



WESTERN INITIATIVES

IMPLEMENTING REAL ELECTRIC ENERGY SOLUTIONS IN THE WESTERN INTERCONNECTION

**WEST
CONNECT**

**Enhancing wholesale
electricity markets
in the southwest**

THE WESTERN INTERCONNECTION encompasses a vast and varied area covering all or part of 16 western states, as well as parts of Canada and Mexico. Electric energy demand, resource mix and transmission needs vary widely across the interconnection, and regional practices have developed to address those needs. While the majority of transmission needs are sub-regional in nature, the transmission planning processes developed in the Western Interconnection provide for the identification and consideration of broader needs. These processes provide the opportunity for all interested parties to be involved in developing projects that meet both sub-regional and inter-regional needs. In addition, the regional organizations recognize the value in coordinating to address other issues common to the entire interconnection and are jointly developing and implementing solutions to the broader issues including the integration of variable resources, facilitating access to new resources and coordinating operations between Balancing Authority Areas (BAAs). The following is a list of some of the important drivers in the West in building transmission to meet the needs of multiple utilities in the region:

Transmission Planning Is Inclusive and Occurs at Local, Sub-Regional and Interconnection-Wide (Regional) Levels

- Meetings are held for local, sub-regional, and interconnection-wide (regional) transmission planning
- Open to all stakeholders
- Projects address mutual needs



Palo Verde to Pinal West 500 kV Line
Salt River Project, Tucson Electric Power Company, Southwest Transmission Cooperative Inc. and Electrical Districts 2, 3 & 4

Geography of West Drives Joint Transmission Projects

- Population centers separated by large distances
- Many generators remote from load centers
- Joint ownership promotes economies of scale and shared risk
- Project participants recognize obligation to pay their share
- Transmission projects that address identified needs get built



Sunrise Powerlink 500 kV Line
San Diego Gas & Electric and Imperial Irrigation District

Siting Is Biggest Challenge to Transmission Construction

- Much of the land in the West is federally owned and controlled
- Siting on federal lands is an impediment to timely construction of needed projects
- Tribal lands comprise a large amount of Western territory; commercial terms for right-of-way must be mutually agreed upon

Renewable Resources and Policies Vary among States in the Region

- Entities seek to meet state and local renewable standards with the most readily available and cost effective local resources
- Local resources are often the most economic and least environmentally damaging option
- Large national EHV transmission overlay not needed to meet renewable energy needs in the West
- Transmission to interconnect and deliver local renewable resources is being built
- As it is needed regional transmission will be built to address renewable resources

History of Regional Planning and Coordination Promotes Operational Solutions

Regional collaboration is addressing emerging operational needs such as variable energy resource integration:

- Intra-Hour Scheduling
- Dynamic Scheduling System (DSS)
- ACE Diversity Interchange (ADI)
- Intra-Hour Transaction Accelerator Platform (I-TAP)
- Balancing Authority Reliability-based Controls (BARC or RBC)
- Analysis of potential Energy Imbalance Market (EIM)

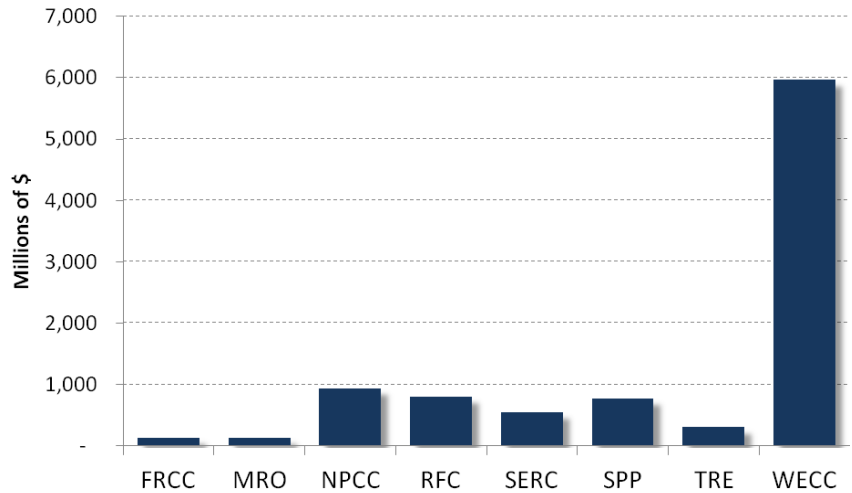
The history and practice of inclusive communication, coordination, joint transmission planning and joint development in the Western Interconnection not only continue to result in the construction of transmission facilities needed to meet the needs of electric consumers, but have created an environment that fosters unique and creative ways to reliably incorporate a wide variety of new resources.

