Whitepaper

WECC 10-Year Regional Transmission Plan
Framework, Components and Process

October 29, 2010

This Whitepaper is for discussion purposes only and has not been endorsed or approved by the WECC Board of Directors, its Transmission Expansion Planning Policy Committee (TEPPC), the TEPPC Scenario Planning Steering Group (SPSG), or WECC Management.

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1 Introduction

This Whitepaper provides an overview and a roadmap for the creation of the Western Electricity Coordinating Council (WECC) 10-Year Regional Transmission Plan (Plan). The Plan is developed through consensus-building process which is an essential component in evaluating expected and potential transmission system additions over the next 10 years.

This Whitepaper is a working document designed to guide the decision-making process for creating the Plan, and to inform a variety of stakeholders about the intent and process of its creation. Its audience includes transmission owners, utilities, regulators, consumer groups, environmental advocates, lawmakers, Non-Governmental Organizations, researchers, and engineers.

This Whitepaper is aimed at educating readers of varying levels of technical expertise with the information necessary to provide input into the Plan, which is due September 2011. The Whitepaper provides a framework for producing the Plan by outlining the current Western Interconnection planning processes, the organizations that will be instrumental in producing the Plan and their respective roles, and a proposed analytical process for creating the Plan. This document is organized into the following sections:

- Background on regional transmission planning,
- Overview of the stakeholder process for approving the Plan,
- Analytical approach for developing the Plan, and
- Appendices that provide discussion questions, organizational memberships, and a glossary of terms and acronyms used in the Whitepaper.

This Whitepaper is not an approval item for any WECC committee. Rather, it serves as a collection point for stakeholder input and as a reference document for future discussions.

1.1 Whitepaper Process

At the September 2010 WECC Transmission Expansion Planning Policy Committee (TEPPC) and Scenario Planning Steering Group (SPSG) meetings, stakeholders posed a number of questions regarding the Plan, which are listed in Appendix A. The TEPPC and SPSG chairs assembled a task force to answer these questions, and to create a whitepaper describing the contents of, and process for, creating the Plan. The 10-Year Regional Plan Task Force, comprised of representatives from TEPPC and SPSG, created this Whitepaper. The members of the Task Force are listed in Appendix D.

The Whitepaper will be the subject of discussions at the upcoming TEPPC and SPSG meetings in November, and at the WECC Board meeting in December. The discussions will focus on (1) assuring a common understanding regarding the contents of and the process for creating the Plan, and (2) soliciting input on the Whitepaper.

A full-day joint TEPPC-SPSG meeting devoted to the Whitepaper topics will take place on November 9. The goal of this meeting is to gather stakeholder input, determine consensus points, and identify subjects that require further evaluation. The Whitepaper will be revised based on discussions at this meeting. Written comments on the Whitepaper are requested by November 15, 2010.

The Whitepaper also will be the subject of a discussion at the WECC Board meeting December 8-10. The Board, who will approve the final Plan, will be briefed on the discussions to date, and will provide input and advice to TEPPC.

After the December Board meeting, the Whitepaper will be revised to reflect discussions to date and posted for further stakeholder comment. After revisions based on these comments, the document will serve as a reference document for the creation of the WECC 10-Year Regional Transmission Plan.

2 Background on Regional Transmission Planning

Transmission planning activities in the Western Interconnection serve to address the varied needs of stakeholders at all levels regarding the future needs of the transmission system. The geographic scale of the Western Interconnection, with its wide diversity in climate, consumer demographics, and resource concentration, requires a division of planning duties. These planning activities are divided by geographic reach and by planning time horizons. Additional information and commentary on regional transmission planning is found in Appendix B.

2.1 Geography of Transmission Planning Activities

The Western Interconnection transmission planning is divided based on individual transmission providers. They coordinate their planning activities through Subregional Planning Groups (SPGs) and with WECC to assure coordination at both the subregional and the interconnection-wide level.

2.1.1 Local Planning

Local planning activities are performed by individual transmission providers to maintain reliable service while addressing load growth, transmission service requests, public policy directives, and stakeholder concerns. Provisions for local planning are compliant with FERC Order 890 as required, and are covered by Attachment K in each Transmission Provider's Open Access Transmission Tariff (OATT) where applicable.

2.1.2 Subregional Planning Activities

Subregional planning activities are conducted by SPGs. Although each SPG operates under different governing structures, each allows transmission providers within a given subregion to perform more detailed analysis than is performed at the WECC level. SPGs develop transmission plans to address reliability, load growth, transmission service requests, and stakeholder concerns. The SPG assessments mirror their members' obligations to provide reliable service. SPGs provide a mechanism that allows for joint consideration of issues among its members and stakeholders. SPGs have organized the SPG Coordination Group (SCG) to coordinate issues that reach across the borders of a single SPG.[1]

2.1.3 Regional Planning Activities

Regional transmission expansion planning is managed by TEPPC. TEPPC planning activities cover three time horizons: the **near-term** and historical evaluation of congestion, **medium-term** congestion studies with development of a 10-year Plan, and **long-term** studies with development of a 20-year Plan. The 10-year Plan will be a new product of TEPPC and expands on the congestion analysis that it has been performing for a number of years.

[1] The DOE grant supports state participation in the activities of the SPGs through the SPSC.

In addition to the activities conducted by TEPPC, other regional planning activities are performed by the WECC Planning Coordination Committee's (PCC), Loads and Resources Subcommittee (LRS), and Variable Generation Subcommittee (VGS). These include resource adequacy forecasts, project coordination and path rating reviews, and variable generation integration analysis.

These planning activities go beyond TEPPC's publication of transmission plans by bridging the gap between concept and development, and the operation of new facilities. The PCC-led path rating review process provides a detailed, technical evaluation of how individual transmission projects comply with reliability standards. The LRS collects information from Balancing Authorities on expected future system loads and resources.

The VGS investigates the operating characteristics of new generation technologies. Although the PCC, LRS, and VGS activities are conducted in parallel to TEPPC, they by provide key input assumptions and forums for addressing pertinent issues that are outside of TEPPC's purview and expertise. Information sharing among all these activities is provided through WECC staff coordination to assure comparability and avoid duplication of effort.

2.2 Regional Planning Time Horizons

Under the terms of the cooperative agreement ("Grant") between WECC and the U.S. Department of Energy (DOE), WECC expanded the breadth and depth of its current transmission planning processes to include the development of 10-year and 20-year interconnection-wide transmission plans for the Western Interconnection.

The 10-year and 20-year WECC regional transmission plans differ in scope and process because they focus on separate objectives. Under present conditions, seven to nine years are required to take a major transmission project from conception through construction, and to actual operation. As a result, the 10-year planning activities focus on specific projects – both planned and in progress – and capacity additions. 20-year plans are less encumbered by project development cycles and current technologies. Thus, 20-year planning activities are top-down and focused on understanding potential "energy futures" and the decisions needed to achieve (or not) those futures.

10- and 20-year planning activities inform other over subsequent planning cycles. 10-year plans provide a starting point for 20-year planning. In turn, 20-year plans inform 10-year activities about opportunities for long-term efficiencies and potential pitfalls.

2.2.1 WECC 10-Year Regional Transmission Plan

In accordance with the terms of the Grant, the TEPPC 10-Year Regional Transmission Plan will be delivered in September 2011 and updated in September 2013. The creation of the 10-Year Plan is a bottom-up process that incorporates coordinated input assumptions from other planning processes with analytical analysis. The details of the 10-Year Plan are covered in subsequent sections.

2.2.2 WECC 20-Year Regional Transmission Plan

In accordance with the terms of the DOE grant, the 20-Year Regional Transmission Plan (20-Year Plan) will be delivered in September 2013. The 20-Year Plan builds on the 10-Year Plan and will be based on the analysis of a broad set of energy futures resulting from a scenario development process.

The scenario development process, led by the SPSG, will begin in December 2010. It will focus on identifying plausible macro-economic conditions, technology shifts, and political drivers that impact how electricity is consumed and produced. The scenarios will provide guidance on assumptions regarding future loads and resources, fuel prices, policy drivers, and technology shifts. Special attention will be given to uncertainties that could have major effects on future transmission needs.

3 WECC 10-Year Regional Transmission Plan

The WECC 10-Year Regional Transmission Plan is an interconnection-wide perspective on expected and potential transmission system additions over the next 10 years. The Plan is designed to help ensure that the Western Interconnection is reliable, safe, low cost, efficient, and environmentally sound.

The Plan will evaluate mid-term (10-year) transmission congestion and will identify possible transmission capacity needs; including options for addressing those needs using a comprehensive set of load, resource, environmental, and policy scenarios provided through stakeholder-driven processes.

To accomplish this, the Plan will have the following components:

1. The Plan will list and explain load, generation, and transmission assumptions; and the basis for those assumptions.
2. The Plan will recognize past planning processes and system additions that have been completed, and projects (those with financial commitment and permitting approval) that have a high probability of being in-service before 2020. These include the SCG Foundational Projects, which are treated as “input assumptions” into the planning process and the Plan. The Plan will describe these projects – including the project sponsors’ analyses of project impacts; e.g., reduced congestion, reliability impacts, access to renewable resources to meet loads, and access to identified renewable resource areas.
3. The Plan will include sensitivity analyses if one or more of the assumed transmission projects is not constructed, and will identify transmission capacity addition(s) that could be considered in lieu of that project.
4. The Plan will identify where there is significant congestion in the reference case, and over a wide range of demand and supply futures as defined by the TEPPC Study Program.
5. The Plan will identify capacity additions necessary to address identified congestion over a wide range of demand and supply futures, as defined by the TEPPC Study Program.
6. The Plan will identify and detail known transmission projects that meet, wholly or in-part, the capacity additions or other transmission solutions identified.
7. The Plan will include conditional transmission, which may be needed to address conditional congestions. This is congestion that occurs when large quantities of new resources are added in one location. The Plan will report on the reliability impacts of projects and capacity additions and other transmission solutions identified in the Plan.
8. The Plan will report on the reliability impacts of projects and capacity additions identified in the Plan.

