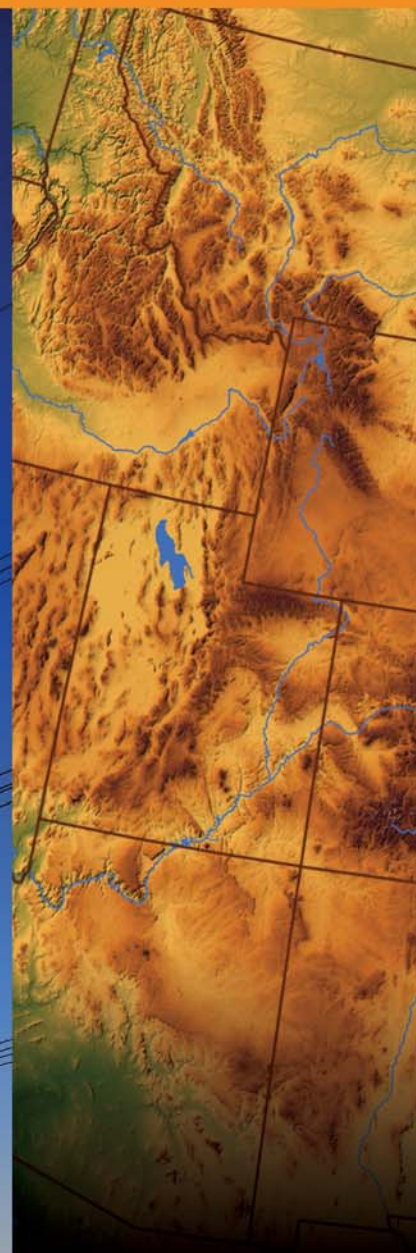


Renewable Energy Transmission Roadmap Appendices



Western
Governor's
Association

June 2010

Western Governors' Association Renewable Energy Transmission Roadmap Appendices June 2010

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Appendix A - General Background, Glossaries and Industry Acronyms

General Background

Steinhurst, William. *The Electric Industry at a Glance*. National Regulatory Research Institute, November 2008. http://nrii.org/pubs/electricity/electricity_at_a_glance.pdf

Brown, Matthew H. and Sedano, Richard P. *Electricity Transmission A Primer*. National Council on Electricity Policy, June 2004. <http://www.raponline.org/Pubs/ELECTRICITYTRANSMISSION.pdf>

Holtkamp, James A. and Davidson, Mark A. *Transmission Siting in the Western United States: Overview and Recommendations Prepared as Information for the Western Interstate Energy Board*. Holland & Hart, August 2009. http://www.hollandhart.com/articles/Transmission_Siting_White_Paper_Final.pdf

Yang, Chi-Jen. *Electrical Transmission: Barriers and Policy Solutions*. Duke University, August 2009. http://nicholas.duke.edu/ccpp/ccpp_pdfs/transmission.pdf

Friedman, Julia and Keogh, Mike. *Coordinating Interstate Electric Transmission Siting: An Introduction to The Debate*. National Council on Electricity Policy, July 2008. http://www.oe.energy.gov/Transmission_Siting_FINAL_41.pdf

The House Subcommittee on Energy and Mineral Resources and the House Subcommittee on Water and Power November 5, 2009 joint oversight hearing, "Getting Past Gridlock: Models for Renewable Energy Siting and Transmission". Presentation materials at http://resourcescommittee.house.gov/index.php?option=com_jcaIpro&Itemid=27&extmode=view&extid=304

Glossary of Electric Power and Transmission Terms

Alternating current (AC): Electric current in which the direction of flow is reversed at frequent intervals: usually 100 or 120 times per second (50 or 60 cycles per second or 50//60 Hz).

Alternative fuels: Solid fuels such as municipal solid waste (MSW), refuse derived fuel (RDF), biomass, rubber tires, and other combustibles that are used instead of fossil fuels (gas, oil, or coal) in a boiler to produce steam for the generation of electrical energy.

Ampacity: The current-carrying capacity of conductors or equipment, expressed in amperes.

Ampere (A) or amp: The basic SI unit measuring the quantity of electricity. The unit for the electric current; the flow of electrons. One amp is 1 coulomb passing in one second. One amp is produced by an electric force of 1 volt acting across a resistance of 1 ohm. A measurement of the rate of flow of electrons past a given point in a conductor or electrical device. It is analogous to cubic feet of water flowing per second.

Ancillary services: Those services necessary to transport the transmission of energy from resources to loads while maintaining

reliable operation of the transmission provider's transmission system.

Array: Any number of photovoltaic modules connected together to provide a single electrical output. Arrays are often designed to produce significant amounts of electricity.

Available Transfer Capability (ATC): Transmission capacity that is not otherwise committed or being used by the owner or other transmission customers. The amount of additional power that can be transmitted over existing facilities at any point in time without creating a need for curtailments of transmission service with the same priority. ATC will depend on the time of use as well as the class of service.

Base load: That part of electricity demand which is continuous, and does not vary over a 24-hour period. Approximately equivalent to the minimum daily load. The minimum load over a given period of time

Breaker: An electric device that breaks or opens an electrical circuit to protect equipment from damage resulting from a fault or overload on system

British thermal unit (Btu): The amount of heat energy required to raise the temperature of one pound of water from 60 degrees F to 61 degrees F at one atmosphere pressure.

Bus (or Busbar): An electrical conductor which serves as a common connection for two or more electrical circuits. A bus may be in the form of rigid bars, either circular or rectangular in cross section, or in the form of stranded-conductor overhead cables held under tension.

Capacitance: That property of a system of conductors and dielectrics that permits the storage of electricity when potential difference exists between the conductors. Its value is expressed as the ratio of quantity of electricity to a potential difference. A capacitance value is always positive.

Capacitor: An electrical device used to support transmission or distribution voltage. It maintains or increases voltage in power lines and improves the efficiency of the electrical system by compensating for inductive losses that produce wasted energy.

Capacitor bank: An array of capacitors connected into a circuit. Capacitors are used to control voltages supplied to the customer by eliminating the voltage drop in the system caused by inductive reactive loads'

Capacity factor: The amount of energy that the system produces at a particular site as a percentage of the total amount that it would produce if it operated at rated capacity during the entire year.

Central power: The generation of electricity in large power plants with distribution through a network of transmission lines (grid) for sale to a number of users. Opposite of distributed power.

Certificate of Convenience & Necessity (CCN): A special permit, commonly issued by a state public utility commission which authorizes a utility to engage in business, construct facilities or perform some other service.

Circuit: A conductor or system of conductors through which an electric current is or is intended to flow.

Circuit breaker: A protective device located on an electric circuit to interrupt the flow of current at that particular point. If a transmission or distribution line or transformer experiences an electrical fault or short circuit, it can be disconnected from the rest of the system by means of the circuit breaker.

Circuit Switchers: Circuit switchers are a set of switches for redirecting current in a substation. Circuit switchers provide equipment protection for transformers, lines, cables, and capacitor banks. They also are used to energize and de-energize capacitor banks and other circuits.

Class of service: A group of customers with similar characteristics, which is identified for the purpose of setting a rate for electric service. Classes include Commercial, Industrial, Residential and other groups.

Cogeneration (Combined Heat and Power): The process in which fuel is used to produce heat for a boiler-steam turbine or gas for a turbine. The turbine drives a generator that produces electricity, with the excess heat used for process steam.

Combined collector: A photovoltaic device or module that provides useful heat energy in addition to electricity.

