

TransWest Express Transmission Project

Regional Planning Project Review Report

May 30, 2008

TransWest Express

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I. Introduction

The purpose of this report is to document the Regional Planning Project Review for the TransWest Express Project. The TransWest Express project was announced by Arizona Public Service (APS) in 2006 to provide transmission service between Wyoming and the Desert Southwest.

Arizona Public Service formed a partnership with PacifiCorp, National Grid, and the Wyoming Infrastructure Authority (WIA) (the 'Partners') to identify and explore regional transmission opportunities with the co-development of the TransWest Express (TWE) and the Gateway South (GS) projects. These two projects could potentially share common corridors and the Partners recognized several potential benefits through co-development of the projects, including improved reliability to the Western Interconnection, a reduction of transmission congestion, an increase in the efficiency of development, and potential for other operational benefits.

The Western Electricity Coordinating Council (WECC) Regional Planning Project Review process for the TWE Project was initiated by National Grid on behalf of APS, PacifiCorp, and the Wyoming Infrastructure Authority on September 20, 2007 (see Appendix 2).

The Partners conducted joint Regional Planning Project Reviews (RPPR) for GS and TWE projects. The appended material to this report is common to both the TWE and GS projects. TWE and GS along with PacifiCorp's joint project with Idaho Power, the Gateway West (GW) project, are three major projects emanating from Wyoming to serve growing needs in the west. This RPPR Report should be reviewed along with the companion RPPR Reports for GS and GW.

WECC's Regional Planning Project Review process provides transmission project sponsors with a procedure to report on planned projects and work together with WECC members and other stakeholders on expanding the system capacity to meet the regional needs within the context of regional plans. WECC provides eleven guidelines to ensure compliance with the Regional Planning Project Review process. Each of these specific guidelines are addressed within the context of this report.

The FERC Open Access Transmission Tariff (OATT) Order 890 provides nine Transmission Planning Principles that Transmission Providers are required to adopt within in their OATT processes. As eight of the nine Principles have been employed during this RPPR, the Report references the specific Principles within the context of the review. (Note that as an open stakeholder review process, the RPPR does not lend itself directly to the Dispute Resolution Principle. The Partners have adopted the Dispute Resolution process within APS' Attachment K. See <http://www.oatioasis.com/azps/index.html>).

The body of this report is sub-divided into three sections: 1) Stakeholder Process, 2) Resource Assessment, and 3) Transmission Assessment. The WECC RPPR guidelines and the Order 890 Transmission Planning Principles that are specifically addressed in each section are listed at the beginning of each section. To assist the reader in determining how each guideline has been addressed by the Partners, the WECC RPPR

guideline number has been noted (in ^{superscript} format) where a specific guideline is addressed within a statement.

The Partners engaged Black & Veatch (B&V) to refine the technical aspects of the projects, evaluate opportunities through co-development, and perform conceptual cost analysis for the evaluation of alternative configurations. A Conceptual Technical Report produced by B&V for the Partners serves to document these evaluations. The Conceptual Technical Report is a supplement to this RPPR Report and is attached as Appendix 3.

II. Regional Planning Project Review Process

A. Stakeholder Process

The following WECC Regional Planning Process guidelines and FERC principles are addressed in this section.

WECC Regional Planning Process guidelines discussed below include:

2. *Cooperate with others to look beyond specific end points of the sponsors' project to identify broader regional and sub-regional needs or opportunities;*
5. *Cooperate with Regional Planning Review Group members in determining the benefits and impacts due to the project;*
7. *Coordinate project plans with and seek input from all interested members, sub-regional planning groups, power pools, and region-wide planning group(s);*
8. *Coordinate project plans with and seek input from other stakeholders including utilities, independent power producers, environmental and land use groups, regulators, and other stakeholders that may have an interest;*
11. *Coordinate with potentially parallel or competing projects and consolidate projects where practicable.*

Order 890 Principles for Transmission Planning discussed below include:

- A. *Coordination*
- B. *Openness*
- C. *Transparency*
- D. *Information Exchange*
- G. *Regional Participation*
- I. *Cost Allocation*

National Grid initiated the RPPR on behalf of the Partners for TWE on September 20, 2007 by soliciting interest of all members of WECC's Planning Coordination Committee (PCC) and Technical Studies Subcommittee (TSS) (see Appendix 2).

