2012-2013

Biennial Transmission Plan

SUMMARY

NORTHERN TIER
TRANSMISSION GROUP

NTTG Mission

To ensure efficient, effective, coordinated use and expansion of the members' transmission systems in the Western Interconnection to best meet the needs of customers and stakeholders.

Above: Crews perform live-line spacer replacement on a 500-kV transmission line between switchyards in central Montana.

On the cover: A segment of the 500-kV Mona-Oquirrh transmission line runs through Tooele County, Utah.

NORTHERN TIER TRANSMISSION GROUP

www.nttg.biz
info@nttg.biz

The extensive high-voltage transmission network of the Northern Tier Transmission Group's transmission providers reaches to all states of the U.S. Western Interconnection.

1. Introduction

This document summarizes the Northern Tier Transmission Group (NTTG) 2012-2013 Biennial Transmission Plan. It highlights the key conclusions of the plan and provides limited background on the plan purpose and process. See the complete plan at the NTTG website (www.nttg.biz) for greater detail, background and graphics.

The NTTG 2012-2013 Biennial Transmission Plan sought to determine transmission system improvements needed for reliable operation in the year 2022 within the NTTG footprint of the western United States. The plan included an economic study and a transmission study.

For the economic study, NTTG combined three requests into one study. The goal of the combined study was to identify what, if any, transmission additions were required for transporting 1,500 MW of wind generation from Montana to the California-Oregon border.

For the transmission study, NTTG created a Null Case, core cases and a Scenario Case.

First, the Null Case established the inadequacy of the existing transmission system to reliably handle forecasted 2022 NTTG system electrical load.

Second, core cases examined five hours representing times of peak load as well as high transmission import and export stress. Power-flow reliability analysis on the five core cases demonstrated the adequacy of expected transmission upgrades to reliably accommodate projected loads and resources in 2022.

Third, the Scenario Case studied the impact of a proposed wind-power generating resource and a proposed high-voltage, direct-current transmission line.

This summary will explain the three components of the transmission study, including the study conclusions, as well as the economic studies performed. But first, the overall purpose of the plan, and the process used to create it, will be highlighted.

Workers install 500-kV breaker at the Idaho Power and PacifiCorp Hemingway Transmission Station in Idaho.

2. Plan Purpose

The study plan established – given a limited number of load and resource scenarios developed through production-cost simulation – whether the expected transmission improvements provide for feasible system operation at times of transmission stress 10 years in the future. The transmission planning process advanced three goals:

1. Identify transmission needs of transmission customers
2. Identify and evaluate transmission congestion that impedes efficient operation of electricity markets.
3. Consider the impacts on congestion of potential new power plants or new transmission projects.

3. Planning Process

The NTTG biennial transmission planning process started in January 2012 and ran through December 2013.

The table below diagrams the steps involved for the transmission study and the economic study.

NTTG EIGHT-QUARTER BIENNIAL PROCESS

NTTG Biennial Planning Cycle				NTTG Economic Study Cycle
Gather Information	01	EVEN YEARS	01	Economic Study Requests
Develop Study Plan, Assumptions	02		02	Perform Economic Studies
Perform Draft Plan Analysis	03		03	Report and Review
Perform Draft Plan Analysis	04		04	
Prepare & Review Draft Report	05	ODD YEARS	01	Economic Study Requests
Process Econ. Studies, Cost Alloc.	06		02	Perform Economic Studies
Prepare & Review Final Report	07		03	Report and Review
Obtain Final Plan Approval	08		04	

4. Study Methodology

NTTG created the power-flow core cases from a chronological, security-constrained, generator-commitment-and-dispatch program. The program enabled the NTTG Technical Work Group (TWG) to identify and select specific conditions, e.g., peak load and maximum export, to perform reliability analysis of the NTTG transmission system. NTTG examined all hours of the year in which available resources and forecasted loads across the Western Interconnection caused the highest stress on the transmission system within the Northern Tier footprint.

Power-flow analysis was performed on the developed cases to determine if any voltage- or thermal-overload violations existed under two conditions: system normal (N-0 pre-disturbance analysis with all lines in service) and one transmission element out of service at a time (N-1 contingency analysis). The power-flow simulation results were then measured against North American Electric Reliability Corp. (NERC) and Western Electricity Coordinating Council (WECC) reliability criteria.

5. Economic Studies

NTTG received three economic study requests during the 2012-2013 planning process and combined these into one study. The combined study determined whether transmission additions were required to transport 1,500 MW of power from Great Falls, Mont., to Malin, Ore., and how much power may be transported from Great Falls to Malin without transmission additions.