Transmission Is Being Funded & Built in the West

Transmission is being planned and constructed in the Western Interconnection. Since 2002 over 2,200 circuit miles of transmission lines rated at 230 kV or above have been planned, sited and constructed in the Western Electricity Coordinating Council (WECC) region¹.

Nearly 6 billion dollars in transmission investment is planned or proposed in the next few years. This potential investment in transmission in the West far exceeds the investment of all other North American Electric Reliability Corporation (NERC) regions combined. WECC transmission owners achieve this level of transmission investment by working together in an open environment to plan, finance, site, and construct high-voltage transmission in the West.

Projected Investment in Transmission Projects through 2013



Source: FERC Office of Energy Projects, Energy Infrastructure Update January 2011

¹NERC 2002 and 2010 Long-Term Reliability Assessments

Regional Planning Is Occurring Voluntarily

Transmission system expansion in the Western Interconnection is coordinated through a bottom-up approach through open and effective local, sub-regional and interconnection-wide (regional) planning processes. This approach works for transmission projects driven by reliability, economics and public policy.

Transmission planning processes at both the local and sub-regional levels provide opportunities for stakeholders – including transmission providers and customers, generation developers and environmental groups – to identify particular needs and interests and review and comment upon proposed projects.

Plans and projects with regional impact are evaluated and vetted through committees of the WECC. This regional review process provides opportunities for all stakeholders to identify needs and interests and to comment on proposed plans and projects.

DOE provided \$26.2 million in funding under the American Recovery and Reinvestment Act to support transmission planning in the Western Interconnection. \$14.5 million of this funding is being used by WECC to evaluate long-term regional transmission needs through a broad stakeholder-driven process. State policy makers are also involved through a \$12 million grant provided to the Western Governors' Association (WGA).

WECC Sub-Regional Planning Groups



Joint Ownership Works

The Joint Ownership funding model is one successful approach to funding transmission development in the West. Because of the low population density in the West, load centers and generators are often separated by large distances. Projects connecting the two may be cost prohibitive for any one transmission owner. Joint Ownership can allow multiple parties to aggregate their needs and efforts into individual transmission projects to achieve critical mass and reduce individual risk and cost.

Mandating the allocation of transmission costs is not necessary. When a project is economically viable, utilities and merchant developers will come together to fund the project. By letting the market work, the most cost effective, beneficial projects will be funded and built. This model has worked for decades in the West and will continue to work even as new, renewable energy projects are proposed and developed.

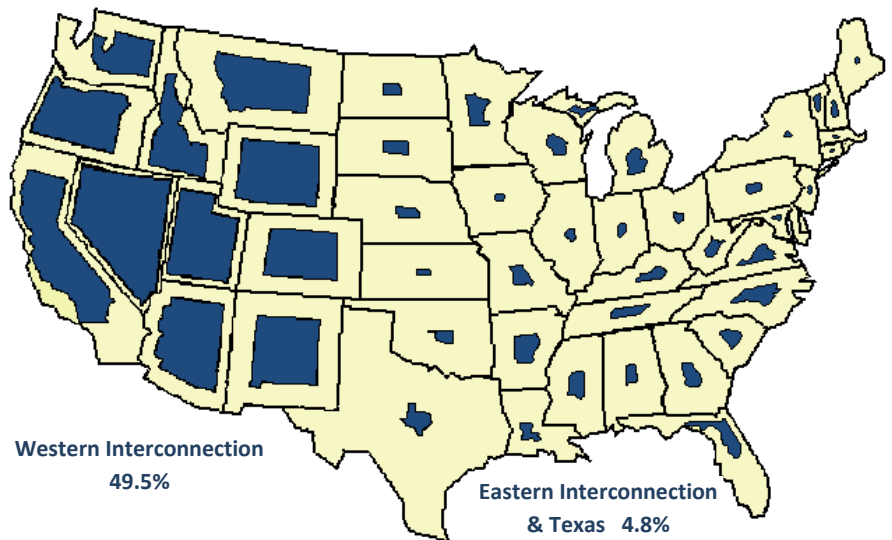
Map of Jointly Owned Transmission and Generation in the Western Interconnection