The discussions on plans for TWE were the latest in a series of public forums on the Project that date back to 2005. APS first introduced the TWE in a public meeting in Phoenix, AZ on November 17, 2005, which was followed by additional meetings in Salt Lake City, UT on March 17, 2006 and Jackson Hole, WY on June 23, 2006. These public meetings were held in conjunction with Feasibility Studies conducted by APS on the project.

The Partners are committed to the development of these projects within an open and transparent process with all stakeholders. The Partners held four joint GS/TWE Stakeholder meetings to seek public input and participation in the projects. To encourage participation at these meetings, they were held jointly and in different states along the proposed project route (see Table 1). In addition, telephone participation of these meetings was augmented via a web cast of the meeting materials. Meeting announcements were sent to WECC members, public officials and other interested parties as well as posted on several websites. Appendix 4 is a sample announcement letter. Representatives from utilities, independent power producers, environmental and land use groups, regulators, and energy policy advocates attended the meetings and provided valuable input. Appendices 5 through 8 are the Stakeholder Meeting Minutes and Attendance Lists. Appendix 9 is a listing of the websites where these materials are posted. WECC RPPR Guidelines: 2, 5, 7, 8

Table 1 TWE and GS Joint Regional Planning Project Review Stakeholder Meetings

Location	Date
Salt Lake City, UT	October 17, 2007
Cheyenne, WY	November 7, 2007
Phoenix, AZ	December 5, 2007
Las Vegas, NV	January 23, 2008

Sub-Regional Planning

Sub-regional planning is carried out by a number of groups within WECC such as the Northern Tier Transmission Group (NTTG) and West Connect.

The NTTG was formed by a group of transmission providers and customers in the Northwest and Mountain states. The footprint of NTTG includes Wyoming, Montana, Idaho, Utah, and parts of Oregon. NTTG coordinates individual transmission systems operations, products, business practices, and planning of the high-voltage transmission network to meet and improve transmission services that deliver power to consumers. In 2007, NTTG recognized the extent of projects within their footprint that were about to enter the WECC RPPR process, initiated an accelerated Regional Planning Process (RPP), or Fast Track RPP, to coordinate these initial projects prior to implementing their full two year planning cycle.

WestConnect is composed of utility companies providing transmission of electricity in the southwest to include Arizona, California, Colorado, Nevada, New Mexico, Texas, and Wyoming. The members work collaboratively to identify, develop and implement cost-effective enhancements to the Western Interconnection wholesale electricity market (see <http://www.westconnect.com>).

As part of the RPPR, the Partners coordinated planning with NTTG, the Southwestern Area Transmission (SWAT) Regional Planning Group, and WestConnect. These sub-regional planning groups coordinate transmission additions planned by the members of these respective organizations. The Partners actively participate in these sub-regional planning groups and WECC committees and have provided briefings and sought input from members and stakeholders on these projects. Table 2 is a listing of the meetings

held during the RPPR period that included agenda items for TWE presentations and stakeholder input. WECC RPPR Guidelines: 2, 5, 7, 8

Table 2 WECC & Sub-Regional Planning Group Meetings that included a Presentation on TransWest Express

Location	Date	Meeting
Vancouver, BC	October 24-26, 2007	PCC
Reno, NV	October 30-31, 2007	SWAT / WestConnect
Boise, ID	November 13, 2007	NTTG
San Francisco, CA	November 28-29, 2007	TEPPC
Portland, OR	January 16-17, 2008	NTTG
Las Vegas, NV	January 16, 2008	SWAT / WestConnect
San Diego, CA	January 16-18, 2008	TSS

WestConnect established principles of Cost Allocation consistent with their members including APS. These principles are outlined in APS Attachment K.