Concentrator (module, array, or collector): An arrangement of photovoltaic cells that includes a lens to concentrate sunlight onto small-area cells. Concentrators can increase the power flux of sunlight hundreds of times.

Conductance: The reciprocal of resistance. It is the ratio of current passing through a material to the potential difference at its ends.

Conductivity: The ability of a material to conduct electric current. It is expressed in terms of the current per unit of applied voltage. It is the reciprocal of resistivity.

Conductor: A wire or combination of wires not insulated from one another, suitable for carrying electric current.

Congestion: A condition that occurs when insufficient transfer capacity is available to implement all of the preferred (or desired) schedules for electricity simultaneously.

Contingency: The unexpected failure or outage of a system component, or multiple components. Utilities are required to plan transmission systems to withstand certain contingencies as defined by reliability organizations.

Conversion efficiency (cell or module): The ratio of the electric energy produced by a photovoltaic device (under one-sun conditions) to the energy from sunlight incident upon the cell.

Demand (Load): The rate at which electricity is being used at any one given time (or averaged over a designated interval of time. Demand is typically measured in Killowatts, while energy use is usually measured in Killowatt hours.

Direct current (dc): Electric current in which electrons flow in one direction only. Opposite of alternating current.

Distributed power: Generic term for any power supply located near the point where the power is used. Opposite of central power.

Distribution Bus: A distribution bus is a steel structure array of switches used to route power out of a substation.

Distribution service: The delivery of electricity to a retail consumer through wires, transformers, and other devices that are not classified as transmission services subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC). Distribution service excludes metering services, meter reading services and billing and collection services, as those terms are used herein.

Electric circuit: Path followed by electrons from a power source (generator or battery) through an external line (including devices that use the electricity) and returning through another line to the source.

Electric current: A flow of electrons; electricity.

Electric energy: The ability of an electric current to produce work, heat, light or other forms of energy. It is measured in watt hours.

Electrical grid: An integrated system of electricity transmission and distribution, usually covering a large area.

Energized (alive, live): Electrically connected to a source of potential difference, or electrically charged so as to have a potential significantly different from that of earth in the vicinity.

Facilities Study: The last study performed in an interconnection request process. It provides final details of the construction, equipment, costs, and schedules of an interconnection.

Feasibility Study: Usually the first study performed in an interconnection request process. It is less expensive and time consuming than a System Impact Study. Its purpose is to screen a project at a low cost to determine if more study work is required or if the project is not feasible to continue the interconnection process.

Federal Energy Regulatory Commission (FERC): An independent regulatory agency which, among other things, regulates interstate oil, natural gas and power transmission sales.

Fossil fuel: A fuel based on carbon presumed to be originally from living matter, e.g., coal, oil, gas. Burned with oxygen to yield energy, used in a boiler to produce steam for the generation of electrical energy.

Fresnel lens: An optical device that focuses light like a magnifying glass; concentric rings are faced at slightly different angles so that light falling on any ring is focused to the same point. Fresnel lenses are flat rather than thick in the center and can be stamped out in a mold.

Fuel: Any material that can be burned to make energy.

Generating Station or Plant (Power Plant): A plant containing prime movers such as internal combustion engines, steam turbines, water wheels, generators and auxiliary equipment to convert energy into electric energy.

Generation: The production electrical power, the movement of electrons through conductors with a spinning electromagnetic machine or by solar photovoltaic cells or other devices. The act or process of transforming other forms of energy into electric energy.

Generation Interconnection Queue: The list of generation projects requesting interconnection to an electric utility's system. Projects are "in line" on a first come, first served basis. New projects requesting interconnection to the system would be studied with projects ahead of them already on the system, generating the MW of power requested.

Gigawatt (GW): One billion watts. One million kilowatts. One thousand megawatts.

Greenhouse gases: Gases that trap the heat of the sun in the Earth's atmosphere, producing the greenhouse effect; the two major greenhouse gases are water vapor and carbon dioxide; lesser greenhouse gases include methane, ozone, chlorofluorocarbons, and nitrogen oxides.

Impedance: The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency.

Insolation: Sunlight, direct or diffuse; from 'incident solar radiation.' Not to be confused with insulation.

Insulated: Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.

Interconnection (process): A process furnished by utilities to vet a generation project and insure that it will not harm the transmission system. It begins with an Interconnection Request by a generation entity and usually includes cash deposits by the Requestor. It includes studies, and meetings to scope the project, study the project, and determine equipment, costs, and schedules in order to connect a generator to the transmission system.

Inverters: Devices that convert DC electricity, which is produced by most wind and solar generation into AC electricity (single or multiphase), either for stand-alone systems (not connected to the grid) or for utility-interactive systems.

Joule: A unit of energy (1 watt-sec).

Kilowatt (kW): 1000 watts.

Kilowatt-hour (kWh): One thousand watts acting over a period of 1 hour. The kWh is a unit of energy. 1 kWh=3600 kJ.

Limiting Element: The weakest portion of the transmission system being studied, a conductor, breaker, or another device. The element, if upgraded, would allow more MW capacity of power on the system.

Load: The demand of power to be supplied by the transmission system to its customers. Load measurements include peak load (winter and summer), and average load.

Megawatt (MW): A unit of power, equal to one million (1,000,000) watts. MWe refers to electric output from a generator, MWt to thermal output from a reactor or heat source (e.g., the gross heat output of a reactor itself, typically three times the MWe figure).

Ohm: The derived SI unit for electrical resistance or impedance; one ohm equals one volt per ampere.

Peak load; Peak demand: The maximum load, or usage, of electrical power occurring in a given period of time, typically a day.

Peak power: Power generated by a utility unit that operates at a very low capacity factor; generally used to meet short-lived and variable high demand periods.

Photovoltaic: Pertaining to the direct conversion of light into electricity.

Point of Delivery: The point where facilities: owned, leased or under license by a customer connects to the utility's facilities.

Power factor: The ratio of the average power and the apparent volt-amperes.

Power: The quantity of electricity being generated, transferred or used at any instant in time, usually expressed in kilowatts or megawatts.

Power Purchase Agreement (PPA): A contract negotiated between a generation entity and a utility to buy power over a given period of time at a given price per kilowatt hour.

Power Transformers: Transformers raise or lower the voltage as needed to serve the transmission or distribution circuits.

Rating: Electrical devices and conductors are given ratings to depict their electrical capacities in both voltage and amps.

Reactive Power: The portion of electricity which establishes and sustains electric and magnetic fields of AC equipment. It is used to control voltage on the transmission network, and must be supplied to magnetic equipment such as motors and transformers.

Relays: A relay is a low-powered device used to activate a high-powered device. Relays are used to trigger circuit breakers and other switches in substations and transmission and distribution systems.

Renewable fuels: Fuels that can be easily made or "renewed." We can never use up renewable fuels. Types of renewable fuels are solar, wind, and hydropower energy.

Reserve capacity: The amount of generating capacity a central power system must maintain to meet peak loads.

Service area: The territory in which the utility has been granted a Certificate of Convenience and Necessity and is authorized by the Commission to provide electric service.

System Impact Study (SIS): A study conducted during an interconnection request process analyzing the effect of a new generation project to a model the existing system or future system model. This is a more rigorous study than a feasibility study, more expensive and time consuming. It requires a "dynamic model" provided by the manufacturer of the generator or (inverter) to analyze how the dynamics of the generator may affect the transmission system.

Shunt Reactors: These are used in an extra high-voltage substation to neutralize inductive reactance in long EHV transmission lines.