Planning & Funding Are Not the Principal Barriers to Transmission Development

Transmission permitting/ siting is considered one of the highest risks facing the electric industry over the next ten years². Unlike the rest of the country, the West is unique in the amount of land owned by the federal government. Siting transmission on federal land can take up to ten years or more. In many cases, obtaining the permits necessary to construct a transmission line can take longer than constructing the line itself. As a result, transmission owners must invest a significant amount of capital in preliminary development of a project without knowing if the project will ever be built.

Percentage of Land Owned by the Federal Government



Source: U.S. General Services Administration, Federal Real Property Profile

The National Interest Electric Transmission Corridors established by DOE pursuant to Congressional direction in the Energy Policy Act of 2005 (EPA 2005) were challenged in court over National Environmental Policy Act (NEPA) concerns and overturned. DOE should address those concerns to allow the establishment of corridors to move forward. Congress can also take steps to expedite the siting process by amending EPA 2005 to explicitly include siting of transmission lines to areas with renewable generation.

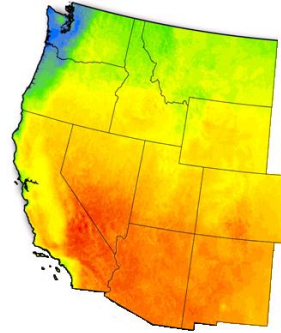
²NERC 2009 Long-Term Reliability Assessment

Significant Renewable Resources Exist Locally in the West

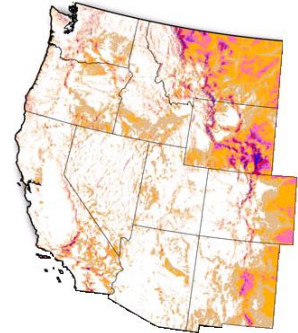
Some have argued that long-line transmission is needed to access power from renewable resources that are remote from load centers. In the West, abundant renewable resources exist in all states, although resource types do vary from state to state. Accessing local renewable resources is often more cost-effective and timely than building long transmission lines. This means lower total electricity prices for consumers and less impact on the environment.

Over 17,000 MW of wind, solar, biomass and geothermal generating capacity have been developed to date in the West³ along with the necessary transmission to move that power to the load centers. These are predominantly local projects serving local needs by delivering clean, cost-effective energy from Western resources. The transmission lines necessary to support these projects are getting built when and where needed.