The Plan will not:

1. Recommend individual transmission projects, but the Plan will identify projects that are assumed constructed in 2020, and projects that could satisfy identified transmission needs.
2. Recommend specific generation additions or projects, but the Plan will identify generation projects that are assumed constructed in 2020, and will provide generation and transmission capital and operating cost information for each study case.
3. Recommend projects but will describe a range of parameters about those projects including environmental compatibility, access to renewable energy zones, resources, etc.
4. Recommend energy policy, but the Plan will identify energy policy considerations and constraints, including input assumptions on how energy policy shapes the final Plan.

3.1 Authority and Intended Uses of the 10-Year Regional Transmission Plan

WECC does not have the authority to order transmission lines be constructed. Nor does WECC have any siting, permitting, or cost allocation authority. It is up to decision-makers at all levels (utilities, developers, regulators, siting agencies, and financiers) to determine what transmission other is built.

The WECC 10-Year Regional Transmission Plan is informational. It is designed specifically to provide high-quality, stakeholder-driven integrated analyses that are internally consistent and reflect statutory requirements. It also provides information on the expected future state of the Western Interconnection, and what interconnection-wide transmission capacity or other transmission solutions may be needed under a variety of future scenarios. Done successfully, the Plan will help guide decision makers on whether and when to build a transmission line or take other related actions.

4 Stakeholder Process for Developing the Plan

For more than a decade, the Western Interconnection has fostered and institutionalized stakeholder-driven initiatives for undertaking transmission expansion planning. The tapestry of collaborative processes and regional stakeholder groups provide a functioning institutional framework for this Plan's development and implementation. Although no entity in the Western Interconnection has the singular authority or responsibility to implement a plan, this doesn't prevent the development of a consensus-based plan that is a valuable, regional reference resource for policymakers and implementers. The benefit of this Plan is that is the result of a creative and robust planning process. The Plan allows for the evolution of new ideas, while still forecasting a reasonable expectation of the future transmission system.

The process for developing this first 10 year Plan began over a year ago, with the opening of the 2010 TEPPC "Study Request Window." when interested parties make requests for transmission studies. Much work already has occurred, and the process will continue through actions of multiple stakeholder entities over the next 10 months.

In the following subsections, key entities' roles and responsibilities are identified.

4.1 Organizations Developing the Plan

4.1.1 WECC

WECC is the Regional Entity for the Western Interconnection. It is comprised of a diverse set of electric industry stakeholders from across the West, including all or parts of 14 U.S. States, Alberta and British Columbia in Canada, and Mexico's Northern Baja. WECC is governed by an independent and balanced stakeholder Board of Directors consisting of 32 directors with representation from seven membership classes. WECC has seven, non-affiliated board members with a variety of skills and backgrounds.

WECC's role is to coordinate and promote a reliable bulk electric power system in the Western Interconnection. Among its functions, WECC serves as a regional planning and policy facilitator for the Western Interconnection. With respect to this activity, WECC operates in a public, stakeholder-driven process through its committee structure to address issues of transmission planning, resource adequacy, variable generation integration, and the operational and commercial aspects of these issues.

The WECC Board provides the approval authority for the 10-Year Regional Transmission Plan.

4.1.2 Transmission Expansion Planning Policy Committee (TEPPC)

TEPPC – a WECC Board committee – conducts and facilitates economic transmission planning in the Western Interconnection. TEPPC activities include fulfilling transmission owner/operator and SPG planning requirements under FERC Order 890.[2] TEPPC has a balanced membership comprised of individuals from WECC-member organizations and stakeholders.

TEPPC has four main functions:

- Oversee and maintain a public data base for production cost and related analysis;
- Develop and implement interconnection-wide expansion planning processes in coordination with the Planning Coordination Committee (PCC), other WECC committees, Subregional Planning Groups (SPGs), and other stakeholders;
- Guide and improve the economic analysis and modeling of the Western Interconnection and conduct transmission studies; and
- Prepare interconnection-wide transmission plans consistent with applicable NERC and WECC reliability standards.

TEPPC has 18 members selected for expertise, geographic diversity and stakeholder representation. A list of TEPPC members appears in Appendix F. It has a Technical Advisory Subcommittee (TAS), workgroups, and designated WECC staff. These units work in concert to perform analysis and to help stakeholders to engage in planning processes. Its primary workgroups are the Studies Workgroup (SWG), Modeling Workgroup (MWG), and Data Workgroup (DWG). Each workgroup is tasked with performing specific duties in the TEPPC study program. Workgroup decisions are made by consensus, with approval from TAS.

TEPPC's role is to ensure the creation of the 10-Year Regional Transmission Plan and to recommend that Plan to the WECC Board for approval.

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[2] Transmission owners and/or operators meet their Order 890 planning requirements with respect to their SPGs and TEPPC through their Attachment Ks to their OATTs. SPGs interact with TEPPC according to their charters.

4.1.3 Scenario Planning Steering Group (SPSG)

The SPSG is a multi-constituency steering group that provides strategic guidance and direct participation in TEPPC activities. Created March 2010, the SPSG provides input on modeling scenarios – the tools to be used, and the key assumptions to be made. It will review and provide input on reference cases, load and transmission assumptions. It also will participate in analyzing study results, developing transmission plan criteria, and reviewing and commenting upon the processes for creating TEPPC reports and transmission plans.[3]

SPSG's membership includes TEPPC members to ensure communication between the groups. The SPSG members participate regularly in TEPPC activities, and it is the responsibility of the SPSG to assure that input from nontraditional stakeholders – specifically Non-Governmental Organizations (NGOs) – is incorporated into the Western Interconnection's planning processes and deliverables. A list of SPSG members appears in Appendix G.

The SPSG will have a key role in developing screening methods and data for evaluation of transmission projects and solutions. It will actively develop the framework for the Plan and provide comment/input on the Plan contents.

4.1.4 State-Provincial Steering Committee (SPSC)

The SPSC consists of appointees from each state and province in the Western Interconnection and comprise one-third of the SPSG membership. The Western States' Water Council and the Western Governors' Wildlife Council are ex-officio members of the Committee. A list of SPSC members appears in Appendix H. The purpose of the SPSC is to provide input into Western Interconnection transmission planning and analysis.

It has three tasks:

- Providing input into regional transmission planning;
- Improving the efficient use of the existing grid; and
- Enabling the integration of large amounts of variable generation.

The SPSC's role is to assure robust state and provincial input in the 10-Year Regional Transmission Plan.

4.1.5 Western Interstate Energy Board (WIEB)

WIEB is an organization of 12 western states and three western Canadian provinces. The purpose of WIEB is to provide the instruments and framework for cooperative state efforts to "enhance the economy of the West and contribute to the well-being of the region's people." WEIB seeks to achieve this through cooperative efforts among member states/provinces, and with the federal government. WIEB serves as the energy arm of the Western Governors' Association (WGA).

Much of WIEB's work is conducted through committees. Its Committee on Regional Electric Power Cooperation (CREPC) consists of the public utility commissions, energy agencies and facility siting agencies in the western electricity grid's western states and Canadian provinces. WIEB staff and CREPC members participate actively in TEPPC activities. To note, CREPC and the SPSC are closely linked through common staff and entity membership.

WIEB's shares the same role as SPSC.

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[3] More detail on the SPSG participation in TEPPC activities is provided throughout Section 5.

4.1.6 Subregional Planning Groups (SPGs)

The SPGs have been organized to address common issues within a particular portion of the Western Interconnection. A list of TEPPC-recognized SPGs is found in Appendix E. Their memberships are diverse as they are comprised of the major load serving entities, transmission owners and operators in their respective areas. Some SPGs include state entities and smaller load-serving entities, such as municipal utilities and rural electric cooperatives. Under their respective charters, SPGs assess and prepare transmission plans for the electrical infrastructure within their individual boundaries. The SPGs provide a forum for input from larger and small owners, operators, load serving entities, customers, and other stakeholders — some of whose interests do not extend to the entire Western Interconnection. Each SPG gathers and identifies the aggregate needs of internal and external consumers. This provides a thorough perspective for aiding TEPPC's regional process.

SPG Coordination Group (SCG) coordinates SPG activities of mutual concern and with regard to TEPPC. A list of SCG members appears in Appendix E. The SCG facilitates the preparation of the SCG Foundational Transmission Projects List that provides what the SCG has determined is an assumed minimum transmission system starting point for TEPPC's future congestion studies. The assumed transmission additions provided by the SCG are used as input to the TEPPC 10-year Regional Transmission Plan, and they provide a reference to perform the TEPPC studies. TEPPC requested the SCG to provide its recommendations on projects expected to be built by 2020.

The role of the SPGs is to ensure that input from their respective transmission providers' plans is considered in the 10-Year Regional Transmission Plan.

4.1.7 States and Provinces

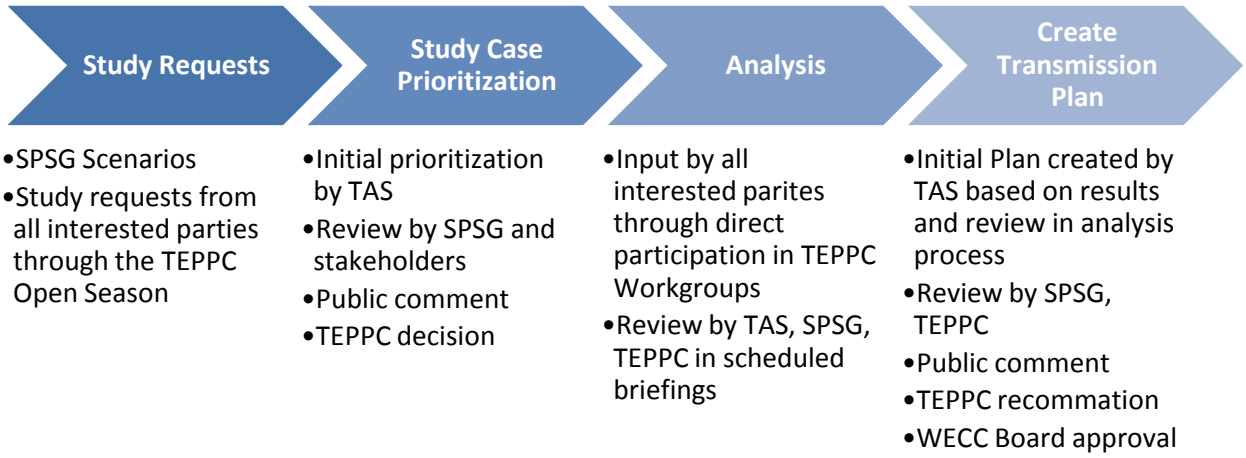
State and provincial agencies, and utility commissions participate in TEPPC activities. This is accomplished through their direct participation in the organization and its subgroups; and through participation in multijurisdictional organizations such as WIEB, CREPC, and SPSC.