Solar thermal electric: Method of producing electricity from solar energy by using focused sunlight to heat a working fluid, which in turn drives a turbogenerator.

Substations: A high-voltage electric system facility. It is used to switch generators, equipment, and circuits or lines in and out of a system. It also is used to change AC voltages from one level to another, and/or change alternating current to direct current or direct current to alternating current.

Step-up Transmission Substation: Receives electric power from a nearby generating facility and uses a large power transformer to increase the voltage for transmission to distant locations.

Step-down Transmission Substation: These substations are located at switching points in an electrical grid. They connect different parts of a grid and are a source for subtransmission lines.

Distribution Substation: These are located near to the end-users. Distribution substation transformers change the subtransmission voltage to lower levels for use by end-users.

Tariffs: Documents which list the services and products offered by the utility and which set forth the terms and conditions and a schedule of the rates and charges for those services and products.

Transformer: An electrical device used to change the ratio of voltage to amps to efficiently transmit electricity from generators across transmission systems to loads.

Transmission lines: Poles or towers connected to bundled metal wire called "conductors" used to move electricity over long distances at high voltages for efficiency.

Overhead Transmission Lines: Overhead AC transmission lines share one characteristic; they carry 3-phase current. The voltages vary according to the particular grid system they belong to. Transmission voltages vary from 69 kv up to 765 kv.

Subtransmission Lines: These lines carry voltages reduced from the major transmission line system, usually 69 kv.

Transmission service: Refers to the transmission of electricity at high voltage to retail electric customers or to electric distribution facilities as defined by the Federal Energy Regulatory Commission (FERC) or a State or local Regulator.

Utility: The public service corporation providing electric service to the public in compliance with local and federal laws and regulations.

Utility Distribution Company (UDC): The electric utility entity that operates, constructs, and maintains the distribution system for the delivery of power to the end user point of delivery on the distribution system.

VARs – VAR support: A VAR (Volt-Amps-Reactive) is a unit of reactive power. Reactive power is required for electric motors, electromagnetic generators, and alternator loads and is essential to ensure continuous, steady voltage on transmission networks.

Volt (V): A unit of measure of the force, or 'push,' given the elec-

trons in an electric circuit. It is analogous to water pressure in pounds per square inch. One volt produces one ampere of current when acting on a resistance of one ohm.

Voltage: A measurement depicting the force of electricity flowing through a conductor or an electrical device. The electric pressure of a circuit in an electric system is measured in volts. It is generally a nominal rating based upon the difference between conductors of the circuit.

Voltage Collapse: An event that occurs when an electric system does not have adequate reactive power support to maintain voltages stability. Voltage collapse can result in system outages and may include interruption of service to customers.

Watt (W): The unit of electric power, or amount of work (J), done in a unit of time. One ampere of current flowing at a potential of one volt produces one watt of power. One watt is equivalent to approximately 1/764 horse power or one joule per second.

Wheel/Wheeling: A term to describe the process of selling power across a transmission system owned by an entity that is not the actual buyer of the power.

Glossary Links

Illustrated Glossary Electric Power Generation and Distribution. United States Department of Labor, Occupational Health and Safety Division. Definitions, photos, and graphic illustrations of equipment used in a typical electric power generation, transmission and distribution system.
http://www.osha.gov/SLTC/etools/electric_power/illustrated_glossary/index.html

Electricity Terms and Definitions. United States Energy Information Administration.
<http://www.eia.doe.gov/cneaf/electricity/page/glossary.html>

Glossary of Electric Industry Terms (April 2005 edition) Edison Electric Institute
<http://www.xcelenergy.com/SiteCollectionDocuments/docs/IR-PEEI2005Definitions.pdf>

Industry Acronyms

AC	Alternating Current
AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
ATC	Available Transfer Capability
BPS	Bulk Power System
BTU	British thermal unit
CAO	Control Area Operator
CC	Combined Cycle
CCN	Certificate of Convenience & Necessity
CCS	Carbon Capture & Storage
CO2	Carbon Dioxide
CPV	Concentrated Photovoltaic
CSP	Concentrating Solar Power
CT	Combustion Turbine
DAS	Data Acquisition System

DAT	Dual Axis Tracker(s)	n-1-1	Overlapping Contingency
DC	Direct Current	n-2	Double Contingency
DEIS	Draft Environmental Impact Statement	NEC	National Electric Code
DOE	United States Department of Energy	NERC	North American Electric Reliability Corporation
DNI	Direct Normal Insolation	NEPA	National Environmental Policy Act
DSIRE	Database of State Incentives for Renewable Energy	NG	Natural Gas
DSM	Demand Side Management	NOX	Nitrogen Oxide
EA	Environmental Assessment	NREL	National Renewable Energy Lab – A DOE Lab
EEC	Embedded Energy Cost	OASIS	Open Access Same Time Information System
EGC	Equipment Grounding Conductor	OATT	Open Access Transmission Tariff
EHV	Extra High Voltage	OCPD	Over Current Protection Device
EIS	Environmental Impact Statement	O&M	Operations and Maintenance
EMF	Electro Magnetic Fields	OMP	Operations and Maintenance Plan
EPACT	Energy Policy Act (1992, 2005)	OSHA	Occupational Safety & Health Administration
EPC	Engineer, Procure, Construct	PEIS	Programmatic Environmental Impact Statement
ESP	Electric Service Provider	PBI	Performance Based Incentive
EPS	Environmental Portfolio Standard	PM	Particulate Matter
ERO	Electric Reliability Organization	POD	Point of Delivery
EWC	Exempt Wholesale Generator	PPA	Power Purchase Agreement
FACTS	Flexible AC Transmission System	Ppm	Parts per million
FERC	Federal Energy Regulatory Commission	PSC	Public Service Commission
FIT	Feed-In Tariff	PUC	Public Utility Commission
FLPMA	Federal Land Policy and Management Act	PURPA	Public Utilities Regulatory Policy Act
FPA	Federal Power Act	RAS	Remedial Action Scheme
GEC	Grounding Electrode Conductor	RECs	Renewable Energy Certificates
GFP	Ground Fault Protection	RES	Renewable Energy Standard
GT	Gas Turbine	REST	Renewable Energy Standard & Tariff (Rules)
GW	Gigawatt (Billion Watts)	RMR	Reliability Must Run
GWh	Gigawatt-hour	RMS	Reliability Management System
GHG	Greenhouse Gases: Methane, Hydrofluorocarbons, CO ₂ , SO ₂ , NO _x	ROA	Return on Assets
HV	High Voltage	ROE	Return of Equity
HVDC	High Voltage Direct Current	ROI	Return on Investment
HY	Hydro	ROW	Right-of-Way
I/S	In-Service	RPS	Renewable Portfolio Standard
IOU	Investor-owned Utility	RTO	Regional Transmission Organization
IPP	Independent Power Producer	SCADA	Supervisory Control and Data Acquisition
IRP	Integrated Resource Plan	SHPO	State Historic Preservation Office
ISO	Independent System Operator	SPS	Special Protection System
ITC	Investment Tax Credit	SHW	Solar Hot Water
LCOE	Levelized Cost of Energy	SIL	Simultaneous Import Limit
kV	Kilovolt	SOX	Sulfur Oxide
kW	Kilowatt (1,000 watts)	SSA	Solar Services Agreement
kWh	Kilowatt-hour	ST	Steam Turbine
LID (effect)	Light Induced Degradation	TRANSCO	Transmission Company
LSE	Load Serving Entity	TTC	Total Transfer Capability
MBR	Market Based Rates	T&D	Transmission and Distribution
Mcf	One Thousand Cubic Feet	UDC	Utility Distribution Company
MLSC	Maximum Load Serving Capability		
MMBtu	1 Million British Thermal Units		
MMcfs	1 Million Cubic Feet		
MORC	Minimum Operating Reliability Criteria		
MVA	Megavolt-Ampere		
MVAR	Megavolt-Ampere Reactive		
MW	Megawatt (Million Watts)		
MWh	Megawatt-hour		
n-0	No Contingency		
n-1	Single Contingency		

Appendix B – Available Regional Studies and Information

A renewable developer will benefit from participation in and/or awareness of state and regional transmission planning and environmental efforts. Developers who participate in these efforts as stakeholders can ensure that the needs or characteristics of their projects are included in such study efforts. Following is a representative list of regional and national studies and initiatives that address some of these issues.