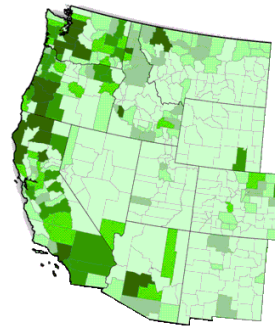
Concentrating Solar Resource



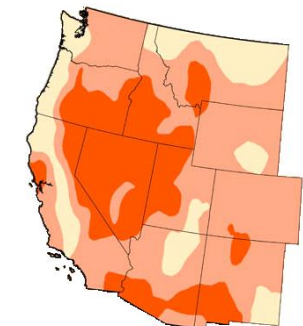
Wind Resource



Biomass Resource



Geothermal Resource



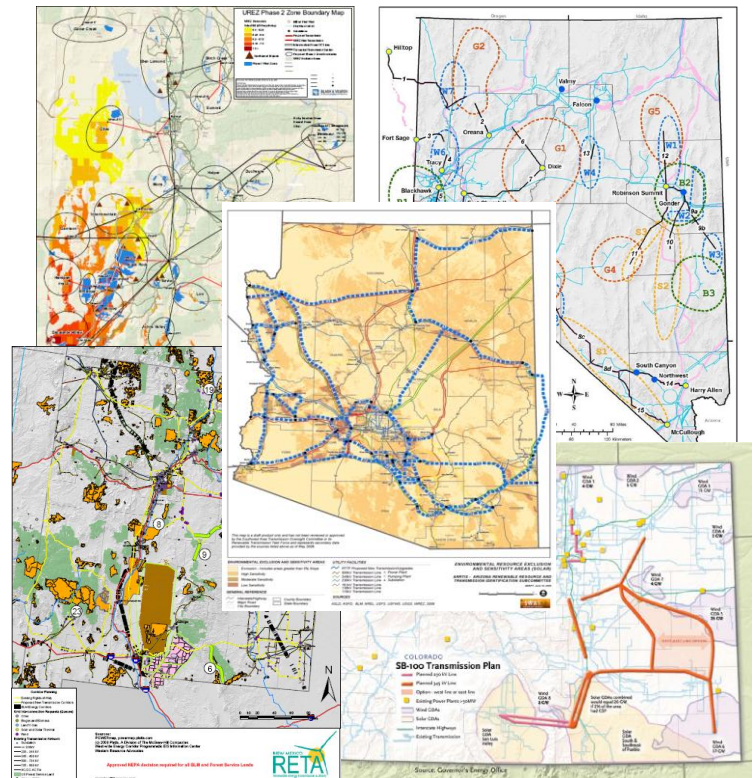
³ACORE "Renewable Energy in America" Spring 2011 Update

Source: NREL

Integration of Renewable Resources Is Being Considered in Planning

Efforts to identify efficient ways to integrate renewable resources into the transmission system have been undertaken in many Western states. Some of these efforts have included the following:

- Arizona Renewable Resources and Transmission Identification Subcommittee (ARRTIS)
- California Renewable Energy Transmission Initiative (RETI)
- Colorado Governor's Office Renewable Energy Development Infrastructure Task Force (REDI)
- Nevada Renewable Energy Transmission Access Advisory Committee (RETACC)
- New Mexico Renewable Energy Transmission Authority (RETA)
- NREL's Western Wind and Solar Integration Study (WWSIS)
- Utah Renewable Energy Zone Task Force (UREZ)
- Western Governors' Association, Western Renewable Energy Zones (WREZ)
- Wyoming Infrastructure Authority (WIA)



These efforts bring together varied stakeholders to discuss environmental impacts, land use implications and other public concerns to identify preferred corridors for renewable energy transmission. By obtaining stakeholder input early in the process, future transmission lines will be sited more quickly and at a lower cost to consumers.

Regional Coordination Promotes Operational and Economic Solutions

Due to the variable nature of some renewable resources, greater scheduling flexibility is required to effectively dispatch these resources. Entities in the West are responding to this need by developing operational solutions. Three regional transmission provider groups – WestConnect, ColumbiaGrid and Northern Tier Transmission Group (NTTG) – are working together as the Joint Initiative. The Joint Initiative utilizes an open, collaborative process which engages all interested stakeholders to develop reliable, cost-effective solutions to regional challenges on an interconnection-wide basis.

Intra-hour Scheduling

Currently generation is scheduled hourly. However, variable resources may not be available for an entire hour. The Joint Initiative is leading the effort to establish intra-hour scheduling beginning with thirty-minute schedules. Participants targeted July 2011 as the start-up month for implementing thirty-minute intra-hour scheduling. At least ten Balancing Authorities (BAs)/transmission providers (TPs) began accepting intra-hour schedules before July 2011, and close to twenty additional BAs/TPs were ready or preparing to accept intra-hour schedules in July 2011. Members of WestConnect coordinated their efforts to create intra-hour reservation and scheduling guidelines and a business practice template in order to attain as much consistency across the WestConnect footprint as possible. The next step by the Joint Initiative is to move to a more granular scheduling timeframe once the implementation of thirty-minute scheduling has matured.

Proposed Energy Imbalance Market (EIM)

WECC has funded and staffed a cost-benefit analysis of a proposed Energy Imbalance Market (EIM) for the Western Interconnection (excluding the California ISO and Alberta Electric System Operator, which already operate energy markets). The proposed EIM would utilize bid-in generation under security-constrained economic dispatch in a five-minute market to provide the most economical, deliverable resources for imbalance energy (difference between scheduled and actual generation). This design is similar to the EIM operated by the Southwest Power Pool⁴.

Such a market could assist with integration of variable resources in the Western Interconnection by providing BAs with broader access to balancing energy. The EIM would also provide coordinated re-dispatch for grid congestion.

The WECC-sponsored cost-benefit analysis was completed in June 2011. Individual BAs will do further individual analysis of EIM capital and operating costs, implementation benefits, and organizational/governance considerations and will decide whether to collaborate in further EIM development efforts.