4.1.8 Federal Agencies

The U.S. Department of Energy (DOE), Federal Energy Regulatory Commission (FERC), the Department of Interior (DOI), and the Department of Agriculture (DOAg) participate in TEPPC activities through ExOfficio positions on the SPSG. In addition, the DOE partially funds TEPPC activities through the grant to WECC. The 10-Year Regional Transmission Plan will be filed with DOE to meet terms of the Grant.

4.2 Roles in Approving and Developing the Plan

Each of the organizations listed above has unique responsibilities, but share a duty to ensure robust stakeholder input into the Plan. The diagram below describes the processes the roles of the individual organizations.



5 Analytic Approach for Developing the Plan

The goal of the Western Interconnection transmission expansion planning process is to evaluate how the transmission system can meet the needs of electricity consumers 10 and 20 years in the future. It seeks to fashion a reliable system that addresses load growth, generation additions, and energy and environmental regulations and policies. Accomplishing this goal requires a sequence of complex analytical steps. While TEPPC has undertaken these complex analytic steps for three planning cycles, 2011 will be the first year the study results are integrated into a 10-Year Plan.

In the following subsections, the major analytic and integration steps that will be used to prepare the Plan are described. These steps range from acquiring system data and identifying major elements, to drafting implementation recommendations. The first four steps provide the data, tools and assumptions to conduct analyses. The next four steps constitute the analytic process itself; and the last four address the integration of analysis and policy to formulate the Plan's components and recommendations.

Taken together, these 12 steps constitute the analytic approach:

1. Acquire System Data, Modeling Tools and Abilities;
2. Prepare the TEPPC Study Program;
3. Develop the TEPPC Base Case Assumptions;
4. Characterize the Study Cases;
5. Conduct Production Cost Modeling of Study Cases and Power Flows;
6. Analyze Existing Transmission System Congestion;
7. Evaluate Forecasted System Congestion Patterns and Relationships;
8. Screen Proposed Solutions for Environmental, Economic, and Policy Considerations;
9. Overlay Potential Solutions on Congested Paths;
10. Conduct Transmission System Assessment for Reliable Service;
11. Identify critical paths and Transmission expansion solutions; and
12. Propose Recommendations for Planning and Plan Implementation.

5.1 Acquire System Data, Modeling Tools and Abilities

The beginning of the overall Regional Transmission Planning process occurs well before any annual cycle or preparation of the Plan. This first step — acquiring system data and modeling tools — will be an ongoing process.

System data is acquired from Balancing Authorities (BAs) annually, through formal data request processes. The most important data acquisition in transmission expansion analyses occurs through WECC's loads and resources information filing by the BAs. This comprehensive process allows the annual compilation of data that describes the existing system — loads, generation, and operating characteristics. It also provides balancing area forecasts by using reasonably common methods of system loads, resources and capacity projected annually through a 10-year horizon.

Models are acquired as needed and are updated periodically[4]. The production cost model used by WECC staff for TEPPC cases, called PROMOD modeling software, was acquired four years ago. An effort is underway to acquire a new, supplemental, long-range planning tool. Purchasing tools, building staff capability, and using public, nonproprietary modeling data, form the fundamental starting point for analyses.

5.2 Prepare the TEPPC Study Program

As described in the TEPPC Regional Transmission Expansion Planning Protocol (Protocol), the TEPPC expansion planning studies and process are consistent with the requirements of Order 890; including the planning principles (excluding cost allocation) and the requirement for an annual study request cycle. All requests received from any stakeholder in the study request window (open from Nov. 1 to Jan. 31 of each cycle), provide the starting point for developing the TEPPC Study Program. The studies that make up the 2010 TEPPC Study Program are found in Appendix I.

The TAS consolidates the requests into the TEPPC Study Program, and prioritizes requests into a set of studies that can be accomplished within the resources available. These studies address the resource or transmission additions, and address the system operation questions asked by stakeholders. The studies evaluate congestion and other scenarios in the target year being studied (10 to 20 years in the future). For the first 10-Year Plan, the target year is 2020.

The 2010 Study Program, and the current study tools available, may constrain the ability to reach meaningful conclusions, and to make strong recommendations in the first 10-Year Plan

5.3 Develop the TEPPC Base Case Assumptions

Parallel to developing the Study Program, WECC staff and stakeholders are developing and updating the basic assumptions and parameters of the data sets describing both the existing and future Western Interconnection. Primary among these are loads, existing and incremental generation facilities, generation characteristics, and existing and incremental transmission facilities.

Highlights of major assumptions and sources for this cycle include:

- **Loads:** Loads in the TEPPC base case reflect the load forecasts of the BAs, as submitted to the WECC Loads and Resources Subcommittee (LRS). Energy Efficiency (EE) and Demand-side Management (DSM) assumptions are also provided by the BAs. In addition, adjustments to the LRS load forecasts were provided by the SPSC to account for ratepayer-funded energy-efficiency and DSM assumptions, which were not

[4] There are a number of submodels used that characterize hyrdoelectric output and dispatched demand-side resources. Data and model improvements are constant activities within planning cycles.

included in the LRS load forecasts.

- **Generation:** This includes existing system generators, projects under construction, renewable resource additions that are required to meet statutory Renewable Portfolio Standards (RPS) and additional thermal generation needed to meet WECC's reserve margin targets for subregions of the Western Interconnection. The generation additions were selected from resources proposed in utility Integrated Resource Plans (IRPs), proposed generation in BA submittals, and where Western Renewable Energy Zones resource screening results indicate a need.

- **Generation Characteristics:** Assumed operational characteristics (capacity factors, generation profiles, heat rates, ramp rates, maintenance schedules, etc.) for various generation types (gas, coal, wind, solar, and geothermal) are provided by WECC staff, BAs, other studies (such as the National Renewable Energy Laboratory (NREL) for wind and solar characteristics), and other publically available information sources.

- **Transmission System Network:** The existing transmission network, including the associated electrical characteristics and operational limitations, come from the WECC Technical Studies Subcommittee (TSS).[5] The TSS manages the central database of technical information about the Western Interconnection transmission system and performs reliability studies.

- **Incremental Transmission Facilities:** For the 2010 planning cycle, incremental regional transmission additions (those assumed to be built and in operation by 2020) were provided to TEPPC by its Subregional Coordination Group (SCG). These project additions were identified in the SCG Foundational Transmission Projects List Report as projects that meet a set of criteria adopted by the SCG. Though these projects did not result from TEPPC analysis – they reflect projects most advanced through the SPGs' respective planning processes, and are those most likely to be built by 2020. These projects are included as input assumptions in the TEPPC base case.

  Information regarding the existing transmission system network, along with local[6] future transmission additions was provided by TSS through the incorporation of their 2020 HS1 basecase.

5.4 Characterize the Study Cases

Beyond the base case assumptions, individual cases in the TEPPC Study Program often require additional specification of assumptions unique to a particular case. The 2010 geographic diversity cases, for example, required removing and relocating 12,000 GWh of energy to eight different subareas of the interconnection. Other cases requested by the SPSC entailed specifying an adjusted forecast for expected EE and DSM, which was not already in the base case load forecast. Another example of characterizing study cases can be found in the SPSC high DSM, technology breakthrough, and carbon reduction cases. The assumptions associated

[5] The TSS is a subcommittee of the WECC Planning Coordination Committee (PCC).
[6] Local additions are comprised of network upgrades near load centers and lines that are not significant from a regional perspective.

with the characterizations generally come from the requesting party coordinating closely with the TEPPC TAS work groups (Data, Modeling, and Studies Work Groups), the SPSC Scenarios Work Group, and others.

5.5 Conduct Production Cost Modeling of Study Cases

Production Cost Modeling (PCM) is an hourly operation simulation of the entire Western Interconnection for the study year. By simulating operations for the whole year, information can be obtained about how different model assumptions and inputs impact transmission congestion, asset utilization, and the ability to serve system loads.

The analytic study process TEPPC conducts to evaluate congestion and potential solutions consists of production cost modeling simulations of the study cases in the Study Program. As part of the 2010 Study Program (the primary source of analytic information for the first 10-Year Plan), more than 100 separate simulations will be analyzed. The analytic study process is led by WECC staff.

The results of the simulations provide information on transmission system congestion and utilization, generation utilization, fuel usage, emissions, unserved load, and costs. The cases are intended to bound potential transmission capacity additions in the next 10 years, to help define central tendencies that address energy policy concerns and constraints, and to address key risks identified in the 10-year horizon. Reviewed as a package, the results provide useful information to compare the changes from one study case to another.

For example, the recently completed suite of study cases entitled, “Geographic Relocation Cases,” reflect specific stakeholder study requests to remove significant quantities of resources from California, and to relocate them in different areas of the Western Interconnection. The goal of these studies was to see how much congestion occurs with resources in one location compared to another; and, more importantly, to see if there is commonality in congested transmission paths across multiple cases. These cases test various uncertain and plausible resources futures; as well as the associated congestion if the generation were to be developed over the 10-year period. Information on the results of these study cases can be found at [link].