Developers should be aware that not all transmission projects will be developed in *existing* transmission corridors or routes, and that neither conceptual transmission corridors nor transmission plans will be route specific, with geographic delineations. Maps which depict locations of proposed corridors or transmission lines are typically conceptual in nature, and *do not depict actual proposed locations of these projects*. Conceptual corridors and proposed transmission lines which have no defined routes should not be used to assess an individual project's feasibility.

State Renewable Energy Planning and Development Efforts

- WGA Western Renewable Energy Zones (WREZ) Project¹ - Phase 1 of this report identified the richest, most commercially viable renewable resources in the Western Interconnection. WGA and the Western Electricity Coordinating Council (WECC) received funding to continue WREZ activities and development of alternative energy development scenarios².
- California Renewable Energy Transmission Initiative (RETI)³ - Assessment of renewable energy zones by 2020⁴
- Nevada Renewable Energy Transmission Access Advisory Committee (RETAAC)⁵ - Purpose to identify commercially developable zones for renewable energy, assess the existing and planned transmission access to these zones, and make recommendations for additional transmission lines.
- New Mexico Renewable Energy Transmission Authority (RETA)⁶ - Purpose to develop maps and documents identifying existing generation and transmission lines and renewable energy resource zones to encourage development, coordinate with agencies, and identify and prioritize best options for transmission corridors.
- Arizona Renewable Resource and Transmission Identification Subcommittee (ARRTIS)⁷ - ARRTIS of the SWAT Renewable Transmission Task Force (RTTF) was developed to identify areas in Arizona with the best potential for renewable generation project development. ARRTIS used a four tier environmental sensitivity and constraint classification system to characterize land areas. The information and maps⁸ developed allowed the RTTF to more strategically define the state's potential transmission network to support renewable energy development.

Transmission Planning

- U.S. DOE Congestion Study 2009⁹ - In 2006 an earlier Congestion study assessed transmission congestion and constraints in the Eastern and Western Interconnections. The results of the Congestion study were used to designate National Interest Electric Transmission Corridors. In 2009, DOE issued another report updating the original Congestion Study.
- WECC Transmission Expansion Planning Policy Committee (TEPPC) - Regional Transmission Expansion Planning (RTEP) process.¹⁰ The process will evaluate long term transmission needs, factoring in variables including demand, resources, energy policies, technology costs, reliability and emissions. TEPPC is also continuing an historical analysis of transmission use on major transmission paths within the WECC footprint.
- WestConnect¹¹ Transmission Planning Report¹² and Plan¹³ - The 2010 transmission plan area includes 15 transmission providers and 28 project sponsors.
- Colorado Coordinated Planning Group (CCPG)¹⁴ - High voltage planning forum for the Rocky Mountain Region (Colorado and Wyoming). A workgroup, Colorado Long-Range Transmission Planning Group provides a forum for load serving entities to explore potential for developing a coordinated transmission system.
- Sierra Subregional Planning Group (SSPG)¹⁶ - SSPG is in development as a high voltage transmission planning forum for northern California and northern Nevada.
- Southwest Area Transmission (SWAT)¹⁷ - The goal of SWAT is to promote regional planning in the Desert Southwest, including segments of California, Nevada, Texas, Arizona, and New Mexico.
- Columbia Grid¹⁸ - Single utility based planning for the combined network of participating utilities in the Pacific Northwest transmission grid in Washington, Oregon, Idaho, Montana, California, Wyoming, Nevada and Utah¹⁹.
- Northern Tier Transmission Group (NTTG)²⁰ - Transmission owners coordinated planning²¹ for participants with facilities in Washington, Oregon, northern California, Idaho, Utah, Montana and Wyoming.
- Southwest Power Pool (SPP)²² - A Regional Transmission Organization(RTO) with members in Arkansas, Kansas, Louisiana, Mississippi, Missouri, Nebraska, New Mexico, Oklahoma, and Texas²³. Regional transmission expansion planning.²⁴
- Midwest Independent System Operator (MISO)²⁵ - Transmission planning²⁶ for parts of Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Montana, North Dakota, Ohio, South Dakota, Pennsylvania, Wisconsin and Manitoba.
- California Independent System Operator (CAISO)²⁷ - Transmission planning for transmission operators, also regional planning via participation in WECC TEPPC. CAISO is developing a statewide conceptual transmission plan with the California Transmission Planning Group (CTPG).²⁸ CTPG used the Renewable Energy Transmission Initiative (RETI)²⁹ conceptual plan³⁰ as a starting point.

- Texas- Transmission planning in Texas is addressed by the Electric Reliability Council of Texas (ERCOT)³¹, SPP, SWAT and WestConnect.

Other Initiatives and Studies

- National Renewable Energy Western Wind and Solar Integration Study(WWIS)³² - Investigates operational impacts of wind and solar energy penetration on the WestConnect system.
- Western Area Power Transmission Infrastructure Program (TIP)³³ - Western was granted authority by the American Recovery and Reinvestment Act of 2009 (ARRA) to borrow up to \$3.25 billion dollars from the US Treasury to fund partnerships to develop transmission infrastructure that delivers renewable energy to market across the West. Western is currently discussing and studying certain projects³⁴ in order to identify qualifying projects.
- Bonneville Power Administration (BPA)³⁵ - BPA was granted authority by ARRA to increase its borrowing limit by an additional \$3.25 billion dollars from the US Treasury to develop transmission infrastructure. BPA is using funds to build a major transmission project³⁶.
- Solar Energy Development Programmatic Environmental Impact Statement (PEIS)³⁷ - Federal agencies evaluate utility scale solar energy development, create maps, environmental policies and mitigation strategies, and amend relevant land use plans. Schedule for issuance of the PEIS is to be determined.
- Section 368 West-wide Energy Corridor Programmatic Environmental Impact Statement (EIS)³⁸ - The Energy Policy Act of 2005 Section 368 called for the designation of energy transport (including electrical transmission, natural gas and hydrogen gas pipelines) corridors in the 11 contiguous western states. The federal agencies involved designated certain corridors and identified coordinated agency processes providing benefits to projects proposing to use the corridors.
- WGA Wildlife Corridors and Crucial Habitat Initiative³⁹ - The WGA Wildlife Council was charged to identify key wildlife corridors and crucial wildlife habitats in the West and to conserve such lands and the species in the corridors.
- Memorandum of Understanding⁴⁰ among the U.S. Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Environmental Protection Agency, the Federal Energy Regulatory Commission, the Advisory Council on Historic Preservation, and Department of Interior, regarding coordination in federal agency review of electric transmission facilities on federal land. (October 2009)
- Interim Guidance for Desert Renewable Energy Project Development, California Energy Commission, Draft Staff Report. (September 2009)

Appendix C - Overview of Utility Resource and Transmission Planning

Resource and Transmission Planning is essential as utilities design and manage their energy production and delivery portfolio. Understanding the development of integrated resource and transmission plans provides insight to some of the key criteria that can cause specific renewable energy projects to emerge as viable options for development. Individual, developer-driven project proponents should understand the criteria that allow specific projects to become “real” as opposed to other projects that may have strong technical merits but will not progress through a utility solicitation process nor become part of a resource portfolio.