NTTG analyzed four transmission configurations for the economic study. Each configuration built on and incorporated the following four additions in an iterative process:

1. 1,500 MW of generation resource added to Great Falls and a 1,500-MW load in Malin
2. 500-kV line from Great Falls to Townsend to Midpoint with a new substation at Townsend
3. 500-kV line from Hemingway to Captain Jack
4. Second 500-kV line from Midpoint to Hemingway

The economic study demonstrated that 1,500 MW of power may be transferred from Great Falls to Malin, with the addition of a 500-kV line from Great Falls to Townsend to Midpoint and series capacitor upgrades at Burns, Malin and Midpoint. Additionally, only 400 MW may be transferred if only the 500-kV line from Great Falls to Townsend to Midpoint is added.

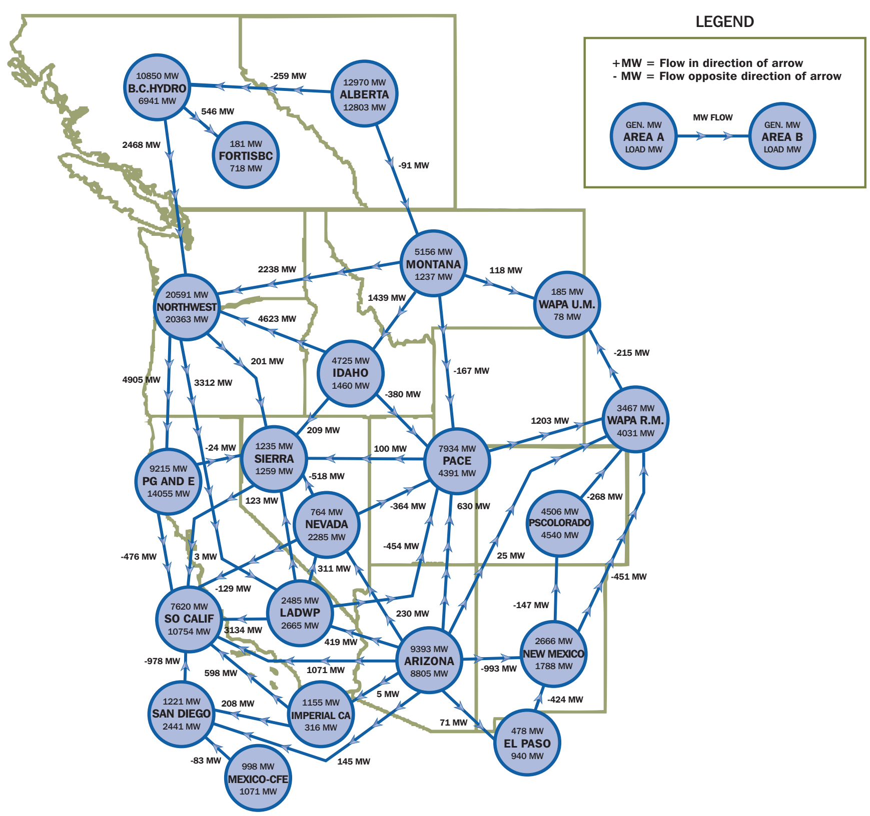


FIGURE 1

Tie-line flows for Economic Study Maximum Export Case 4

6. Null Case

The Null Case sought to discover whether the near-term transmission system could meet the demands of the NTTG footprint year 2022 forecast load. The Null Case was derived from the July 21, 2022 @ 16:00 hours case, modified to reflect the near-term transmission system by removing 23 of the 30 Common Case Transmission Assumptions (CCTA) projects.

Power-flow analysis was performed on the Null Case to determine if any voltage or thermal overload violations existed during system normal (N-0 pre-disturbance analysis with all lines in service) and one transmission element out of service at a time (N-1 contingency analysis) as described in Chapter 2.

The Null Case demonstrated that the near-term transmission system is inadequate to meet forecasted 2022 load and resource requirements. Additional transmission would be required to reliably meet future needs.