5.6 Analyze Existing Transmission System Congestion

A second major area of congestion analysis is undertaken annually – separate from and in parallel with the PCM simulations. This consists of highly detailed studies of congestion that occurs on key Western Interconnection transmission paths. For the 2010 study program, real-time data for actual transfers, schedules, and reported available transmission capacity (ATC) are assessed for the 24 most heavily utilized paths. Data used for this existing system congestion analysis is confidential and is aggregated to protect transmission owners. Congestion is evaluated and reported using a variety of path utilization metrics. The highest congested paths in various seasons, flow directions, and years are identified. This work has been undertaken for the last three years and provides insights as to how existing paths are used, and how that use is changing. In addition, this analysis enables TEPPC to compare and contrast historical and simulated future congestion.

5.7 Evaluate System Congestion Patterns and Relationships

The results of the study cases and historical congestion analyses are evaluated to identify patterns. These patterns then must be compared to existing knowledge and observations of how the interconnection operates, and why study case results might show variations in operation (and congestion). The most significant of the future congestion results emerge over

the course of reviewing many cases, and these can be compared to path congestion results from the historical analyses. Paths that presently are congested (as well as paths that are consistently congested across a range of plausible resource futures), rise to the top as the paths most in need of congestion mitigation solutions.

There are varying categories of congestion which will be characterized in the 10-Year Plan:

Design – Lines or paths that were built to serve the full capacity of a generation facility.

Chronic – Paths that historically have been, and remain, congested.

Conditional – Congestion that occurs when large quantities of new resources are added in one location. In other words, the congestion is contingent on the construction of specific generation facilities.

Recurrent – Lines or paths that are congested across a range of plausible resource futures or conditions.

Congestion may be the result of either physical or contractual limitations. Physical congestion is caused by limits on actual energy flows on lines or paths. Contractual congestion is driven by transmission rights and the availability of transmission capacity in the market. The production cost simulations only identify physical congestion.

These differing types of congestion may have high, medium, low or no priority for finding mitigation solutions. Priorities and solutions to identified congestion are explored below.

While hourly production cost modeling may produce useful information about hourly congestion, this information may not be sufficient to drive new investment. Given the decentralized market structure and transmission ownership in the Western Interconnection, major new transmission investment is likely to be driven by utility desires to access renewable generation resources with a high degree of delivery assurance. Relying on “as available” hourly transmission capacity, derived from hourly production cost modeling, is unlikely to provide sufficient assurance of delivery to support large investments in new generation resources.

5.8 Screen Proposed Transmission Projects for Environmental, Economic, and Policy Considerations

In order to best match potential transmission projects to congestion reduction priorities and public policy directives, detailed data about potential proposed transmission projects is needed. WECC undertakes this information gathering function through multiple avenues: The WECC Transmission Information Portal; the TEPPC study request process; WECC’s project coordination and path rating procedures; the subregional planning groups; and the SPSG Environmental Data Task Force (EDTF). The continuous screening process seeks to have a current and comprehensive database of project-specific information on key parameters including:

- Financial commitment,
- Path rating status,
- Permitting status,
- Generation access,
- Load access,
- Impacts on reliability and congestion relief,
- Responsiveness to public policy requirements,
- Environmental attribute screening, and

- Alignment with known renewable energy zones and corridors.

5.9 Overlay Potential Projects on Congested Paths

The information and results of previous steps provide a basis for integrating congestion results, project characteristics, production cost analyses (including variable and capital cost estimates) energy policy considerations, risk assessment, and other factors that pertain to grid expansion. These factors include the robustness of potential energy transactions, diversity of intermittent renewable output, need for balancing and regulating resources. The goal of this step is to match projects with congestion needs; while also considering non-congestion parameters, such as incremental capital costs, delivery of renewable resources, firmness of financial commitment, and avoidance of environmental constraints. This would result in a set of identified beneficial capacity expansion priorities and options.

5.10 Conduct Transmission System Assessment for Reliable Service

An important requirement under WECC's agreement with DOE is that its interconnection-wide plans will be evaluated for their reliability implications. As described in the Plan Outline in Appendix C, this component of the analytic process addresses planning and operational reliability questions.

The comprehensive review will be undertaken in a partnership of WECC staff, the SCG, and TEPPC. Traditional power flow (AC) analyses will be conducted, with or without the 30 projects identified in the Foundational Projects List. Selected expansion options also would be tested for reliability impacts. The SCG will assist WECC staff in creating the power flow cases from the production cost study cases including: Selection of hours of interest (high and low load); selection of transmission contingencies (N-1 outages); and parameter conversion from the Production Cost Model to power flow model. The reliability assessment will be a first-order (N-1) to assess elements of the Plan for major reliability criteria violations.

Of equal importance, identified operational and integration issues and solutions will be evaluated, including those associated with intermittent resources. Input will be sought from WECC's VGS, National Laboratories, and other entities that are involved in understanding operational and integration issues in the Western Interconnection.

5.11 Identify Critical Paths and Transmission Expansion Solutions

The 2020 reference case will be the starting point for the 10-Year Plan. The reference case includes Foundational Projects and any additional transmission needed to relieve congestion in the reference case. However, the 2020 reference case also will be tested to determine any impact if some of the Foundational Projects are not built and alternative solutions are offered.

Also, contingency analyses will be conducted using the reference case as a starting point. These contingency or conditional analyses can answer "what if" questions, such as:

- What if there is significantly more DSM than in the reference case?
- What if utilities have to meet stringent carbon emission reduction targets?
- What if solar technologies have low penetration levels in the Southwest?

Where study results can answer the "what if" questions, the results of those studies are included in the Plan. Where no studies were performed to address the "what if" questions, then that gap is identified in the initial Plan. Next, the Plan then overlays the transmission solutions that

respond to the "what if" questions. Where there are common projects across a wide range of demand and supply scenarios will be noted and included in the Plan.

The Plan will summarize the work described in the previous steps, and will illustrate how the work leads to a set of recommended capacity additions. Individual elements will address specific types of congestion identified in 5.7, and the reliability questions analyzed in 5.10.

Capacity additions will be organized by what purpose they serve:

- **Reliability** – Selected projects will be evaluated for their impact on system reliability.
- **Design congestion** – This may or may not indicate that additional transmission investment is warranted.
- **Chronic congestion** – This may or may not indicate that transmission investment is warranted. Some congestion may not be cost-effective to fix or there may be non-wires solutions.
- **Conditional congestion** – This may indicate that transmission is needed based on a set of resource additions (e.g. congestion caused by developing renewable energy zones).
- **Recurrent congestion** – This may indicate that transmission is needed based on multiple times as conditional congestion.

Specific transmission projects will be identified in conjunction with identified capacity needs, but not recommended.

5.12 Develop Recommendations for Planning and Plan Implementation

Identifying, screening, and organizing transmission projects and capacity additions into components of the Plan is the primary focus; but moving toward a collaborative set of actions to see projects actually built requires a more specific set of recommendations. Recommendations will be organized by subject (e.g., permitting, financing, non-wires alternatives, etc.) and to whom the recommendations are directed.

The recommendations will also discuss suggestions for implementing the 10-Year Plan, as well as suggestions for improving the planning process for the second 10-Year Plan and the first 20-Year Plan. Recommendations may be directed towards:

- State regulators and policymakers,
- Federal regulators,
- Subregional planning groups, such as SCG,
- Transmission owners and project developers,
- NGOs, and
- WECC.

Appendix A Discussion Questions (FAQs)

The following discussion questions were presented to the Task Force and were based primarily on questions raised during associated discussions at the September 2010 TEPPC and SPSG meetings.

1. What are the Plan's goals?
2. How will the Foundational Projects be incorporated into the Plan?
3. Will the 10-Year Transmission Plan identify specific transmission capacity additions (i.e., 1000 MW of transmission capacity between New Mexico and Southern California) and recommend that these additions be implemented?
4. Will the 10-Year Transmission Plan identify specific transmission projects and recommend that these projects be built?
5. By identifying specific transmission capacity additions or projects, will the 10-Year Transmission Plan be identifying renewable resources?
6. How will the 10-Year Transmission Plan address a range of study cases?
7. What differences, if any, do we anticipate between a 10-Year Transmission Plan (delivered in 2011 and 2013) and a 20-Year Transmission Plan (delivered in 2013)?

The responses to the Task Force's questions, even if repetitive, are designed to encourage stakeholder discussion and to reach consensus answers.

6.1 What are the Plan's goals?

This Plan will work toward a system that allows the region to evaluate the long-term costs of producing and delivering electricity to consumers, minimize congestion, and to provide access to areas rich in renewable resources. The plan is subject to the following constraints: (1) The Plan will address reliability on a preliminary basis; (2) it must be environmentally acceptable; (3) it must allow utilities to meet regulatory and statutory requirements (e.g., RPS); and (4) lines must be built and operating by 2020.

In addition, the plan will consider energy policy goals and constraints, assess major risks (e.g., assumed projects are not constructed), and be flexible enough to meet grid infrastructure needs that may be identified in the development of a 20-year plan.

6.2 How will the Foundational Projects be incorporated into the Plan?

In order for the Plan to be useful, it must take into account decisions that have already been made, and recognize the organizations that have the authority to make those decisions**.** The Plan will identify projects (transmission and generation) that are expected to be built by 2020 as input assumptions. The Foundational Transmission Projects List – created through a thorough review by the Subregional Coordination Group (SCG) of existing, approved individual Subregional Planning Group (SPG) transmission plans and projects – will be included in the Plan as one of the input assumptions (assumed built in 2020). Selection of individual projects for the foundational list is based on a set of SCG-determined criteria (permitting, financial commitment, reliability and interconnection-wide significance).

The primary purpose of the Foundational Transmission Projects List is to recognize that past and ongoing planning and permitting processes have resulted in new transmission projects being approved, but that are not yet constructed. These transmission projects, existing and under-construction generation projects, future load assumptions, demand side management, and demand response, all serve as the key components in TEPPC's study cases.

6.3 Will the 10-Year Transmission Plan identify specific transmission capacity additions (i.e., 1000 MW of transmission capacity between New Mexico and Southern California) and recommend that these additions be implemented?

This Plan will evaluate system congestion in the TEPPC study cases, and identify potential transmission capacity needs. The Plan will not recommend specific additions. However, the Plan will identify areas where chronic or recurrent congestion occurs, the capacity additions needed to alleviate the congestion, and known projects that appear to satisfy the identified capacity additions.