Transmission Planning

Utility transmission planning refers to the technical electrical transmission system evaluations that allow individual utilities to meet compliance with the North American Electric Reliability Corporation (NERC) and the Western Electric Coordinating Council (WECC) guidelines for reliability and system disturbance and performance levels while providing for the delivery of resources to meet electrical demand.⁴¹

Because the transmission system in the West is regionally interconnected, studies of system conditions are typically done in collaborative forums, relying on participation from multiple utilities as well as external stakeholders to determine load growth, contractual commitments, electrical flows, and other inputs that affect the system. In addition to participation in the WECC, utilities are typically members of sub-regional planning groups and other organizations or parties to agreements regarding transmission planning issues. For example, the WestConnect planning organization includes a seven-state area in the West and provides a forum for the coordination of transmission planning issues.⁴²

Utility transmission planning will typically include an assessment of the following needs:

- Provide adequate transmission to designated network resources in-order to reliably and economically serve all network loads
- Support individual utility and other network customers’ local transmission and sub-transmission systems
- Provide for the interconnection of new resources
- Accommodate requests for long-term transmission access

Based on these factors, transmission planning studies will identify potentially overloaded or vulnerable segments of the existing electrical system and the need for new or upgraded transmission and ancillary facilities such as substations, switchyards, transformers, series capacitors or other related equipment. These potential transmission projects are evaluated with other regional utilities to identify impacts of the addition of these facilities, and to determine if certain projects can be jointly planned, financed and

constructed. Those projects that are identified as being necessary for future development are usually evaluated within a ten-year planning horizon to allow for adequate time for front-end siting, permitting, and construction activities. Many states require that utilities annually file their Transmission Plans with their state regulatory agency as part of the public record.

Resource Planning

Utility resource planning evaluates options to establish a balanced and cost-effective portfolio that meets the needs of utility customers. Resources that have historically been evaluated include traditional technologies such as nuclear, coal, hydroelectric, and natural-gas facilities. Today, there are many more resource choices including renewable technologies such as solar, wind, biomass, biogas, and geothermal. Utility resource planning also includes the consideration of demand-side management programs, which can affect the amount of energy consumed and needed for delivery to customers over time.

The overall purpose of the resource planning process is to identify a set of resources that meets the future electricity needs of the utility's customers in a balanced and cost-effective manner, while also satisfying customers' desire for reliable electric service, price stability, and environmental responsibility. Resource planning is an integral part of utility business planning and involves input and involvement from many different departments within the utility, stakeholders and regulators.

The resource planning process begins with a forecast of future customer electricity needs which are typically modeled over a fifteen or thirty-year period. Next, the utility will compare the existing resource portfolio to projected future customer needs. The result of this comparison is the "gap" or the amount of future customer needs that are greater than that which can be met by existing resources. This is followed by a comparison of different resource technologies that can best fill the resource "gap" described above. This step typically involves both quantitative and qualitative analyses of different resource alternatives, including conventional generation, renewable resources, and demand-side measures (energy efficiency and distributed generation). Viable resource options are then brought forward for portfolio-level analysis in which alternative resource expansion plans are developed and analyzed through detailed production cost simulations. These detailed simulations combine the potential new resource alternatives with the existing resource portfolio and include projections of future costs, environmental impacts and capital spending. The cost analysis portion provides an estimate of the future total system cost of each resource alternative. Utilities consider costs for fuel, purchased power, capital and transmission for new resources, energy efficiency program costs, natural gas transportation, and emissions allowance costs for currently regulated emissions, such as Sulfur Dioxide ("SO₂"), and potentially regulated emissions including greenhouse gases (GHG).

In the past, resource planning was often referred to as "least-cost planning." The primary purpose of least-cost planning was to select a resource plan that resulted in the lowest cost of providing service to customers in the future. There is a growing recognition

in the industry that a narrow focus on "least-cost" may no longer be appropriate. The recent volatility of natural gas prices and the current debate surrounding climate change are just two examples of major risk factors and uncertainties that must be addressed in the resource planning process. These risk factors greatly complicate the decision-making process because it is difficult, if not impossible, to evaluate all of the uncertainties that can impact the resource choices, and, in many cases, the solutions that address these uncertainties can result in higher costs to customers (at least in the near term). Today, unprecedented challenges and uncertainties demand consideration of several key risk factors. These items are listed below and are important considerations in resource planning.

- Diversity of energy sources
- Environmental impact
- Financial sustainability
- Resource self-sufficiency
- Positioning for climate change policy
- Long-term planning for resource needs
- High reliability
- Need for flexibility

Risk analysis plays an important role in the resource planning process. The risk analysis process involves both quantitative and qualitative assessments of future potential risks, such as changes in fuel prices or future environmental regulations (the current issues surrounding climate change are a good example of this). Because many risks cannot be easily quantified, the risk assessment process inevitably requires a great deal of judgment.

The end result of the resource planning process is a specific set of actions or steps that will provide for a robust set of resource options to meet future customer needs. These actions/steps may involve steps such as actual resource acquisition, preliminary steps (such as issuing a Request for Proposal ("RFP"), or evaluation of longer term resource options. These steps are an important means of addressing the risks inherent in long-term resource planning.

Summary

Utilities are bound by regulation and customer obligations to provide reliable resources at reasonable costs through energy production and transmission. The collaborative technical and financial analysis that supports utility planning relies on a number of inputs and criteria to determine which projects are the most viable expenditures of capital resources. Energy project developers should look to the criteria embedded in utility resource planning filings with their state or local regulatory authorities, as well as individual utility resource solicitation processes, for guidance in the types of project characteristics that are considered viable by electric utilities. Additionally, stakeholders should monitor long-range transmission planning initiatives through state ten-year planning efforts or collaborative stakeholder forums such as those within the WestConnect sub-regional planning organizations to learn about the proposed purpose, location, and in-service date of future transmission projects. Understanding and participating in any public forums related to utility planning processes will only

increase the opportunities for the interconnection of viable energy development projects to the regional electric grid.