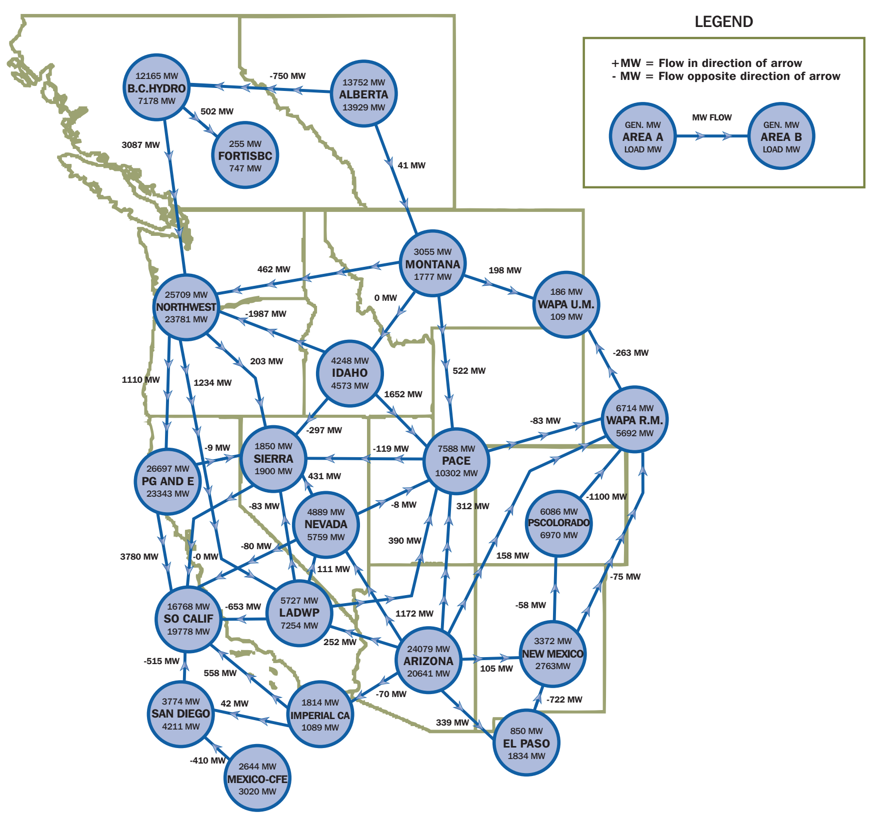


FIGURE 2

Null Case Area Tie-line

7. Core Cases

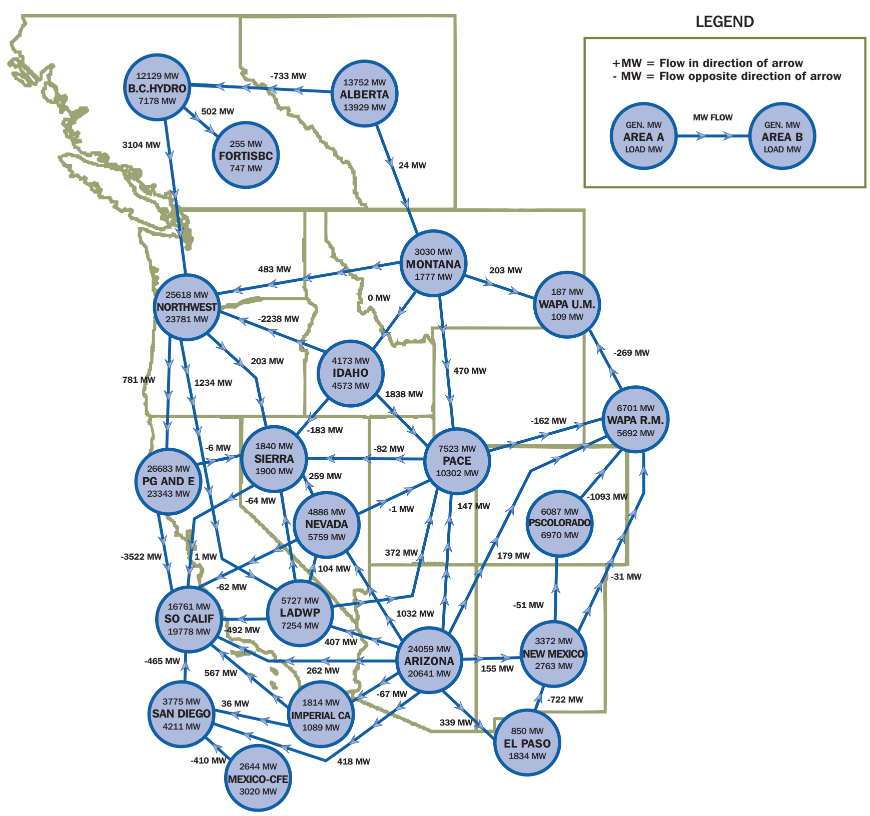
The NTTG TWG created a set of five core cases to analyze future system reliability under five different stressed conditions within the NTTG footprint. The committee selected peak-load hours as well as high-import and high-export conditions that produced those stress points.

The power-flow cases used in the biennial study process were derived from the WECC Transmission Expansion Planning Policy Committee (TEPPC) 2022 production-cost model (PC1). From this model, five core cases were generated based on NTTG transmission providers' coincident: 1) peak summer load, 2) peak winter load, 3) maximum export and 4) maximum import/minimum export; and, additionally, 5) high California-Oregon Intertie (COI) plus Pacific DC Intertie (PDCI) southbound flow coincident with low NTTG export.