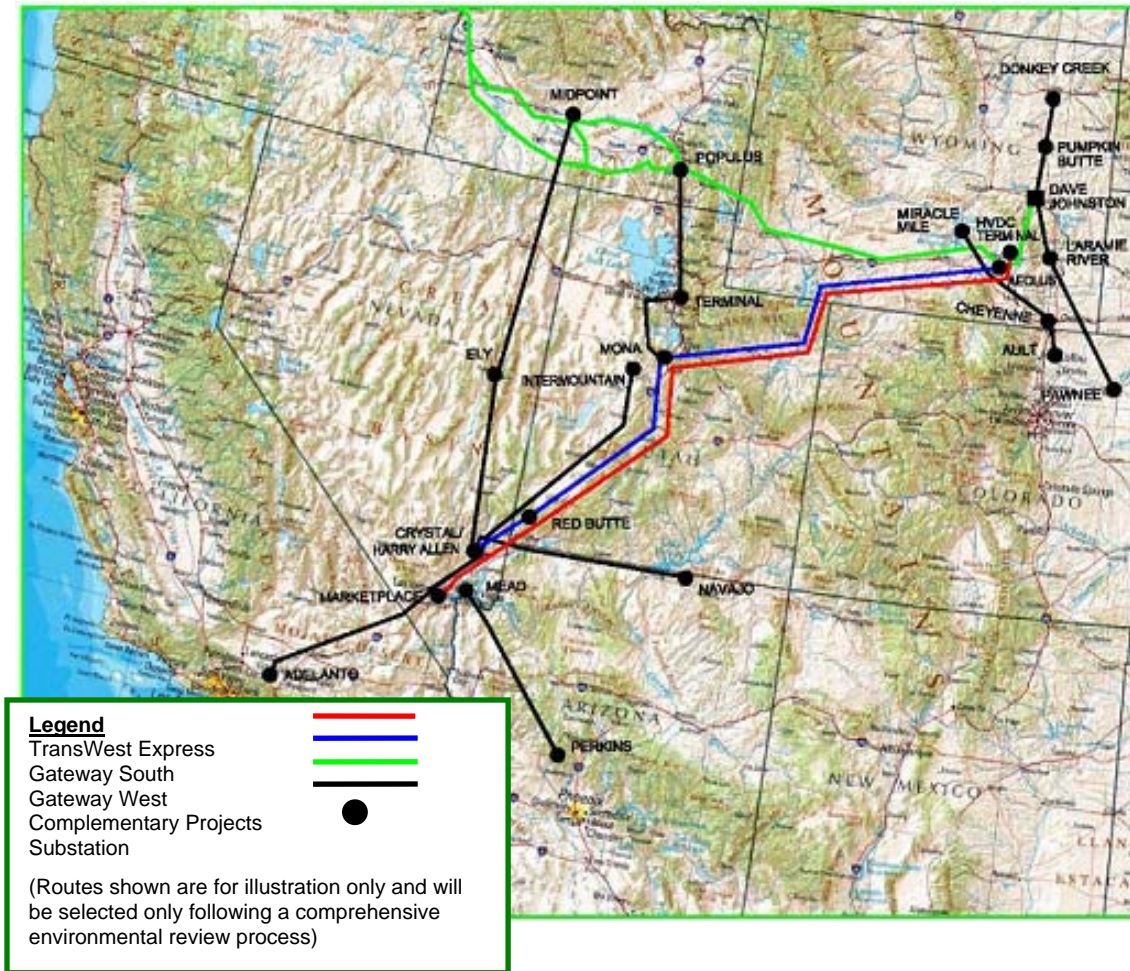
The Partners reviewed the relationship of TWE to other projects within the WECC RPPR and Rating processes. Table 3 provides a list of the complementary projects to TWE. These projects are complementary because they will help strengthen the Western Interconnection by providing increased capacity into and out of the same transmission 'hubs' as TransWest Express. Figure 1 provides a graphical representation of the complementary projects to both GS and TWE. The Partners have established good working relationships with the sponsors of these complementary projects to share respective project plans, agree on the relationship of these projects with TWE, and ensure development plans are generally consistent with one another. The Partners did not identify any project within the WECC process that would be competing with TWE.