Appendix D – Environmental Permitting Websites

National Environmental Policy Act:
<http://www.epa.gov/compliance/nepa/>

Council on Environmental Quality:
<http://www.whitehouse.gov/administration/eop/ceq/>

NEPA net: Access the following link and use the drop down list for a tabs for Federal agencies'

NEPA websites and contacts:
<http://ceq.hss.doe.gov/nepa/nepanet.htm>

Department of Interior
<http://www.doi.gov/>

National Atlas of Lands: Access the following link and select Map List to view and print Federal and Indian Reservation maps by state.
<http://www.nationalatlas.gov/printable/fedlands.html#us>

Bureau of Indian Affairs Regions, Agencies and Tribes served: Access the following link and use a map to select regions to view office contact information and tribes served.
<http://www.bia.gov/groups/webteam/documents/interactivere-source/idc-002651.swf>

Bureau of Land Management: <http://www.blm.gov/wo/st/en.html>

Alaska: <http://www.blm.gov/ak/st/en.html>

Arizona: <http://www.blm.gov/wo/st/en.html>

California: <http://www.blm.gov/ca/st/en.html>

Colorado: <http://www.blm.gov/co/st/en.html>

Idaho: <http://www.blm.gov/co/st/en.html>

Kansas, New Mexico, Oklahoma, Texas:

<http://www.blm.gov/nm/st/en.html>

Utah: <http://www.blm.gov/ut/st/en.html>

Nevada: <http://www.blm.gov/ut/st/en.html>

Oregon, Washington: <http://www.blm.gov/or/st/en.html>

Montana, North Dakota, South Dakota:

<http://www.blm.gov/mt/st/en.html>

Wyoming, Nebraska: <http://www.blm.gov/wy/st/en.html>

National Park Service: Access the following link to use the drop down menu and find a National Park by State.
<http://www.nps.gov/index.htm>

Environmental Protection Agency: <http://www.epa.gov/>

Region 10: Alaska, Idaho, Oregon, Washington:

<http://www.epa.gov/region10/>

Region 9: California, Nevada, Arizona and Pacific Islands:

<http://www.epa.gov/region9/>

Region 8: Colorado, Montana, North Dakota, South Dakota,

Utah, Wyoming and 27 Tribal Nations:

<http://www.epa.gov/region8/>

Region 7: Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations:

<http://www.epa.gov/region07/>

Region 6: Arkansas, Louisiana, New Mexico, Oklahoma, Texas and 66 Tribes:

<http://www.epa.gov/region6/index.htm>

United States Forest Service: Access the following link to use the drop down menus to find information on a Forest or Grassland by State or by Forest name. <http://www.fs.fed.us/>

United States Fish and Wildlife Service: <http://www.fws.gov/>

Map link to USFWS offices in individual states:

<http://www.fws.gov/offices/>

Access the link and select a state to view state-specific information.

United States Department of Defense: <http://www.defense.gov/>

US Military bases in the United States: Access the following National Park Service site to select a region on the map to view military bases and an index of military bases.

<http://www.nps.gov/nagpra/documents/basesmilitarymap.htm>

United States Army Corps of Engineers: Access the following link and select a region on the map to view districts, which have links to State Areas.

<http://www.usace.army.mil/about/pages/locations.aspx>

Federal Aviation Administration: <http://www.faa.gov/>

Regional offices: Access the following Federal Aviation

Administration link and select a region and state.

http://www.faa.gov/about/office_org/headquarters_offices/arc/ro_center/

State Transportation Departments: Access the followings Federal Highway Administration site to use the drop down menus to find information for a State Department of Transportation web site.

<http://www.fhwa.dot.gov/webstate.htm>

State Historic Preservation Offices: Access the following National Park Service site to use a drop down menu to find State Historic Preservation Offices.

<http://www.nps.gov/nr/shpolist.htm>

State Game and Fish Departments: Access the following U.S. Fish and Wildlife Service site to use a drop down menu to find a list of natural resource agencies, including Game and Fish Departments.
<http://www.fws.gov/offices/statelinks.html>

State Land Departments/Commissions/Agencies/Boards:

Arizona: <http://www.land.state.az.us/index.html>

Permits and ROW procedures: <http://www.land.state.az.us/programs/operations/applications.htm>

California: <http://www.slc.ca.gov/>

Renewable Energy leasing/ROW:

http://www.slc.ca.gov/Renewable_Energy/Renewable_Home.html

Colorado: <http://trustlands.state.co.us/Pages/SLB.aspx>

Renewable Energy leasing/ROW:

<http://trustlands.state.co.us/Projects/Pages/RenewableEnergy.aspx>

Idaho: <http://www.idl.idaho.gov/>

Easement acquisition/real estate sales:

http://www.idl.idaho.gov/bureau/RealEstate/index_re.htm

Kansas:

Montana: http://dnrc.mt.gov/About_Us/about.asp

Trust Land Management Division: <http://dnrc.mt.gov/trust/default.asp>

ROW applications:

<http://dnrc.mt.gov/trust/REMB/rightsofwayforms.asp>

Nebraska: <http://www.belf.state.ne.us/>

Wind leasing: http://www.belf.state.ne.us/wind_leasing.htm

Nevada: <http://lands.nv.gov/program/landoffice.htm>

Applications for acquisitions of State land:

<http://www.lands.nv.gov/forms/forms.htm>

New Mexico: <http://www.nmstatelands.org/>

Rights of Way Section:

<http://www.nmstatelands.org/default.aspx?PageID=68>

ROW applications:

<http://www.nmstatelands.org/default.aspx?PageID=68>

Northern Mariana Islands:

North Dakota: <http://www.land.nd.gov/>

ROW applications: <http://www.land.nd.gov/surface/row/>

Oklahoma: <http://www.clo.state.ok.us/>

Oregon: <http://www.oregon.gov/DSL/index.shtml>

State Land Management:

<http://www.oregon.gov/DSL/LW/index.shtml>

State Land Board:

<http://oregonstatelands.us/DSL/SLB/index.shtml>

South Dakota: <http://www.sdpubliclands.com/>

Texas: <http://www.glo.state.tx.us/>

Easement forms:

http://www.glo.state.tx.us/prof_svcs/asset_inspection/applications.html

Utah: <http://trustlands.utah.gov/home/index.html>

Washington: <http://www.dnr.wa.gov/Pages/default.aspx>

Leasing and Land Transactions: <http://www.dnr.wa.gov/BusinessPermits/Leasing/Pages/Home.aspx>

Wyoming: <http://slf-web.state.wy.us/>

State Departments of Environmental Quality: Access the following U.S. Environmental Protection Agency site and utilize a drop down menu to locate websites for State DEQs.

<http://www.epa.gov/epahome/state.htm>

Appendix E - Federal Energy Related Sites

Department of Energy Western Area Power Administration (Western): Access the following link and use tabs to identify regions and Hot Topics: <http://www.wapa.gov/>
Western Transmission: <http://www.wapa.gov/transmission/default.htm>

Bonneville Power Administration (BPA): <http://www.bpa.gov/corporate/>

BPA Transmission: <http://www.transmission.bpa.gov/>

U.S. Department of Energy: Access the following link and use tabs to navigate to the EERE page which provides tabs for funding and renewable energy. <http://www.eere.energy.gov/#>

National Renewable Energy Laboratory: <http://www.nrel.gov/>

Transmission Reliability

North American Electric Reliability Corporation:
<http://www.nerc.com/>

Southwest Power Pool Regional Entity: <http://www.spp.org/section.asp?pageID=90>

Western Electricity Coordinating Council: <http://www.wecc.biz>

Federal Energy Regulatory Commission: <http://www.ferc.gov/industries/electric/indus-act/reliability.asp>

Texas Regional Entity: <http://www.texasre.org/Pages/Default.aspx>

Transmission Planning

WestConnect: Regional and sub regional transmission planning by utilities in Nevada, Arizona, Colorado, New Mexico, Wyoming, and parts of California and Texas. <http://www.westconnect.com/planning.php>

Western Renewable Energy Zones:

http://www.westgov.org/index.php?option=com_content&view=article&id=219&Itemid=81

California Independent System Operator 2010 Transmission Plan:
<http://www.caiso.com/20a1/20a1dbe417300.html>

Final Proposal: <http://www.caiso.com/276c/276ceed66ae20.pdf>

California Renewable Energy Transmission Initiative:

<http://www.energy.ca.gov/reti/index.html>

California Transmission Planning Group: <http://www.ctpg.us/public/index.php>

Generator Interconnection Queues

Arizona:

Arizona Public Service Company (APS):