PEAK HOURS	
1. July 21 16:00	Coincident NTTG summer peak load **(Fig. 3)**
2. January 5 10:00	Coincident NTTG winter peak load **(Fig. 4)**
HIGH TRANSFER HOURS	
3. November 6 10:00	Maximum coincident NTTG footprint export **(Fig. 5)**
4. September 8 17:00	Minimum coincident NTTG footprint export (or maximum import) **(Fig. 6)**
5. June 6 12:00	Highest COI/PDCI flow coincident with low NTTG footprint exports **(Fig. 7)**

FIGURE 3

Tie-line Flows for Summer Peak-Load Core Case – July 21 16:00



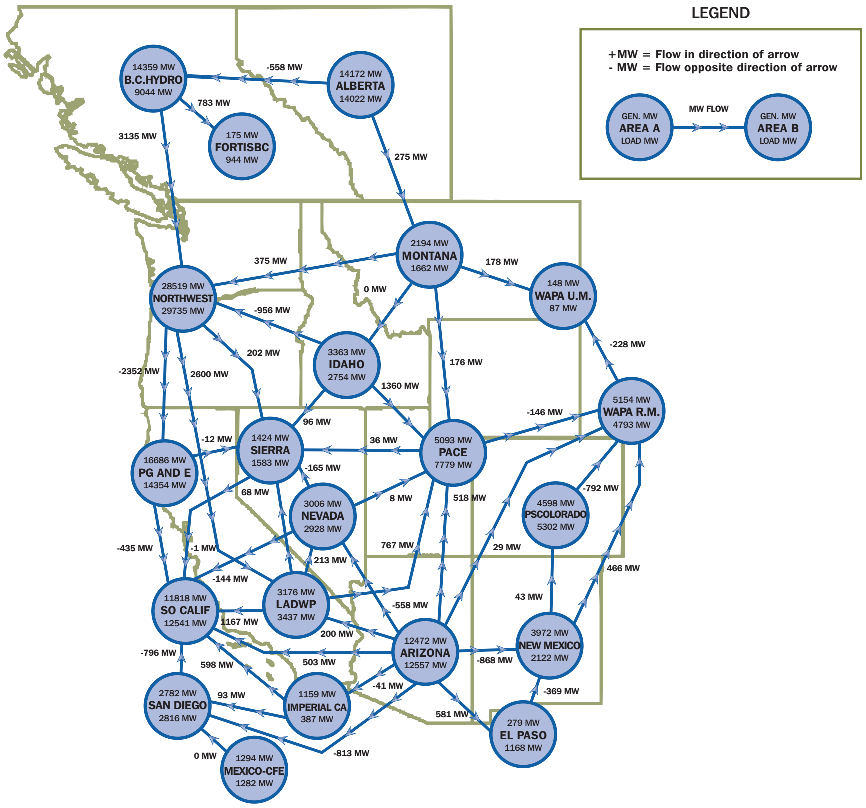


FIGURE 4

Tie-line Flows for Winter Peak-Load Core Case – Jan. 5 08:00

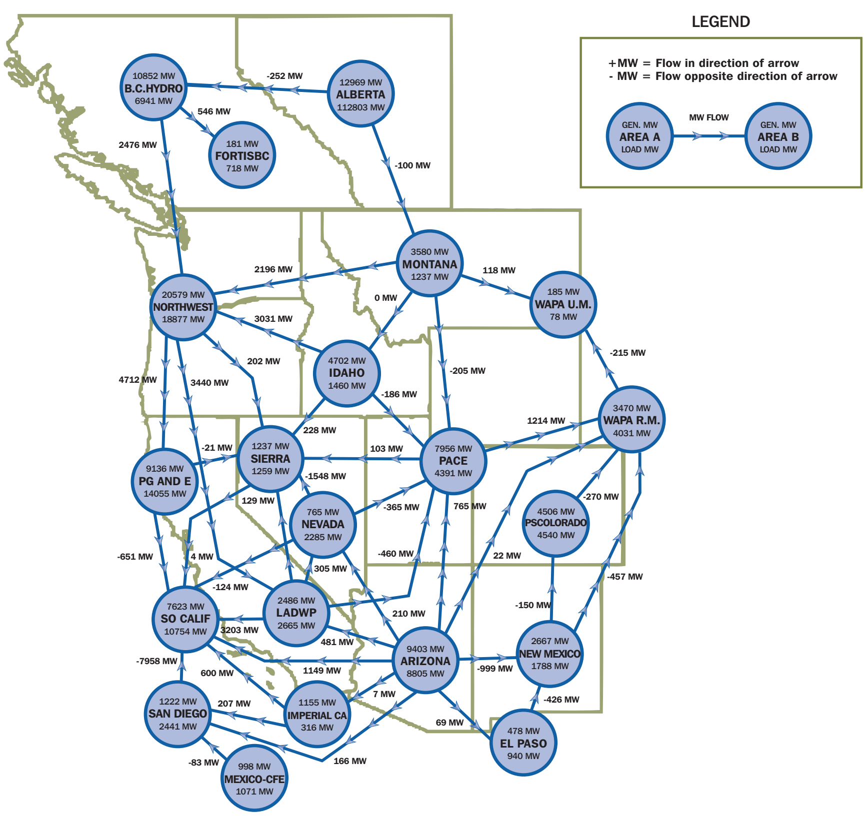