WECC RPPR Guidelines: 2, 5, 7, 11

Table 3 Complementary Projects to TransWest Express

Project	Voltage
Wyoming – Colorado Inter-tie	345 kV
TOT 3 Upgrade (300 MW)	230 kV
Populus – Terminal (Path C upgrade)	345 kV
Mona – Terminal (PacifiCorp internal)	2 – 500kV
Gateway South	500 kV
Great Basin (North & South)	500 kV
Southern Navajo Upgrade (Path 51)	500 kV
Navajo – Crystal Upgrade	500 kV
Perkins – Mead Upgrade	500 kV

Figure 1 TWE and GS Complementary Transmission Projects



B. Resource Assessment

The following WECC Regional Planning Process guidelines and FERC principles are addressed in this section.

WECC Regional Planning Process guidelines discussed below include:

1. *Take multiple project needs and plans into account, including identified utilities' and non-utilities' future needs, environmental and other stakeholder interests;*
4. *Identify and show how the project improves efficient use of, or impacts existing and planned resources of the region (e.g., benefits and impacts, transmission constraint mitigation);*
9. *Review the possibility of using the existing system, upgrades or reasonable alternatives to the project to meet the need (including non-transmission alternatives where appropriate);*
10. *Indicate that the sponsor's evaluation of the project has taken into account costs and benefits of the project compared with reasonable alternatives.*

Order 890 Principles for Transmission Planning discussed below include:

C. Transparency

E. Comparability

H. Economic Planning Studies

APS's summer resource capacity requirements are expected to increase nearly 8,000 MW by 2025. APS annual energy sales are expected to increase by 70% by 2025. Other Southwest utilities that could benefit from capacity provided by the TWE (Tucson Electric Power, Salt River Project, Nevada Power Company, Southern California Edison, and Los Angeles Department of Water and Power) are also projecting high growth rates. California, Arizona and Nevada have all established Renewable Portfolio Standards (RPS) that requires more than 100,000 GWh of renewable energy by 2025. ^{WECC RPPR}

Guidelines: 1

South east Wyoming has one of the highest concentration of high class wind energy potential in the country. This resource could provide the means to make significant strides towards meeting RPS in the region. Expanded transmission corridors from Wyoming would provide an electrical pipeline from a state with one of the most economic renewable energy resources in the US.

The primary objectives of the TWE project are to:

- Provide options for meeting future resource integration needs, including renewables (e.g. wind, thermal);
- Improve resource diversity and reliability;
- Provide increased access for third party transmission users;
- Improve overall electric reliability in the Western Interconnection;
- Take advantage of standard voltages, standard increments of capacity, and economies of scale.

The existing transmission capacity available to export from Wyoming is fully committed. These constraints led to the recommendations for transmission expansion along similar routes as TransWest Express from the Western Governors Association (WGA), the Rocky Mountain Area Transmission Study (RMATS), and the Clean and Diversified Energy Advisory Committee (CDEAC). ^{WECC RPPR Guidelines: 1, 4, 9, 10}

C. Transmission Assessment

The following WECC Regional Planning Process guidelines and FERC principles are addressed in this section.

WECC Regional Planning Process guidelines discussed below include:

1. *Take multiple project needs and plans into account, including identified utilities' and non-utilities' future needs, environmental and other stakeholder interests;*
3. *Address the efficient use of transmission corridors (e.g. rights-of-ways, new projects, optimal line voltage, upgrades, etc.);*
6. *Identify transmission physical and operational constraints resulting from the project or that are removed by the project.*

Order 890 Principles for Transmission Planning discussed below include:

- A. *Coordination*
- C. *Transparency*
- E. *Comparability*
- H. *Economic Planning Studies*

The Partners performed a conceptual level technical analysis of TWE and GS to review and update prior work performed by the Partners, refine the technical aspects of the projects, develop and analyze alternative configurations of the combined projects, and evaluate opportunities through co-development. The Partners engaged Black & Veatch to assist with this review. The Conceptual Technical Report developed by Black & Veatch for the Partners is attached as Appendix 3.