6.4 Will the 10-Year Transmission Plan identify specific transmission projects and recommend that these projects be built?

In accordance with the TEPPC charter, "TEPPC shall not take positions on cost allocation nor shall TEPPC advocate on behalf of specific projects." All known transmission projects that relieve identified congestion will be referenced as "possible solutions." In short, the Plan will provide decision-makers with information that can be used to compare individual projects.

The transmission projects listed in Foundational Transmission Projects List – created through a thorough review by the Subregional Coordination Group (SCG) of existing, approved individual Subregional Planning Group (SPG) transmission plans and projects – will be included in the Plan as one of the input assumptions.

6.5 By identifying specific transmission capacity additions or projects, will the 10-Year Transmission Plan be identifying renewable resources?

Resource and load assumptions are made first, and then the impacts of these decisions on the transmission system are evaluated. Renewable resources identified through other processes, in combination with stakeholder input provided to TEPPC, are studied to identify congestion and evaluate transmission options to reduce congestion.

Resource assumptions are derived from: (1) Existing and under-construction generation and load-based resources; (2) enacted public policy; and (3) Integrated Resource Plans and other documents that provide information on where resources may be constructed. In addition, resource assumptions may be specified in a study request and provided by the party making the request.

The capital and operating costs of new resources (generation and transmission) are accounted for (including their production cost and emissions benefits) in the study case results. A comparison of the various generation resource packages will be presented in the Plan, along with multiple parameters of the additional transmission capacity to access the resource. No recommendation on any particular generation or transmission resource will be included in the Plan.

6.6 How will the 10-Year Transmission Plan address a range of study cases?

The Plan will look forward 10 years, which naturally limits the range of possible futures (i.e., transmission projects, nuclear generation, and other, very large facilities that are not feasible in the 10-year timeframe — unless they are already in some stage of development). The range of alternatives is determined by the set of study cases that have been suggested by stakeholders through the TEPPC Study Request Process and included in the TEPPC Study Program.

The TEPPC Transmission Plan includes a wide range of underlying assumptions about economic growth, energy policy, demand-side management, etc. While it considers a number of study cases, it doesn't encompass an exhaustive range of scenarios. A more exhaustive range of possibilities will be studied in the course of creating the long-term, 20-Year Regional Transmission Plan.

6.7 What differences, if any, do we anticipate between a 10-Year Transmission Plan (delivered in 2011 and 2013) and a 20-Year Transmission Plan (delivered in 2013)?

In accordance with the terms of the DOE grant, the 10-Year Regional Transmission Plan will be delivered in 2011, with an update in 2013. The 20-Year Regional Transmission Plan will be delivered once in 2013.

The 10-year and 20-year WECC transmission plans differ in scope and process because they focus on separate objectives. Under present conditions, seven to nine years are required to take a major transmission project from conception through construction to actual operation. As a result, the 10-year planning activities focus on specific projects – both planned and in progress. 20-year plans are less encumbered by project development cycles and current technologies. Thus, 20-year planning activities are top-down and focused on understanding potential "energy futures" and the decisions needed to achieve (or not) to those futures.

The 20-Year Plan builds on the 10-Year Plan, and will be based on the analysis of a broad set of energy futures resulting from a scenario development process. The scenario development process, led by the SPSG, will begin in December 2010, and will focus on the identification of plausible macro-economic conditions, technology shifts, and political drivers that impact how electricity is consumed and produced. The scenarios will provide guidance on assumptions regarding future loads and resources, fuel prices, policy drivers, and technology shifts. Special attention will be given to uncertainties that could have major effects on future transmission needs.

Appendix B 10-Year Regional Transmission Plan Prologue

[This prologue is included in the Whitepaper as background commentary on planning]

The WECC 10-Year Regional Transmission Plan (Plan) explains the fundamentals of electric system planning. These fundamentals are assumed by system planners, but are seldom explained in planning reports. Instead, most electric system planning reports often are too technical to be easily understood by general stakeholders. Because the Plan will have wide circulation beyond technical specialists, this prologue provides simplified descriptions of technical and non-technical conditions that govern electric system planning for transmission expansion.

Planning for the Future

Planning for the future is an inherent, everyday activity. We buy milk today, so that tomorrow we can pour it on our cereal. Longer range, we maintain an inventory of milk in the refrigerator to meet our expected needs until our next shopping trip.

Electric energy is an exception to our usual approach to using inventory to meet our future needs. Electric power must be produced and transmitted as it is used. True, we can store energy in various mechanical, chemical or thermal forms, such as in reservoirs, batteries or tanks of salts. But this type of storage is secondary and must be converted back to electrical

energy before it can be used. Since the energy product cannot be stored in its native form, we are forced to inventory the capacity to produce and deliver electrical power[7] as it is used. The technical character of electrical industry planning is therefore dictated by the need to maintain a capacity inventory. In addition, electric system planning also is defined by other constraints – service reliability, geography, societal and environmental considerations. These factors impact any plan for meeting future electric energy needs.

Technical Constraints

If each consumer of electric energy had to maintain his or her own capacity inventory to meet their greatest energy needs, a very large percentage of that capacity would idle much of the time. It would serve only as a reserve to be used if or when needed. A reserve is needed to meet various demands for energy loads over the course of a day. Or, it is needed to back-up a generator that does not produce energy as expected, either because it failed or because of type of energy generated is intermittent, such as wind.

From its inception, the electric power industry has recognized that using transmission to interconnect large groups of generators and loads makes it is possible to substantially reduce the reserve capacity required. Transmission interconnections grew steadily during the 20th Century until about 1975, when the electric power transmission networks in North America took on their essential character and topology. Sharing reserve requirements within an interconnection makes it possible to capture energy diversity across a wide area. Owing to its large geographic scale, the Western Interconnection has usage diversity (varying amounts of use by consumers across an hour, a day, a week, or a season) and production diversity (energy from hydro, wind, solar, nuclear, and fossil-fired generation). Capturing diversity through a transmission-enabled interconnection has both reliability and economic value.

Modern economies are heavily dependent upon reliable electric service. To the nonspecialist, this means that when a switch is operated, the lights, dishwasher or computer come on as expected, without a perceptible time delay. Of course to the specialist, things are a bit more complicated. From the system engineer's point of view, there are many moving parts, each of which must function correctly to deliver the service expected by consumers. For instance, if lightning strikes a transmission line, protective equipment must switch that line out of service within milliseconds to prevent damage to equipment or cause a failure of the entire system. If a boiler develops a tube leak, its generator must be taken off-line while repairs are made.

In both cases, there must be sufficient capacity in place to continue to meet the load. There must be transmission capacity to absorb the additional flow from a lost line, and generation capacity online to immediately meet the load no longer served by the lost generator. So while interconnection provides a set of benefits, one of its costs is the need for close coordination among the interconnected parties for both system operations and system planning.

To maintain the reliable electric service expected by a society that is increasingly dependent upon technology, reliability standards are put in place to govern the actions and to establish the

[7] The terms power and energy have distinct meanings. Power is the ability to do work, for example, the horsepower produced by an automobile engine at a given point in time. Energy is the amount of work done over an interval of time, for instance the amount of gasoline consumed on a trip. Electric power is measured in watts (W), kiloWatts (kW =1000 W) and megaWatts (MW = 100 kW). Electric energy is measured in Watt-hours (Whr), kilo-Watthours (kWh), megaWatt-hours (MWh), etc. The unit of a Watt is capitalized in honor of James Watt of steam engine fame.

responsibilities of the interconnected parties. Reliability standards govern the maximum amount of power on a transmission line or paths (groups of lines), the level of generation operating reserves required, and acceptable responses to a contingency, etc.

Interconnection of systems also brings economic value to the participants. The earliest interconnections provided an opportunity for trade among the interconnected utilities. For instance, a new power plant, capable of producing more energy than was initially needed by the owner, could sell energy to a neighboring utility, which would use the purchase to delay construction of its next power plant. The scale of such trading expanded to daily and hourly trades among utilities. With the introduction of open transmission system tariffs in the 1990s, further competitive trade has been enabled, and new, nonutility producers entered the electric energy market.

Geographic Constraints

As noted earlier, Western North America imposes limitations on the nature of the transmission system. If it were possible to erase the transmission map and start over with a new system, it is likely that the topology of new network would likely resemble that of the existing network for three reasons:

First, population centers dictate the location the majority of the system's electrical loads. Except for areas along the Pacific coast, population centers are distributed widely in the west, with open space between them, and their locations are dictated by water availability.

Second, resources generally are rooted to a specific location. While gas and coal-fired generation can be located near load; other resources, such as hydro, wind, or geothermal generation occurs where the resource exists. This requires transmission to make delivery to population centers. Solar generation also is location specific, but because solar resources are located near load centers in Southern California and the Southwestern desert, the transmission need is somewhat reduced.

Third, once loads and resources are identified, the shape of the network is located where it can be most effectively interconnected. While it first might seem that a very large set of lines is possible, geographic constraints actually reduce the number of practical routes. In addition to topographic obstacles (mountains, rivers, lakes, and deserts), there are limitations imposed by special land-use boundaries (national parks, military reservations, environmentally sensitive areas, wilderness areas, Native American lands, cultural sites, etc.). Practical routes also must consider the technical fact that lines are most effective and economically viable when they connect with major generation and load centers.

Combined, these result in a fairly constrained set of transmission route options for consideration.

Regulatory, Environmental and Societal Constraints

During the last 20 years, most utilities have been subject not only to the economic regulation of prices, but to policy regulation – especially of the types of generation resources that can be used in the future. Initially this occurred through Integrated Resource Planning (IRP), Load and Resource planning, and more recently through Renewable Portfolio Standards (RPS). In the future, greenhouse gas regulations may impose additional constraints on resource selection. Transmission plans must recognize these policy choices, and their implications for resource locations and transmission capacity requirements.