FIGURE 5

Tie-line Flows for Maximum Export Core Case – Nov. 6 10:00

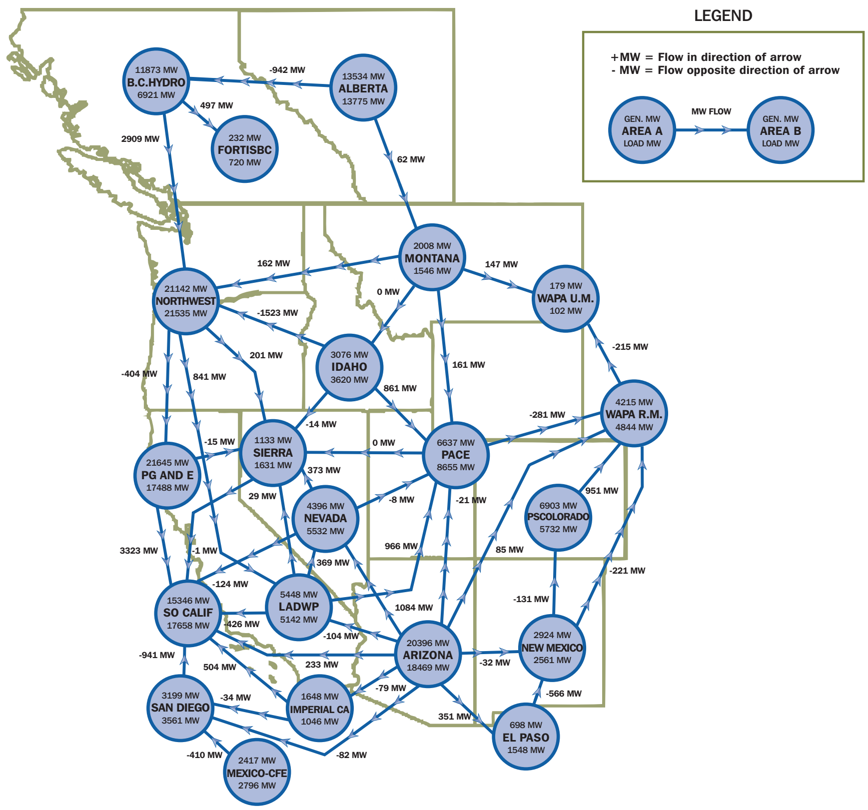


FIGURE 6

Tie-line Flows for Maximum Import Core Case – Sept. 8 17:00

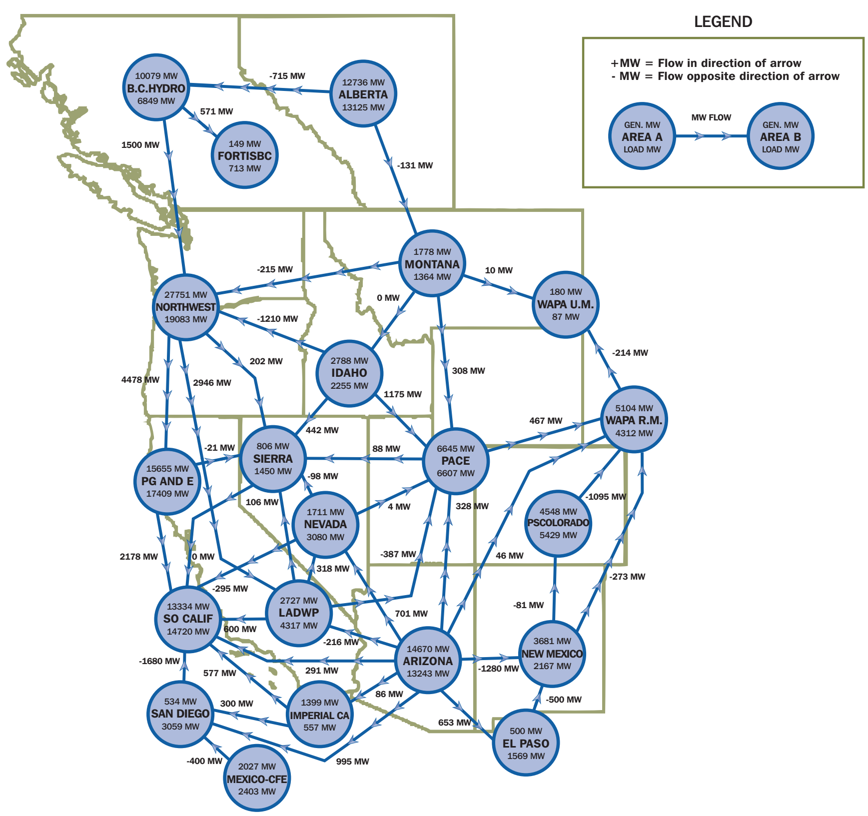


FIGURE 7

Tie-line Flows for COI/ PDCI Core Case – June 6 12:00

The five core cases demonstrated that the expected transmission projects, represented in the TEPPC PC1 model, provide adequate transmission capacity to accommodate forecasted 2022 loads and resources. No additional transmission facilities are needed in this timeframe based on the analysis of the five stressed conditions represented in the core cases.