The initial review of alternatives considered a wide range of potential solutions for the two projects. The general requirements for the TWE project were originally developed by APS and documented within the TWE Feasibility Studies. These requirements include terminations in eastern Wyoming and in the Desert Southwest with a nominal rating of 3000 MW. These general parameters were combined with the parameters for Gateway South to develop a series of alternatives. A high level screening of alternatives determined the following:

- Utilizing 765 kV AC technology would not be economic because it would need to be de-rated below optimal capacity to meet WECC and NERC Reliability Criteria;
- With an overall hub to hub distance of over 900 miles for TWE, HVDC technology is more economic than AC technology.

The Partners developed twelve project alternatives to meet the combined project needs of TWE and GS. The alternatives included standalone GS and TWE projects, combinations of projects ranging from 4500 MW to 7500 MW export out of Wyoming, and TWE terminations in the Las Vegas and/or Phoenix areas. The twelve scenarios were screened on a series of qualitative and quantitative metrics. Conceptual cost estimates and capacity projections were made to make quantitative comparisons between the alternatives. The cost estimates were prepared by B&V, reviewed by the Partners, and then used to assist in selecting between the alternatives. ^{WECC RPPR Guidelines: 1, 3}

The Partners evaluated from an environmental perspective several route alternatives for the projects. The general methodology to identify the corridors focused on crossing land with the least environmental sensitivity and utilizing locations where siting opportunities exist. Siting opportunities generally include designated utility corridors from adopted land management plans or areas with existing transmission lines or other energy transportation (pipeline) infrastructure. Additionally, many of the preliminary corridors follow designated utility corridors on Federal land. The approach for determining potential transmission corridors, both intrastate and interstate, was based on data from secondary sources. The resulting proposed study area and alternative corridors for further evaluation within the development of an Environmental Impact Statement is shown in the Conceptual Technical Report (Appendix 3, Figure 3-1 page 3-2). ^{WECC RPPR Guidelines: 3}

Based on the analysis, the selected configuration for the TWE project is a bi-pole 500 kV HVDC line between south central Wyoming and the southern Nevada (Marketplace

substation) area. The findings in the Conceptual Technical Report (Appendix 3) conclude that a 500 kV HVDC hub in southern Nevada provides a significant addition of capacity to the Desert Southwest market at a lower cost.

Further analysis of the 3,000 MW delivered from Wyoming to southern Nevada is expected to be transferred to southwest regional locations. A new 'WECC Path' designated 'TransWest Express' will be created with a proposed rating on the order of 3,000 MW. The expected transfers from the southern terminal will be a combination of available transmission capacity leading to Southern California market, a reverse schedule toward the Phoenix area using the existing 500 kV network, and the local 230 kV and 500 kV network into the Las Vegas area. WECC RPPR Guidelines: 6

Feasibility studies have illustrated that the loss of a single pole of the TWE project will impact the interconnected system within acceptable parameters until generation tripping can occur. The simultaneous loss of both poles and attendant generation tripping will be studied to determine the regional impacts. The TWE project will be designed to operate for bipole and in a monopole operation with some short term overload and ramp down characteristics that will be defined as part of future studies. These dynamic impacts and the generation tripping schemes will be analyzed and resolved as part of the WECC Phase 2 rating process. WECC RPPR Guidelines: 6