A transmission system is defined by the geography it serves and by the terrain it must traverse. Approval of a route for a transmission line is complex and time consuming. It currently takes up to nine years to obtain needed approvals, order materials and construct a transmission line. In the West, the federal government is a major landowner, with the Forest Service and the Bureau of Land Management being key agencies. As stated earlier, there are national and state parks, national and state monuments, military reservations, Native American lands, and cultural sites to consider. Private land acquisitions or easements are important in urban or agricultural areas. Environmental impacts on wildlife are a major consideration for public lands, while impacts on land use and perceived health concerns affect routing over private lands.

When non-specialists read a transmission planning report, they may conclude that all these factors have not been considered because the discussion in the report is focused on the electrical performance of the planned system. In the past, specialists often forget to include discussions of more broad ranging, nontechnical considerations in their planning reports – because often those considerations were addressed at the beginning of the process, when a set of practical options were initially developed. The goal of expanded The WECC Regional Transmission Planning (RTEP) process is to include stakeholders in the planning process who are not engineers, so that the resulting transmission plan will explicitly address all of the considerations discussed above.

Appendix C Draft Outline of the 10-Year Regional Transmission Plan Report

I. Overview and Goals

- **A. Prologue**
- **B. Answer "What is the compelling story for the Plan?"**
- **C. How did we arrive at this point?**
- **D. What are the metrics for success?**

II. WECC 10-Year Regional Transmission Plan

- **A. Disclaimers, assumptions, recommended uses**
- **B. List of Projects**
- **C. List of other capacity recommendations and potential solutions**

III. Ten Year Study Cases

- **A. Description of study cases and requestors (2019, 2020)**
- **B. Summary of load, resource, transmission, and other assumptions**
- **C. Summary of results**

IV. Input Assumptions

- **A. Generation**
  - **i. List of generation assumed constructed in the study cases**
  - **ii. Description of Generation**
- **B. Loads**
  - **i. Load and Resource future load projections**
  - **ii. State-adjusted load projections**
  - **iii. Energy Efficiency assumptions**
  - **iv. Demand-side management assumptions**
- **C. Transmission**
  - **i. List of projects assumed constructed in the study cases**
  - **ii. Description of transmission projects**
  - **iii. Projects to be reported on (in-service date 2020 or earlier)**
    - Energized 2006-2010
    - Under construction
    - Foundational – permitted
    - Foundational – potential
    - Potential – in permitting
    - Potential – conceptual
  - **iv. Attributes to be described**
    - Financial commitment
    - Permitting status
    - Generation access

- Load access
- Impacts on reliability and congestion relief
- Responsiveness to public policy requirements
- Environmental attribute screening
- Alignment with known renewable energy zones and corridors

V. OUTPUTS

A. Summary of results

B. 2019 Study Case results

C. 2020 Study Case results

D. Analysis of Results

i. Summary of analyses

ii. Consistently congested paths, corridors, SCI variation

E. Comparison with other findings

i. TEPPC Historical congestion report

ii. DOE congestion report, SPG's reports, WWSIS report, etc.

F. Reliability Assessment: Power flow (AC) analysis of the Plan

i. Process on creating the power flow models from the production cost studies

ii. Selection of hours of interest (high- and low-load)

iii. Selection of outages

G. Operational and Integration Issues

i. Discussion of potential operational assumptions and identified concerns. Concerns will not be addressed as part of the Plan. Rather, the information will be researched further by WECC and others.

H. Preliminary Assessment for Environmental Aspects of the 10-Year Plan

VI. Operational Production Cost Model assumptions

A. Balancing area and unit commitment pool assumptions

B. Reserve requirements

VII. Comments from OC and VGS

VIII. Related activities and further reading

A. WWSIS, VGS, SPGs, States, Provinces

IX. Conclusions and Observations

A. Congestion relief: Description of paths/corridors

B. Projects and congestion mitigation options in 10-year horizon

C. Transmission commonly found to provide a solution to congestion in a multitude of scenario futures/ study programs.

X. Additional analyses for refinement of results – 2011-2012

XI. Recommendations

A. State and federal regulators, permitting agencies and policymakers

B. Subregional planning groups

C. Transmission owners and project developers

D. WECC

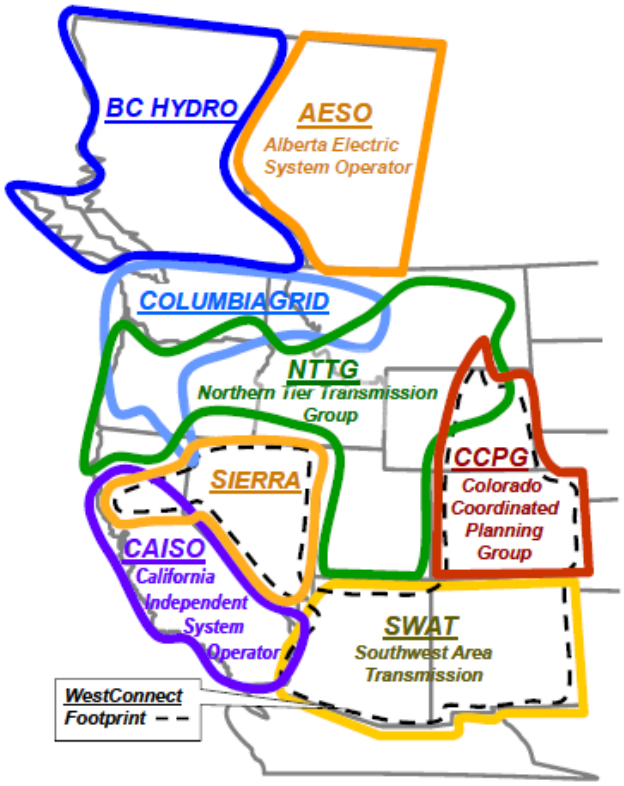
WECC 10-Year Regional Transmission Plan Volumes

Volume I	**WECC 10-Year Regional Transmission Plan (50-page glossy) – highlights**
Volume II	**WECC 10-Year Regional Transmission Plan Report (100 pages) – outlined above**
Volume III	**Study Case Results Report (2019 & 2029 studies) (300 pages)**
Volume IV	**Western Interconnection Planning Entities and Membership (10 pages)**
Volume V	**Transmission Reliability Assessment/Evaluation Documentation (50 pages)**
Volume VI	**Appendices**
Volume VII	**Appendix A: TEPPC 2010 Study Program (30 pages)**
Volume VIII	**Appendix B: TEPPC 2009 Study Program (30 pages)**
Volume IX	**Appendix B: 2009 Historical Analysis Results Summary report (50 pages)**
Volume X	**Appendix C: Studies Assumption Documentation Matrix (20 pages)**
Volume XI	**Appendix D: Project Screening Documentation (50 pages)**
Volume XII	**Appendix E: Reliability Assumptions Documentation Matrix (20 pages)**
Volume XIII	**Appendix F: SCI variation and the calculation involved**

Appendix D 10-Year Regional Transmission Plan Task Force

Name	Organization	Representing
Grace Anderson	California CEC	State Energy Agencies
Jim Baak	Vote Solar Initiative	Renewable Advocate
Jeff Billinton	AESO	Canadian Utility
Scott Cauchois	TEPPC Chair	TEPPC/WECC Board
John Cupparo	PacifiCorp	Large Utility – WECC Board
Susan Henderson	Xcel Energy	Subregional Planning Groups
Ed Higginbottom	BCTC	Canadian Utility
Bill Pascoe	TransWest Express	Independent Transmission Developers – Task Force Chair
John Savage	Oregon PUC	WGA CREPC
Julia Souder	Clean Line Energy Partners	Transmission Operators, Owners and Developers
Jim Tarpey	Colorado PUC	State Utility Commissions – SPSG chair
Carl Zichella	Natural Resources Defense Council	Environmental Advocate
Bradley Nickell	WECC	WECC Staff Lead – Editor
Steve Walton	WECC	TEPPC facilitator
Deston Nokes	WECC	Technical Writer

Appendix E TEPPC-Recognized Subregional Planning Groups



SCG Membership		
Name	**Organization**	**REPRESENTATION**
Rich Bayless	Northern Tier Transmission Group (NTTG)	NTTG
Scott Cauchois	WECC Non-Affiliated Director	TEPPC Chair
Gary DeShazo	California Independent System Operator (CAISO)	CAISO
Susan Henderson	Public Service Company of Colorado – Xcel Energy	Colorado Coordinated Planning Group (CCPG)
Ed Higginbottom	BC Hydro	Canadian Utility
Jeff Billinton	Alberta Electric System Operator (AESO)	AESO
Jeff Miller	ColumbiaGrid	ColumbiaGrid
LeeAnn Torkelson	Salt River Project	Southwest Area Transmission (SWAT)
Brian Whalen	NV Energy	Sierra

Appendix F TEPPC Membership

Name	ORGANIZATION	REPRESENTATION
Grace Anderson	California Energy Commission	State Energy Office
Rich Bayless	Northern Tier Transmission Group	Northern Tier Transmission Group - SPG
Jeff Billinton	Alberta Electric System Operator (AESO)	AESO - SPG
Scott Cauchois	Non-Affiliated Director	WECC Board of Directors
John Cupparo	PacifiCorp	WECC Board of Directors
Gary DeShazo	California Independent System Operator	Independent System Operator - SPG
Ken Dragoon	Renewable Northwest Project	Integrated Resource Plan Expert
Mike Evans	Shell Energy North America	Wholesale Market Expert
James Feider	City of Redding	Load Serving Entity
Susan Henderson	Public Service Company of Colorado (Xcel Energy)	Colorado Coordinated Planning Group - SPG
Dian Grueneich	California Public Utilities Commission	Public Utility Commission
LeeAnn Torkelson	Salt River Project	South West Area Transmission - SPG
Jeffrey Miller	ColumbiaGrid	ColumbiaGrid – SPG
Bill Pascoe	TransWest Express	Transmission Owner
Harlow Peterson	USE.	Consumer
Paul Schmidt	NV Energy	Sierra
Steven Walton	TEPPC Facilitator	
Allan Woo	British Columbia Hydro & Power Authority	Generator Owner
Carl Zichella	Natural Resources Defense Council	Environmental
Bradley Nickell	WECC	WECC Staff Lead – Editor
Steve Walton	WECC	TEPPC facilitator
Deston Nokes	WECC	Technical Writer