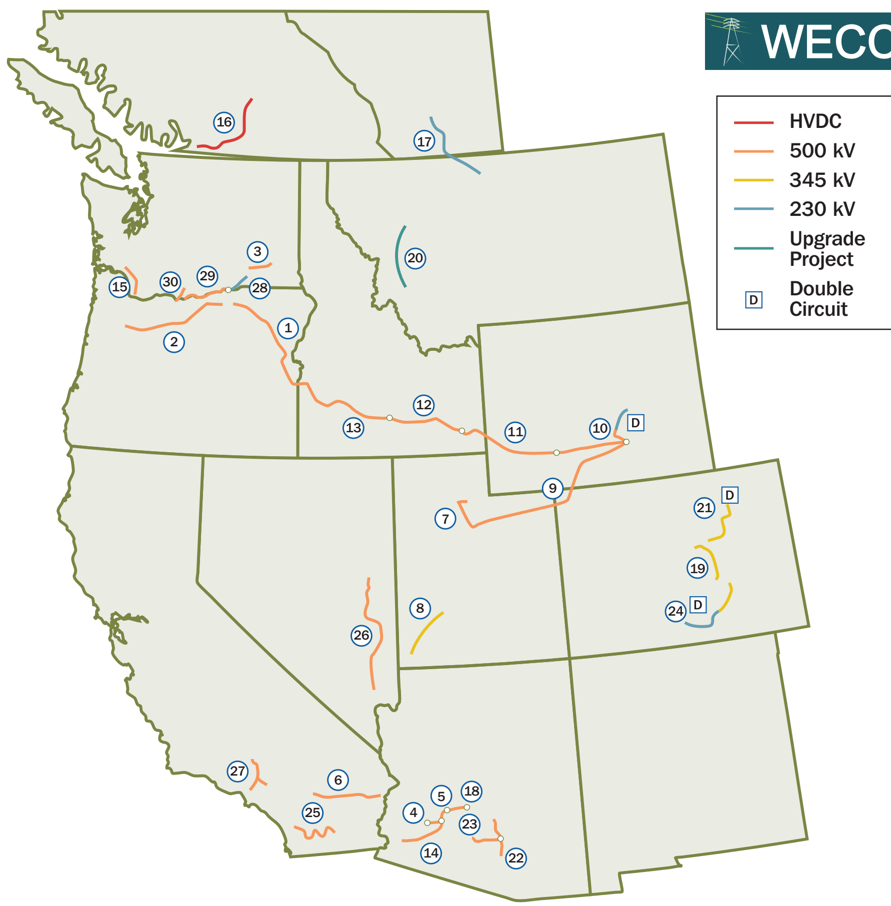
FIGURE 8
Foundational Projects – 2022

2022 COMMON CASE TRANSMISSION ASSUMPTIONS (CCTA)

The purpose of the CCTA is to provide a basic set of transmission facilities that TEPPC can use as a starting point for their own studies. The CCTA is a list of facilities that have a high probability of being in service by 2022.

1. Boardman - Hemingway (B2H)
2. Cascade Crossing
3. Central Ferry - Lower Monumental (Little Goose Area Reinforcement)
4. Delaney - Palo Verde Line
5. Delaney - Sun Valley Line
6. Devers - Colorado River (DCR) Project
7. Gateway Central Project: Mona to Oquirrh (Segment C)
8. Gateway Central Project: Sigurd - Red Butte
9. Gateway South Project: Segment 2 (Aeolus - Mona)
10. Gateway West Project: Segment 1A (Windstar to Jim Bridger)
11. Gateway West Project: Segment 1B (Bridger - Populus single circuit)
12. Gateway West Project: Segment 1C (Populus - Midpoint)
13. Gateway West Project: Segment E (Midpoint - Hemingway)
14. Hassayampa - North Gila #2 Line
15. I-5 Corridor Reinforcement Project (Castle Rock - Troutdale)
16. Interior to Lower Mainland Transmission (ILM) Project
17. Montana Alberta Tie Project (MATL)
18. Morgan - Sun Valley Line
19. Midway - Waterton
20. Path 8 Upgrade/Colstrip Transmission Upgrade (western portion only)
21. Pawnee - Smoky Hill
22. Pinal Central - Tortolita
23. Pinal West - Pinal Central - Browning (SEV)
24. San Luis Valley - Calumet - Comanche
25. Sunrise Powerlink
26. SWIP South
27. Tehachapi Renewable Transmission Project
28. Walla Walla to McNary (Energy Gateway Segment A)
29. West of McNary Reinforcement Project Group 1 (McNary - John Day)
30. West of McNary Reinforcement Project Group 2 (Big Eddy - Knight)