Balancing Authority Reliability-based Controls (BARC or RBC)

The integration of variable energy resources can cause an increase in the frequency variation within an interconnected electric system. Frequency variation is one component of Area Control Error (ACE), a quantity that each Balancing Authority Area's (BAA) Automatic Generation Control (AGC) system computes and regulates in order to match generation to load within the BAA. AGC systems increase or decrease the output of regulating generators in order to maintain ACE within limits prescribed by the Control Performance Standard 2 (CPS2) mandated by NERC. RBC is a proposed replacement for CPS2 that relaxes the limits on a BAA's ACE when it is in a direction that helps the interconnection recover from the frequency variation, thereby mitigating the impact of variable generation on control performance while also reducing wear and tear on regulating generators.

About 70% of WECC BAAs are currently participating in the RBC field trial that began in March 2010. Results to date suggest relatively insignificant negative effects on reliability, including a slight increase in interconnection frequency error. Next steps for RBC include expanding the field trial to more BAAs within WECC, investigating the impact of on-peak to off-peak interchange schedule transitions on interconnection frequency, and tuning the AGC algorithm to take advantage of the expanded RBC limits.

ACE Diversity Interchange (ADI)

When a significant amount of variable energy resources are installed in one BAA, it can cause large, short-lived imbalances between its load and generation. ACE is a measure of a BAA's load and generation imbalance. A number of BAAs within WestConnect, ColumbiaGrid and NTTG are testing an experimental method called ADI that shares the responsibility of balancing interconnection load and generation among several BAAs. ADI electronically exchanges the ACE requirement of BAAs that are over-generating with those of neighboring BAAs that are under-generating, thus integrating variable energy resources into a

⁴Southwest Power Pool is a NERC Regional Entity and regional transmission organization (RTO) operating in nine midwestern and southern states.

larger pool of loads and generation. As a result, ADI reduces the system control burden on an individual BAA without undue investment by other ADI participants.

ADI is currently set-up and operating in the Western Interconnection. Several BAAs in the northern portion of WECC are utilizing ADI now. Implementation of ADI in the southern portion of WECC is imminent. In addition, a NERC subcommittee is drafting a white paper on implementation of ADI.

Intra-Hour Transaction Accelerator Platform (I-TAP)

The Joint Initiative participants recognize the need for a computer-based tool to help facilitate the identification, consummation and scheduling of intra-hour energy transactions. The Joint Initiative has contracted with a vendor to develop a product called webExchange to provide a one-stop shop for subscribers to purchase, sell and schedule energy on an intra-hour basis. The functionality can be implemented manually or automatically and will allow users to:

- Manually post bids and offers for energy which can be viewed by other participants;
- Find postings to match request, execute and confirm trades; and
- Locate low cost transmission paths with adequate capacity, purchase transmission and create e-Tags.

Dynamic Scheduling

The Joint Initiative worked with a software vendor to develop a Dynamic Scheduling System, or DSS. Normal energy products require level energy production throughout an entire hour. Dynamic products vary throughout the hour. Schedules must be tracked in real time to know what has actually been purchased. DSS utilizes advanced communications to rapidly establish links between BAAs on a transaction-by-transaction basis. These communications facilitate both intra-hour schedules and dynamic schedules. After a period of production testing and confirmation of operational stability, the DSS Operations Committee designated March 11, 2011 as the DSS Implementation Date. New participants are now being accepted for DSS.

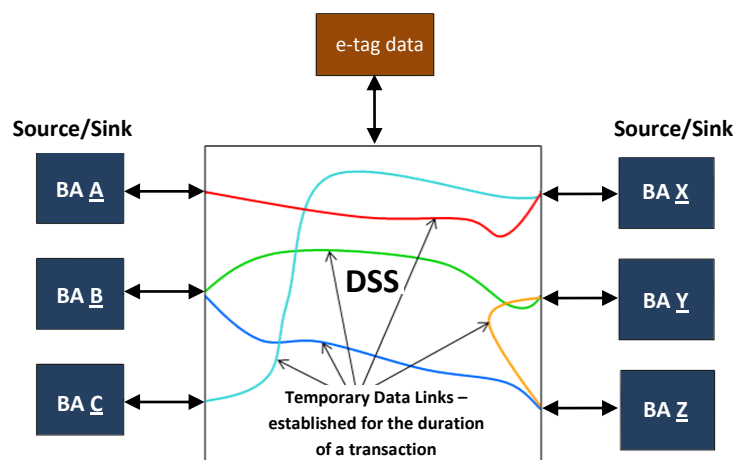
The vendor has developed and is testing the product. The goal is to have the system fully operational in 2011.