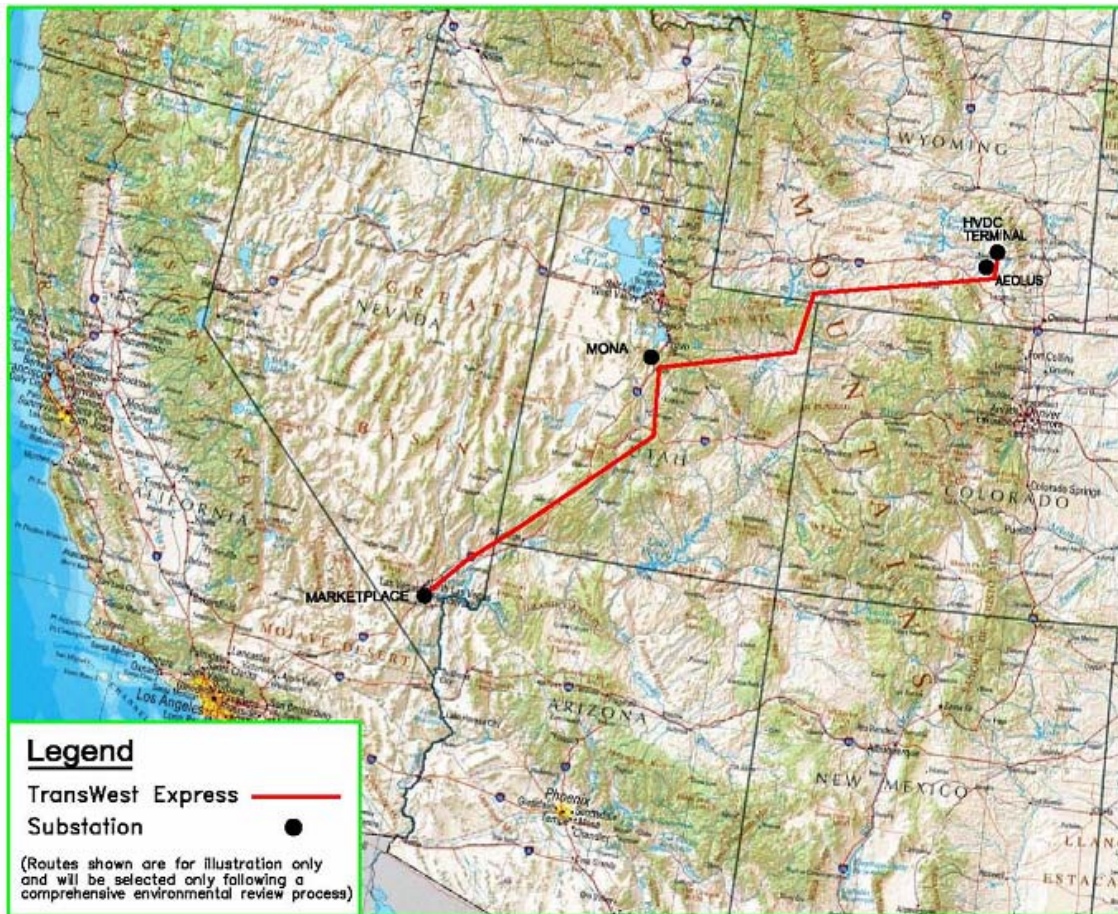
TWE and the complementary GS project are anticipated to strengthen the Western Interconnection. Through the WECC Phase 2 Rating process this performance will be evaluated.

III. Conclusion

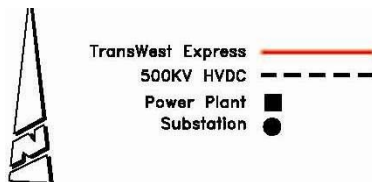
The Partners conducted joint Regional Planning Project Reviews for TransWest Express and Gateway South projects. This review was supplemented with a conceptual technical review of both projects that looked into potential routes and alternative configurations. The Partners are committed to the development of these projects within an open and transparent process with all stakeholders. The scope of this conceptual review and the results were shared at the four stakeholder meetings held in late 2007 and early 2008. Stakeholders provided input that helped refine the projects.

Upon completion of the RPPR, the TWE project has been configured to consist of a 500 kV direct current transmission line that is approximately 800 miles long, originating in the Medicine Bow area near the new Aeolus substation (to be built as part of the Gateway West project) in south central Wyoming and continues to the Las Vegas area near the Marketplace substation with a planned in-service date of 2015 (Figure 2). The line will be capable of delivering up to 3,000 MW of resources to growing markets in the Desert Southwest.

Figure 2 Proposed TransWest Express Transmission Project



(Route shown is for illustration only and will be selected only following a comprehensive review process)



Based on the analysis conducted by the Partners, the TWE project and the complementary GS project are anticipated to strengthen the Western Interconnection. The Partners have entered these projects into the WECC Project Rating Review process as independent projects. As with the RPPR, the intent is to take the projects jointly through the WECC Project Rating Review process and demonstrate this improved performance through Phase 1 and Phase 2 of the process.