Blue Text - Indicates Under Construction



SUBREGIONAL COORDINATION GROUP (SCG)

CAISO - California Independent System Operator
CTPG - California Transmission Planning Group
CG - Columbia Grid
CCPG - Colorado Coordinated Planning Group
NTTG - Northern Tier Transmission Group
SIERRA - Sierra Subregional Planning Group
SWAT - Southwest Area Transmission
AESO - Alberta Electric System Operator
BCCPG - BC Coordinated Planning Group

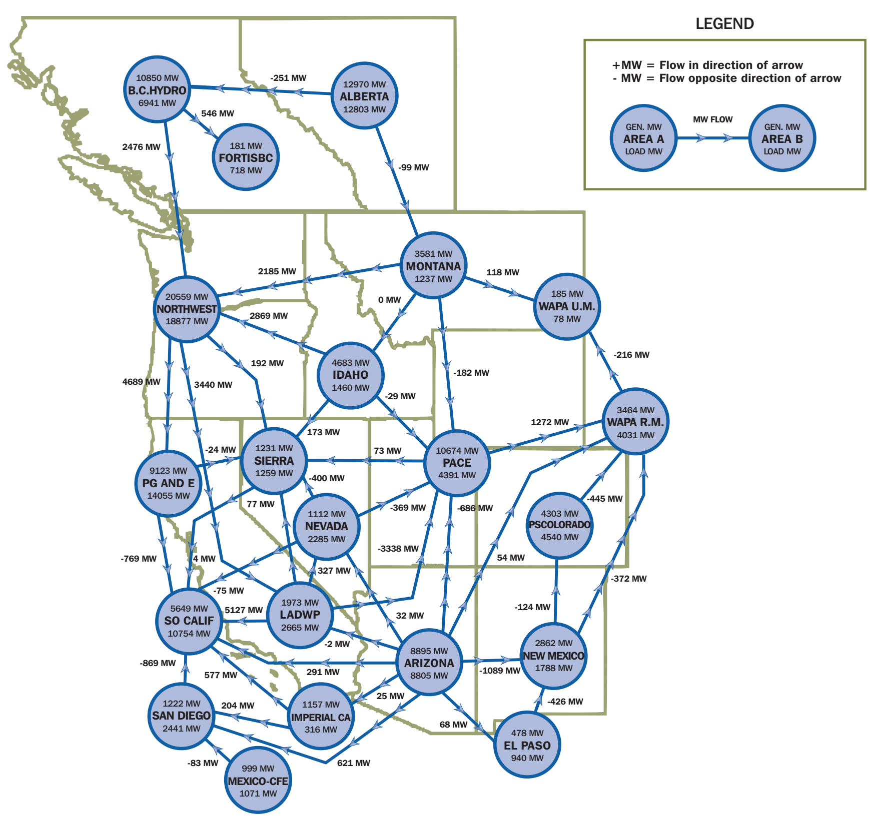
8. Scenario Case

In the first quarter of the biennial planning cycle, Power Company of Wyoming (PCW) submitted data for a new 3,000-MW wind resource in southwest Wyoming. TransWest Express (TWE) also submitted data for a proposed 600-kV extra-high-voltage direct-current electric-transmission system with 3,000-MW capacity. The Planning Committee agreed to study the impact of the PCW generation and DC line as a scenario case in the study process.

Study results for the Scenario Case showed the need for remedial actions for loss of both poles of the new bipole DC line if transferring 3,000 MW. Even tripping one-half of the wind generation in Wyoming, as recommended by TransWest Express, was insufficient to achieve acceptable results within the NTTG footprint. Study results also showed that if the TransWest Express DC line flow were reduced to 2,650 MW (receiving end), the loss of the DC bipole would be less severe, with few or no violations, depending on whether remedial action were employed.