WestConnect Transmission Pricing Experiment

In July 2009, nine WestConnect TPs, both jurisdictional and non-jurisdictional, initiated a FERC-approved two-year pilot for providing hourly non-firm point-to-point transmission service across the WestConnect footprint at non-pancaked rates. The experiment utilizes a scheduling and billing platform designed and administered by OATI and offered through the TPs’ wesTTrans OASIS sites. The experiment allows for WestConnect non-jurisdictional TPs to participate in providing the non-pancaked service without triggering FERC jurisdiction over their rates.

Because the experiment was introduced right at the beginning of the recession – which caused electric loads and wholesale power prices and price spreads between trading hubs to drop markedly – the number of transactions using the hourly non-pancaked transmission rates has not been as high as projected. The WestConnect TPs have requested and FERC has approved an extension of the experiment to 2013. The TPs feel confident that recovery in the economy and in sales of electric power will increase the use of the discounted transmission service for sales of wholesale generation.

DSS E-tag Implementation
Instantaneous Information Using WECC-Approved Communication Links to Monitor, Measure and Invoice for Actual Energy Delivered Under Dynamic E-tags



Acronyms Used in This Document

ACE	Area Control Error	NTTG	Northern Tier Transmission Group
ADI	ACE Diversity Interchange	OASIS	Open Access Same-Time Information System
AESO	Alberta Electric System Operator	OATI	Open Access Technology International, Inc.
AGC	Automatic Generation Control	RBC	Balancing Authority Reliability-based Controls (see also BARC)
ARRTIS	Arizona Renewable Resources and Transmission Identification Subcommittee	REDI	Colorado Governor's Office Renewable Energy Development Infrastructure Task Force
BA	Balancing Authority	RETA	New Mexico Renewable Energy Transmission Authority
BAA	Balancing Authority Area	RETACC	Nevada Renewable Energy Transmission Access Advisory Committee
BARC	Balancing Authority Reliability-based Controls (see also RBC)	RETI	California Renewable Energy Transmission Initiative
BCCPG	British Columbia Coordinated Planning Group	RTO	Regional Transmission Organization
CCPG	Colorado Coordinated Planning Group	SWAT	Southwest Area Transmission
CPS2	Control Performance Standard 2	TP	Transmission Provider
DOE	Department of Energy	UREZ	Utah Renewable Energy Zone Task Force
DSS	Dynamic Scheduling System	WECC	Western Electricity Coordinating Council
EHV	Extra-High Voltage	WGA	Western Governors' Association
EIM	Energy Imbalance Market	WIA	Wyoming Infrastructure Authority
EPAAct 2005	Energy Policy Act of 2005	WREZ	Western Renewable Energy Zones
FERC	Federal Energy Regulatory Commission	WWSIS	Western Wind and Solar Integration Study
I-TAP	Intra-Hour Transaction Accelerator Platform		
NEPA	National Environmental Policy Act		
NERC	North American Electric Reliability Corporation		
NREL	National Renewable Energy Laboratory		

WestConnect is a regional effort among 13 utilities in the Southwest and Rocky Mountain areas of the Western Interconnection to investigate and implement cost-effective wholesale market enhancements for the Western Grid and to work cooperatively with other Western Grid organizations and market participants to seek broad consensus for wholesale market enhancements to ensure as much consistency as possible in reliability and business practices. WestConnect participants include Arizona Public Service Company, El Paso Electric Company, Imperial Irrigation District, NV Energy, Public Service Company of New Mexico, Sacramento Municipal Utility District, Salt River Project, Southwest Transmission Cooperative, Transmission Agency of Northern California, Tri-State Generation and Transmission Association, Tucson Electric Power Company, Western Area Power Administration and Xcel Energy-Public Service Company of Colorado. See WestConnect's website at www.westconnect.com.

Contact: Charlie Reinhold, WestConnect Project Manager, (208) 253-6916, reinhold@ctcweb.net.