<http://www.oatioasis.com/azps/index.html>

Select "Generator Interconnection" > "Active/Exec Agrmt Queue Listing"

Salt River Project Agricultural Improvement and Power District (SRP):

<http://www.oatioasis.com/SRP/index.html>

Select "Large Generator Interconnect" > "SRP Owned Transmission" or "Jointly Owned Transmission" or "ANPP Transmission"

Southwest Transmission Cooperative, Inc. (SW Transco):

<http://www.oatioasis.com/SWTC/>

Select "Interconnection Queue"

Tucson Electric Power Company (TEP)

<http://www.oatioasis.com/tepc/index.html>

Select "Generation Interconnection" > "Queued Interconnection Requests"

California:

Imperial Irrigation District (IID):

<http://www.oatioasis.com/iid/index.html>

Select "Generation Interconnection" > "IID LGIP Queue Listing"

Western Area Power Administration (Western):

Rocky Mountain Region (WACM):

<http://www.oatioasis.com/LAPT/index.html>

Select "Interconnection Requests/Studies" > "Interconnection and Transmission Queue"

Desert Southwest Region (WALC):

<http://www.oatioasis.com/walc/index.html>

Select "Large Generation Interconnection" > "LGI Trans Queue"

Sierra Nevada Region (WASN):

<http://www.oatioasis.com/wasn/index.html>

Select "Interconnection Requests" > "Generator Interconnection" > "Generator Interconnection Queue"

Sacramento Municipal Utility District (SMUD): <http://www.oatioasis.com/smd1/index.html>

Select "Interconnection Queue"

California Independent System Operator Generator Interconnection Queue:

<http://www.caiso.com/14e9/14e9ddd1ebf0ex.html>

PacifiCorp: <http://www.oasis.pacificorp.com/OASIS/PPW/>
Under "Generation Interconnection Requests" heading, "View Current Queue"

Colorado:

Public Service Company of Colorado – Xcel Energy (PSCo):

http://www.rmao.com/wtpp/psco_studies.html

Select "PSCo Generation Interconnection Requests"

Black Hills/Colorado Electric Utilities:

<http://www.oatioasis.com/bhct/index.html>

Select "Interconnection Requests" > "Generator Interconnection Queue"

Platte River Power Authority:

<http://www.oatioasis.com/prpa/index.html>

Select "Interconnection Requirements"

Hawaii:

Hawaiian Electric Company:

<http://www.heco.com/portal/site/heco/>

Hawaiian Electric Industries, Inc. (HEI): <http://www.hei.com/>
Supplies power to 95% of Hawaii's population through its electric utilities: Hawaiian Electric Company, Inc.; Hawaii Electric Light Company, Inc.; and Maui Electric Company, Limited.

Idaho:

Idaho Power: <http://www.oatioasis.com/ipco/index.html>

Select "Generation Interconnection" > "Generation Interconnection Queue"

PacifiCorp: <http://www.oasis.pacificorp.com/OASIS/PPW/>
Under "Generation Interconnection Requests" heading, "View Current Queue"

Kansas:

Southwest Power Pool (SWPP):

<http://sppoasis.spp.org/OASIS/SWPP>

Requires login to access transmission information.

Westar Energy, Inc.: <http://www.oatioasis.com/WR/index.html>

Montana:

Montana Alberta Tie LTD:

<http://www.oatioasis.com/mat1/index.html>

Select "Interconnection Agreement" > "MATL Generation Queue"

Northwest Energy: <http://www.oatioasis.com/NWMT/index.html>

Select "Generation-Load-Transmission Interconnection"

Nebraska:

Mic-Continent Area Power Pool (MAPP):

<http://www.oatioasis.com/MAPP/index.html>

Midwest ISO:

<http://www.midwestmarket.org/page/Generator+Interconnection>

Nevada:

NV Energy – Nevada Power Company (NPC): <http://www.oatioasis.com/NEVP/index.html>

Select "Transmission and Interconnection Requests" > "Interconnection Requests"

NV Energy – Sierra Pacific Power Company (SPPC): <http://www.oatioasis.com/sppc/index.html>

Select "Transmission and Interconnection Requests" > "Interconnection Requests"

PacifiCorp: <http://www.oasis.pacificorp.com/OASIS/PPW/>
Under "Generation Interconnection Requests" heading, "View Current Queue"

New Mexico:

El Paso Electric Company (EPE):

<http://www.epelectric.com/internetsite/transmission.nsf/transmission?OpenForm>

Select "Interconnection Requests"

Public Service Company of New Mexico (PNM): <http://www.oatioasis.com/pnm/index.html>

Select "Interconnection and Delivery Services Studies" > "Status of System Impact Studies" > "Interconnection Studies Status"

Tri-State Generation and Transmission Association (Tri-State):

<http://www.oatioasis.com/tsgt/index.html>

Select "OATT Queue" > "TSTG Interconnection Service Queue"

North Dakota:

Midwest ISO:

<http://www.midwestmarket.org/page/Generator+Interconnection>

Basin Electric Power Cooperative:

<http://www.oatioasis.com/BEPC/index.html>

Login is required for information.

Oklahoma:

Southwest Power Pool (SWPP):

<http://sppoasis.spp.org/OASIS/SWPP>

Requires login to access transmission information.

Oregon:

Portland General Electric:

<http://www.oatioasis.com/pge/index.html>

Select "Generation Interconnection" > "Interconnection Requests"

PacifiCorp: <http://www.oasis.pacificorp.com/OASIS/PPW/>
Under "Generation Interconnection Requests" heading, "View Current Queue"

South Dakota:

Midwest ISO:

<http://www.midwestmarket.org/page/Generator+Interconnection>

Northwest Energy: <http://www.oatioasis.com/NWMT/index.html>

Select "Generation-Load-Transmission Interconnection"

Texas:

ERCOT: <http://www.ercot.com/gridinfo/sysplan/>
 Link on right side of page: "Planning and Operations Information"
 Requires a username and password.

Utah:

Deseret Power:
<http://www.oasis.pacificorp.com/oasis/dgt/main.html>
 Requires login to access information.

PacifiCorp: <http://www.oasis.pacificorp.com/OASIS/PPW/>
 Under "Generation Interconnection Requests" heading, "View Current Queue"

Washington:

Avista Corp:
http://www.oatioasis.com/AVAT/AVATdocs/GIP_Queue-V36.pdf

Bonneville Power Administration:

<http://www.oatioasis.com/bpat/index.html>
 Select "Generation Interconnection" > "Generation Interconnection Request Queue"

Puget Sound Energy:

OASIS: <http://www.oatioasis.com/psei/index.html>
 Transmission Services: <http://www.pse.com/solutions/doingbusiness/Pages/transmissionServices.aspx>

Portland General Electric:

<http://www.oatioasis.com/pge/index.html>
 Select "Generation Interconnection" > "Interconnection Requests"

PacifiCorp: <http://www.oasis.pacificorp.com/OASIS/PPW/>
 Under "Generation Interconnection Requests" heading, "View Current Queue"

Wyoming:

Platte River Power Authority:
<http://www.oatioasis.com/prpa/index.html>
 Select "Interconnection Requirements"

PacifiCorp: <http://www.oasis.pacificorp.com/OASIS/PPW/>
 Under "Generation Interconnection Requests" heading, "View Current Queue"

General:

Many of the states listed above are also included in the WestTrans OASIS site:
http://www.oatioasis.com/cwo_default.htm

Utilities listed on the WestTrans site include: APS, Avista Corp., Bonneville Power, BC Transmission Corp., Black Hills Energy, Cheyenne Light Fuel and Power, Columbia Grid, Colorado Springs Utilities, El Paso Electric, Imperial Irrigation District, Idaho Power, Los Angeles Dept. of Water and Power, Montana Alberta Tie Ltd, Nevada Power, NorthWestern Energy, Portland General Electric, Public Service Company of New Mexico, Platte River Power Authority, Puget Sound Energy, Xcel Energy, Sacramento Municipal Utility District, Sierra Pacific, Salt River Project, Southwest Transmission Cooperative, Inc., Transmission Agency of Northern California, Tri-State Generation and Transmission Association, Inc.,

Tucson Electric Power, Western Area Power Administration; Desert Southwest Region (WALC), Colorado/Missouri Region (WACM), Sierra Nevada Region (WASN).