Appendix G SPSG Membership

Name	Organization	Representation
Grace Anderson	California Energy Commission	State Official
Jim Baak	The Vote Solar Initiative	Technology Advocate
Craig Cox	Interwest Energy Alliance	Technology Advocate
Robert Cunningham	U.S. Department of Agriculture	Ex-Officio Member
John Cupparo	PacifiCorp	WECC Board Member
Pamela Eaton	The Wilderness Society	Lands Protection Advocate
James Feider	City of Redding	TEPPC LSE
Bryce Freeman	Wyoming Office of Consumer Advocate	Consumer Advocate
Gary Graham	Western Resource Advocates	Wildlife Advocate
Dian Grueneich	California PUC	State Official
Susan Henderson	Xcel Energy	TEPPC SPG
Ed Higginbottom	BCTC	Canadian Utility
Denise Hill	Independent Power Producers Coalition of the West	Technology Advocate
Tom Kaiserski	Montana Governor's Office	State Official
Neal Kemkar	U.S. Department of Interior	Ex-Officio Member
Bevan Laing	Alberta Dept. of Energy	Provincial Official
Tracey LeBeau	SNR Denton US LLP	Tribal Representative
Lawrence Mansueti	U.S. Department of Energy	Ex-Officio Member
Kristin Mayes	Arizona PUC	State Official
John McCaull	Geothermal Energy Association	Technology Advocate
Harlow Peterson	USE Consultants	TEPPC Consumer
John Savage	Oregon PUC	State Official
Howard Schwartz	Washington Energy Office	State Official
Marsha Smith	Idaho PUC	State Official
Julia Souder	Clean Line Energy Partners	Transmission owner/operator/developer
Jim Tarpey	Colorado PUC	State Official
Steven Weiss	NW Energy Coalition	Technology Advocate
Carl Zichella	Natural Resource Defense Council	TEPPC Environmental

Appendix H SPSC Membership

Name	Organization	REPRESENTATION
Tim Grant	*Alberta Department of Energy*	Alberta
Kevin Kinsal Kristin Mayes	*Arizona State* Arizona PUC	Arizona
Les MacLern	BC Ministry of Energy, Mines and Petro Res	British Columbia
Jeff Byron Dian Grueneich	California Energy Commission California PUC	California
Jim Tarpey Morey Wolfson	Colorado PUC Colorado Energy Office	Colorado
Marsha Smith John Chatburn	Idaho PUC Idaho Office of Energy Resources	Idaho
Ken Toole Tom Kaiserski	Montana Governors Office Montana Governors Office	Montana
Jason Marks Jim Noel	New Mexico Public Regulation Commission New Mexico Public Regulation Commission	New Mexico
Hatice Gecol Rebecca Wagner	Nevada Office of Energy Public Utilities Commission of Nevada	Nevada
John Savage Tom Stoops	Oregon PUC Oregon Department of Energy	Oregon
Hunter Roberts	South Dakota Department of Tourism and State Development Governor's Office of Economic Development	South Dakota
Donna Nelson	Texas PUC	Texas
Dianne Nielson Ric Campbell	Utah Energy Office Utah Public Service Commission	Utah
Tom Karier Jeff Goltz	Northwest Power Pool and Conservation Council Washington Utilities and Transportation Commission	Washington
Steve Oxley	Wyoming Public Service Commission	Wyoming
John Harja	Utah Governor's Office	Western Governors Wildlife Council – Ex-Officio
Alexandra Davis	*Colorado Department of Wildlife*	Western States Water Council – Ex-Officio

Appendix I 2010 TEPPC Study Program Study Requests

Study Requests for New 2019 Studies – Medium-term
2019 Strategy: Update the 2019 basecase with refined thermal plant parameters, additional HTC modeling, AB/BC model improvements, and other quick known fixes. New resource and transmission expansion scenarios (from 2009 and 2010 study requests) will be run while the new 2020 case is being developed. Only fixes that can be implemented by May 1 will be incorporated into the 2019 dataset update to maximize the resource scenarios and expansion cases that can be run.

Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2019 PC1A	PG&E, NTTG	Minor update to 2019 base case.		High	Completed
2019 EC1A-1	PG&E		Central CA Clean Energy Transmission Project (Midway-Gregg 500 line)	High	Completed
2019 EC1A-2	PPL Energy and NTTG		Determine economic effects of the WECC N-2 Common Corridor outage	Med	This study case is not being completed. This has been reported back to the study requestor
2019 EC1A-3	Startrans IO, LLC		Analyze the congestion in the SF Bay area and evaluate potential solutions	Low	Not completing. Request has been referred back to the SPG.
2019 EC1A-4	Green Energy Express LLC		Study impact of Green Energy Express Transmission Project Phase 1 on congestion	Low	Not completing. Request has been referred back to the SPG.

Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2019 PC7	WestConnect, PG&E	Based on 2019 PC1A - Arizona/Southern Nevada: re-locate capacity equivalent of 12,000 GWh energy from California		High	Completed
2019 EC7-1	Startrans IO, LLC		Phoenix-Mead-Adelanto line converted to HVDC	High	Completed
2019 EC7-2	Green Energy Express LLC		Green Energy Express Transmission Project Phases 2&3	High	Completed
2019 EC7-3	SCE		Palo Verde-Colorado River 500 kV line	High	Completed
2019 EC7-4	LADWP, IID, SCPPA		Green Path North Project (Indian Hills-Upland)	Low	Project dropped by study requestor
2019 EC7-5	Central AZ Water Conservation District		Harcuvar Transmission Project	Low	Not completing – Local project
2019 PC8	NTTG	Based on 2019 PC1A - Wyoming: re-locate capacity equivalent of 12,000 GWh energy from California		High	Completed

Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2019 EC8-1	TransCanada		Zephyr Project (Wyoming-Las Vegas HVDC)	High	Completed
2019 EC8-2	TransWest Express and NTTG		600 kV HVDC from Central Wyoming to Las Vegas	High	Completed
2019 EC8-3	PacifiCorp		Hemingway-Captain Jack 500 kV Transmission Line and Gateway West #2	High	Yet to be completed
2019 EC8-4	Black Hills et al, Sunzia Project Participants		High Plains Express Transmission Project and SunZia Project	High	Completed
2019 EC8-5	Portland General Electric, PacifiCorp		Cascade Crossing (Boardman-Bethell 500 kV line) and Gateway West #2	High	Yet to be completed
2019 EC8-6	TransElect, Wyoming Infrastructure Authority		Wyoming-Colorado Intertie Project (345 kV lines)	High	Completed
2019 EC8-7	PacifiCorp		Gateway South #2	High	Yet to be completed

Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2019 EC8-8	NTTG, PPL Energy		Determine impact of new energy market hub in eastern Wyoming	Low	Not completing. Request has been referred back to the SPG.
2019 PC9	NTTG, PG&E, BCTC, SeaBreeze	Based on 2019 PC1A - British Columbia : re-locate capacity equivalent of 12,000 GWh energy from California, add reshaping using existing storage capability		High	Completed
2019 EC9-1	PG&E		Canada-PNW-Northern California Project	High	Not completing. Request has been referred back to the SPG.
2019 EC9-2	SeaBreeze and NTTG		Test impact of Juan de Fuca cable project in alleviating congestion	Low	Not completing. Request has been referred back to the SPG.
2019 EC9-3	SeaBreeze		Juan de Fuca Cable Project II	Low	Not completing. Request has been referred back to the SPG.

Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2019 PC10	Sierra SPG	Based on 2019 PC1A - Northern Nevada: re-locate capacity equivalent of 12,000 GWh energy from California		High	Completed
2019 EC10-1	NV Energy		Reno to Las Vegas 500 kV line (Blackhawk to Amargosa/Northwest) and 2 Blackhawk to Tracy/Tesla 500 kV lines	High	Completed
	Sierra SPG	Evaluate the congestion that results from the development of 1000 MW of wind in northern CA and northern NV at 230 kV		Low	Not completing. Request has been referred back to the SPG.
2019 PC11	NTTG	Based on 2019 PC1A - Alberta: re-locate capacity equivalent of 12,000 GWh energy from California		High	Completed
2019 EC11-1	TransCanada		Northern Lights Project	High	Yet to be completed
2019 EC11-2	MATL		Montana-Alberta Transmission Line (MATL)	High	Not completing. Request for information needed to complete study has not been provided by requestor

Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2019 PC12	PG&E, Grasslands Renewable Energy LLC and NTTG	Based on 2019 PC1A - Montana: re-locate capacity equivalent of 12,000 GWh energy from California		High	Completed
2019 EC12-1	TransCanada		Chinook Project (Colstrip-Las Vegas HVDC)	High	Completed
2019 EC12-2	NWE		Mountain States Intertie Project and SWIP (Midpoint-Robinson Summit-Las Vegas 500 kV line)	High	Completed
2019 EC12-3	NWE		MT-NW Path 8 Upgrades (500-700 MW increase)	High	Completed
2019 EC12-4	Grasslands Renewable Energy LLC, NTTG, PPL Energy		Add 400 MW Pump Storage between Garrison and Broadview	High	Completed
2019 EC12-5	PPL Energy and NTTG		Colstrip-Zephyr AC transmission line with Zephyr and Chinook projects	Low	Not completing

Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2019 EC12-6	PPL Energy and NTTG		Colstrip-Zephyr AC transmission line with Zephyr project upgraded to 800 kV and no Chinook project	Low	Not completing
2019 EC12-7	PPL Energy and NTTG		Test impact on congestion of two 345 kV DCTL to tie Great Falls to both Broadview and to Garrison over the existing 230 kV ROW's.	Low	Not completing
2019 EC12-8	PPL Energy and NTTG		Test impact on congestion of a 345 kV uprate to the existing 100 kV lines from Great Falls to Helena. Continue past Helena to the Townsend 500 kV substation.	Low	Not completing
2019 EC12-9	NTTG-PPL Energy		Test impact on congestion of project from EC12-7 but instead of a double 345 kV lines from Ovando to Garrison, convert North Amps to 500 kV (Garrison to Ovando to Hot Springs (a BPA 500 kV site)) and meet the GF 345 at Ovando.	Low	Not completing

Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2019 EC12-10	NTTG-NWE		Test impact on congestion of the Collector system to move generation from Cutbank, Judith Gap, Belt, Broadview and Ennis areas into Townsend	Low	Not completing
2019 EC12-11	NTTG-NWE		Test impact on congestion of upgrading Path 18 to 401 MW	Low	Not completing
2019 PC13		Based on 2019 PC1A – New Mexico: re-locate capacity equivalent of 12,000 GWh energy from California	Include Tres Amigas for part of the resource development	High	Completed
2019 EC13-1	Clean Line Energy Partners LLC		Centennial West Clean Line (3,500 MW)	High	Yet to be completed
2019 EC13-2	SunZia SW Project Participants		SunZia Project, High Plains Express, Tres Amigas	High	Yet to be completed
2019 EC13-3	Dine Power Authority		Navajo Transmission Project (Four Corners-Marketplace 500 kV)	High	Yet to be completed

Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2019 PC14	NTTG	Based on 2019 PC1A -Oregon-Washington-BC coastal: re-locate capacity equivalent of 12,000 GWh energy from California		High	Completed
2019 EC14-1	SeaBreeze		West Coast Cable and I-5 Corridor Projects	High	Not completing. Request for information needed to complete study has not been provided by requestor
2019 EC14-2	SeaBreeze		Project Triton	High	Not completing. Request for information needed to complete study has not been provided by requestor
2019 EC14-3	TANC		COI Uprate Project (to 5100 MW)	High	Completed

Study Requests for 2020 Studies – Medium-term					
2020 Strategy: Create a new 2020 basecase and run carbon reduction, DSM, and efficiency scenarios as requested. These will be high priority cases when the new 2020 dataset is available in the fall.					
Portfolio Case Number	Requested By	Resources to be Added	Transmission to be Added	Priority	Status as of 10/20/2010
2020 PC1	SPSC	Develop base case guided by utility IRPs with specified assumptions with appropriate review from state regulators, medium load forecast		High	In-progress
2020 PC2	SPSC	From 2020 PC1, run high load case		High	Yet to be completed
2020 PC3	SPSC	From 2020 PC1, develop high DSM case per Table 1 in SPSC study request and evaluate transmission needs		High	Yet to be completed

2020 PC4	SPSC	To achieve carbon reduction targets of the Waxman/Markley benchmarks of 17% by 2020 and consistent with California AB32, add to 2020 PC1 combinations of (i) aggressive EE, conservation, DSM additions, (ii) increased interior wind, (iii) increased SW solar, (iv) combinations of interior wind and SW solar, (v) carbon adder/tax, and (vi) coal fired generation shutdown.		High	Yet to be completed
2020 PC5	SPSC	Scenario 3: From 2020 PC1, evaluate impacts of breakthrough technologies on transmission congestion; include storage, central and distributed photovoltaics, modular nuclear, IGCC and Carbon Capture and Sequestration, Super conducting lines, DSM (EE and DR)		High	Yet to be completed
2020 PC6	Grasslands Renewable Energy LLC, NTTG	Aggressive interior wind in MT, approx 25,000 GWh total over today	Study appropriate transmission projects	Med	Yet to be completed
2020 PC7	TransWest Express, NTTG	Aggressive interior wind in WY, approx 25,000 GWh total over today	Study appropriate transmission projects	Med	Yet to be completed

2020 PC8	Western Grid Group	Using 2020 PC1, apply carbon constraints by utility or region to meet goal of 30% reduction by 2020. Optimize resource mix outside of ProMod with 10% coal retirements, 20% EE, 20% renewable energy		Med	Yet to be completed
2020 PC9	Zglobal	Evaluate benefits of full operation of Tres Amigas project	SunZia Project, High Plains Express, Tres Amigas	Med	Yet to be completed

Appendix J Glossary of Terms & Acronyms Used in this Whitepaper

AC	Alternating Current.
ATC	Available Transfer Capability.
BA	Balancing Authority -- An entity responsible for instantly matching generation and load within a specific area of the Western Interconnection; usually an electric utility or an organization acting for group of electric utilities.
Base Case	A representation of the Western Interconnection used by TEPPC as a starting point for system analysis within a portion of a Study Program.
Bottom-up Planning	A planning process, used to developing the WECC 10-Year Regional Transmission Plan that is initiated at the local level and SPG level, with integration of local and SPG proposals through TEPPC to produce an interconnection-wide plan.
CAISO	California Independent System Operator, a TEPPC recognized subregional planning group.
CCPG	Colorado Coordinated Planning Group – a subregional transmission planning area within WestConnect.
ColumbiaGrid	A subregional transmission planning group within the Western Interconnection.
Congestion	A condition that exists when transmission system constraints prevent the dispatch of lowest cost resources to meet system loads.
Contingency	An event that changes the configuration of the electric power system, such as the loss of a generator or transmission line.
CREPC	Committee on Regional Electric Power Cooperation.
CTPG	California Transmission Planning Group.
DC	Direct Current.
DG	Distributed Generation.
DOE	United States Department of Energy.
DSM	Demand Side Management.
DWG	Data Work Group formed by the TAS.

EDTF	Environmental Data Task Force formed by the SPSG.
EPACT	Energy Policy Act of 2005.
ERCOT	Electric Reliability Council of Texas.
FERC	Federal Energy Regulatory Commission.
Foundational Project	A transmission expansion project that meets the SCG criteria for a facility that is expected to be operational by the end of the WECC 10-Year Regional Transmission Plan.
HAWG	Historical Analysis Work Group formed by TAS.
HVAC	High Voltage Alternating Current, usually facilities operating at 230 kV or greater.
HVDC	High Voltage Direct Current, usually operating at 230 kV or greater.
LBNL	Lawrence Berkeley National Laboratory.
LMP	Locational Marginal Price(s) calculated in a Production Simulation, which occurs due to transmission system congestion.
Load Center	A geographic area with a concentrated electrical load.
Long-term	Planning activities that have a 20-year or longer time horizon.
LRS	Loads and Resources Subcommittee of PCC.
LSE	Load serving entity, often a local utility operating a distribution system.
Mid-Term	Planning activities that have a 10-year horizon.
MWG	Modeling Work Group formed by TAS.
Need	As used in this whitepaper, need has the general usage meaning of a lack of a something that is desirable or required. It does not mean the specific legal usage of a formally established obligation that must be satisfied.
NGO	Non-Governmental Organization.
NREL	National Renewable Energy Laboratory.
NTTG	Northern Tier Transmission Group is a subregional transmission-planning group within the Western Interconnection.
NWPCC	Northwest Power and Conservation Council.

OATT	Open Access Transmission Tariff consistent with FERC Orders 888, 889 and 890.
Path	Path, or Transmission Path, is a single or set of key transmission lines with an established rating that are monitored in TEPPC studies. There are 64 paths in the Western Interconnection. Paths are analogous to the term flowgate used in other parts of North America.
PCC	Planning Coordination Committee of WECC.
PCM	Production Cost Model — An analytic representation of an electrical generation and transmission system used to determine the most efficient dispatch of generation to meet system loads within the reliability constraints on power system operations.
Plan	The WECC 10-Year Regional Transmission Plan to be submitted to DOE by WECC in 2011.
Planning	The act or process of developing a plan.
PNNL	Pacific Northwest National Laboratory.
Production Simulation	The use of a PCM over a specific time interval, for example, hourly dispatch evaluations for each hour of a one-year period.
Reference Case	A modification of a Base Case specified by SPSC, SPSG or other group making a study request.
Region(al)	Region(al) is defined as the Western Interconnection.
RFP	Request for Proposals.
RMATS	Rocky Mountain Area Transmission Study.
RPS	Renewable Portfolio Standard.
SCG	SPG Coordination Group.
Screening	The process for examining the results of a series of study results or historical information to determine the need for more detailed analytic examination.
Short-term	Planning activities with a time horizon of five years or less.
SPG	Subregional Planning Group.
SPSC	State-Provincial Steering Committee.
SPSG	Scenario Planning Steering Group.

SPSG(Sierra)	The Sierra Subregional Planning Group, a subregional transmission planning area within WestConnect.
Stakeholder	A person or entity who has expressed an interest and a wish to participate in the planning activities of TEPPC.
Study Program	A joint set of studies, developed under the provisions TEPPC Transmission Planning Protocol, that is to be completed by TEPPC during a given year. Each Study Program is developed based on consideration and prioritization of all study requests received by transmission providers in a given year, with portions of the study work being designated for completion by TEPPC, subregional planning groups and transmission providers.
Subregion(al)	Part(s) of the Western Interconnection that have organized to conduct planning activities.
SWAT	Southwest Area Transmission, a subregional transmission planning area within WestConnect.
SWG	Studies Work Group formed by TAS.
TAS	Technical Advisory Subcommittee of TEPPC.
TEPPC Protocol	The TEPPC Transmission Planning Protocol, a document that describes the transmission planning serviced to be provided by TEPPC to assist transmission providers in meeting their interconnection-wide planning obligations under FERC Order No. 890.
TEPPC	Transmission Expansion Planning and Policy Committee of WECC.
TO	Transmission Owner.
Top-down Planning	An interconnection wide planning process used for developing a 20-Year Plan that is initiated by TEPPC with participation by the SPGs and other stakeholders.
Transmission	The class of electrical facilities used to interconnect generators and loads, usually operating at 115 kV or greater.
TSS	Transmission Studies Subcommittee of WECC.
VGS	Variable Generation Subcommittee of WECC.
WECC	Western Electricity Coordinating Council.
WestConnect	An organization of utility companies providing transmission service in the Southwestern United States, which has three subregional planning areas, CCPG, SSPG (Sierra) and SWAT.

Western Interconnection	The synchronized electric power network operating in 11 Western United States, two Western Canadian provinces and Northern Baja Mexico.
WGA	Western Governors Association.
WSCC	Western Systems Coordinating Council (1967-2002) that was merged with Western Regional Transmission Association and Southwest Regional Transmission Association to form WECC.