp/ugp.htm



September 20, 1999