Appendix F – Technical Interconnection Process

Interconnection Request

A developer will file an application and request for interconnection together with a deposit (varies) with a transmission provider (TP) to interconnect with the system. The application must identify the type of service requested, (energy or network), the location of the generator and the location of proposed point of interconnection, the type of generation (solar thermal, photovoltaic, wind, hydro, gas coal, nuclear), amount of generation in MW, equipment to be used, and the proposed commercial operation date. Once the application is deemed complete, the developer's project will be listed in the "queue", which is a list of all projects seeking interconnection with a particular TP. The developer must also demonstrate site control for the generator location. The TP will review the application and schedule a meeting to discuss the project and potential alternative interconnections.

Feasibility Study (FS)

This is the first of a series of technical studies. This study is a preliminary evaluation of the system impact and cost of interconnecting the generator to the TP's system. The developer must provide a deposit (varies) for the cost of this study. The study will use existing studies if practicable, and will include a power flow and short circuit analysis. This study will include a consideration of other projects which are in earlier in time in the queue and may have an impact on the developer's project. The developer and TP will meet to discuss the results of the study. Some developers are skipping this study, and proceed directly to the next level of study, called a System Impact Study.

System Impact Study (SIS)

This is an evaluation of the proposed interconnection on the reliability of the transmission system. The developer must provide a deposit (varies) and demonstrate site control. The TP will use existing studies if practicable, and use reasonable efforts to complete the study in 90 days. The TP can study interconnection requests, individually, or can study them in combination, or "clusters". The TP will use a date range for interconnection requests which will be studied in a cluster. This study will include a short circuit analysis, power flow analysis and stability analysis. The study will identify impediments, or requirements for interconnection, a preliminary estimate of time and cost necessary to correct problems identified, a list of facilities which will be required to accommodate the developer's request for interconnection together with a good faith estimate of construction costs and cost responsibility for the facilities. At the same time that the SIS is delivered to the developer he will also receive from the TP a draft agreement for the next study, (Facilities Study) which will contain an estimate of the costs and

time frame to complete it. The developer will usually have a defined period of time within which to sign this agreement, provide the technical information required and submit the required deposit (varies) for study costs.

Facilities Study

This is a more detailed study and estimate of the costs of the equipment, engineering and procurement construction work and timeframes required to implement the findings of the SIS to interconnect the generator to the transmission system. The TP will coordinate this study with any other affected transmission system, and will use existing studies if practicable. The facilities study agreement can call for a 90 day delivery date for the study with a +/- 20 percent cost estimate, or for a 180 day delivery date for the study, a +/- 10 percent cost estimate.

Interconnection Agreement

This document will establish the binding obligations of the parties regarding the final obligations of the parties and the costs of the interconnection.

Notes

¹ http://www.westgov.org/index.php?option=com_content&view=article&id=219&Itemid=81

² For information regarding WGA proposal see; http://www.westgov.org/index.php?option=com_content&view=article&id=129&Itemid=57

³ <http://www.energy.ca.gov/reti/index.html>

⁴ See Phase 1B Final Report and Final 2 B reports at: <http://www.energy.ca.gov/reti/documents/index.html>

⁵ <http://www.retaac.org/Home>

⁶ www.nmreta.org

⁷ http://www.westconnect.com/planning_swat_rttf_arrrtis.php

⁸ <http://www.westconnect.com/filestorage/ARRTIS%20Final%20Report.pdf>

⁹ http://congestion09.anl.gov/documents/docs/Congestion_Study_2009.pdf

¹⁰ <http://www.wecc.biz/PLANNING/TRANSMISSIONEXPANSION/RT/EP/Pages/default.aspx>

¹¹ Main page and footprint map
<http://www.westconnect.com/aboutwc.php>

¹² The planning report identifies 2009 planning activities and 2010 planned study activity for the regional and sub regional planning group within the WestConnect footprint. http://www.westconnect.com/filestorage/wc_2010_planning_report_complete_030510
Errata at http://www.westconnect.com/filestorage/wc_2010_report_errata

¹³ The plan contains transmission plans for the 15 transmission providers and 28 project sponsors.
http://www.westconnect.com/filestorage/wc_trans_planning_2010_final_rpt_041910

¹⁴ http://www.westconnect.com/planning_ccpg.php

¹⁵ http://www.westconnect.com/planning_ccpg_lr.php

¹⁶ http://www.westconnect.com/planning_sierra.php

¹⁷ http://www.westconnect.com/planning_swat.php

¹⁸ http://www.westconnect.com/planning_sierra.php

¹⁹ Footprint map at <http://www.columbiagrid.org/client/ColumbiaGrid%20Map.jpg>

²⁰ Main page and footprint map at <http://www.nttg.biz/site/>

²¹ http://nttg.biz/site/index.php?option=com_content&task=view&id=13&Itemid=85

²² <http://www.spp.org/index.html>

²³ Footprint map at
http://www.spp.org/publications/SPP_Fast_Facts.pdf

²⁴ <http://www.spp.org/section.asp?pageID=115>

²⁵ <http://www.midwestiso.org/page/MisoPortalHome>

²⁶ <http://www.midwestmarket.org/page/Planning>
Approved Transmission Expansion Plan at
http://www.midwestmarket.org/publish/Folder/3e2d0_106c60936d4_-75240a48324a

²⁷ <http://www.caiso.com/>

²⁸ <http://www.ctpg.us/public/index.php>

²⁹ <http://www.energy.ca.gov/reti/index.html>
RETI includes participation by the California Public Utility Commission, California Energy Commission, CAISO, and publicly owned utilities.

³⁰ <http://www.energy.ca.gov/reti/documents/phase2A/maps/>

³¹ <http://www.ercot.com/>

³² <http://www.nrel.gov/wind/systemsintegration/news/2010/847.html>

³³ <http://www.wapa.gov/recovery/default.htm>

³⁴ <http://www.wapa.gov/recovery/planning.htm>

³⁵ <http://www.bpa.gov/corporate/>

³⁶ <http://www.bpa.gov/corporate/RecoveryAct/mcnary-johnday.cfm>

³⁷ <http://solareis.anl.gov/index.cfm>

³⁸ <http://corridoreis.anl.gov/>

³⁹ http://www.westgov.org/index.php?option=com_content&view=article&id=123&Itemid=68

⁴⁰ <http://www.whitehouse.gov/files/documents/ceq/Transmission%20Siting%20on%20Federal%20Lands%20MOU.pdf>

⁴¹ Details on the reliability criteria can be found at the WECC website; <http://www.wecc.biz/documents/library/procedures/CriteriaMaster.pdf>

⁴² More information about WestConnect and its affiliated sub-regional planning organizations is available at www.westconnect.com/planning.php



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GOVERNORS'
ASSOCIATION**

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