FIGURE 9

Maximum Export TransWest Express Reduced Scenario

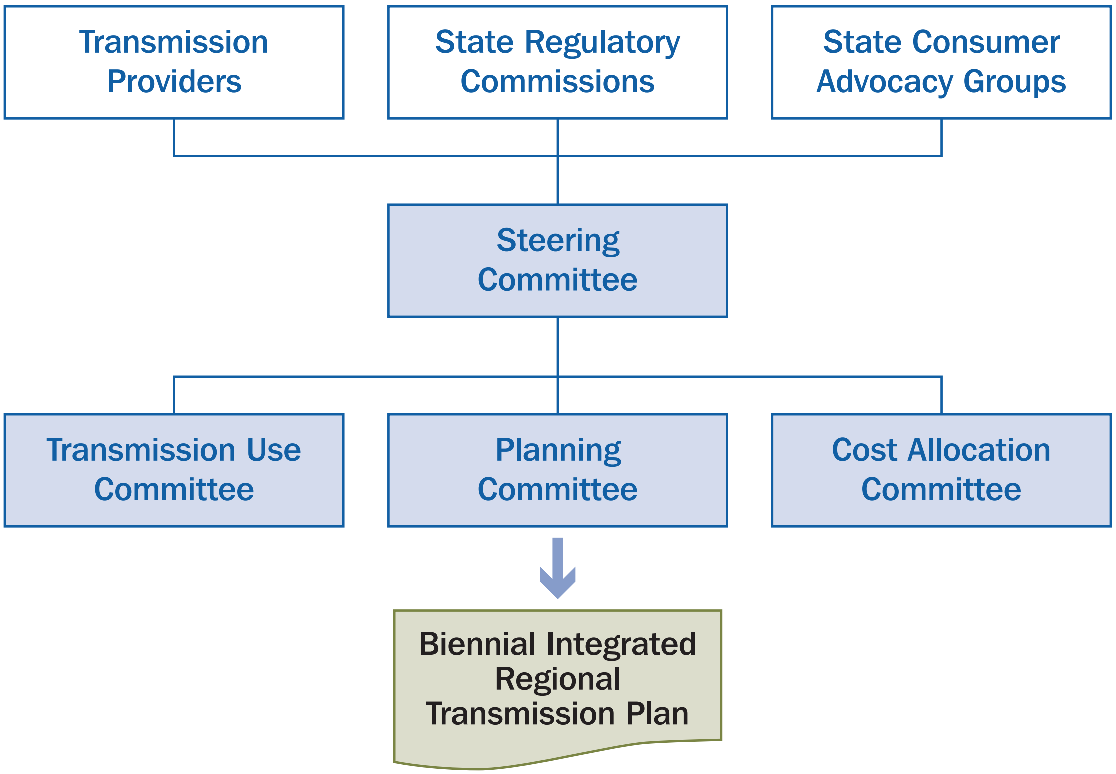


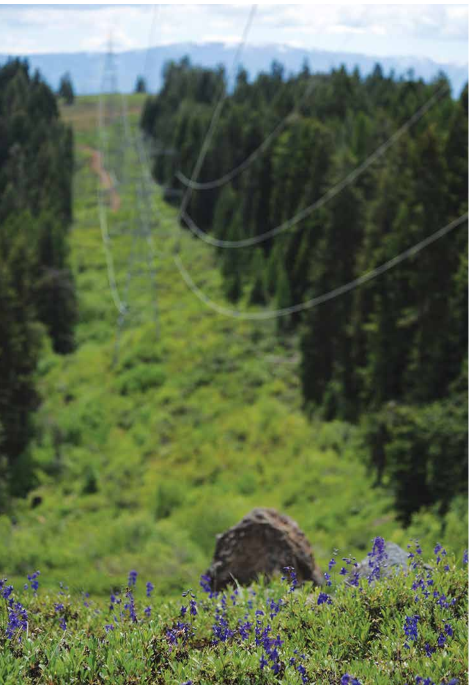
9. The Northern Tier Transmission Group

The Northern Tier Transmission Group was formed voluntarily in 2007 to promote effective planning and use of the multi-state electric transmission system within the Northern Tier footprint. NTTG fulfills FERC Order 890 requiring local transmission providers to participate in regional and subregional planning. Northern Tier provides a forum where all interested stakeholders, including transmission providers, customers and state regulators, can participate in planning, coordinating and implementing a robust transmission system.

An Erickson S-64 aircrane clutches the bridge section of a 500-kV tower for the Mona-to-Oquirrh segment of PacifiCorp's Energy Gateway Transmission Expansion project.

STRUCTURE OF THE NORTHERN TIER TRANSMISSION GROUP





NTTG focuses its efforts on the evaluation of transmission projects that move power across the subregional bulk electric transmission system, serving load in its footprint and delivering electricity to external markets. The transmission providers belonging to Northern Tier serve over 4 million retail customers with more than 29,000 miles of high-voltage transmission lines. These members provide service across much of Utah, Wyoming, Montana, Idaho and Oregon, and parts of Washington and California.

NTTG works with other entities within its footprint, the WECC Planning Coordination Committee for reliability planning, the WECC TEPPC for economic planning, and neighboring subregional planning entities.

Northern Tier Members

The Northern Tier Transmission Group's organizational structure has multiple levels, as shown above. Overall planning direction is provided by the Steering Committee, whose membership at publication was as follows:

- Deseret Power Electric Cooperative
- Idaho Power Company
- Idaho Public Utilities Commission
- Montana Consumer Counsel
- Montana Public Service Commission
- NorthWestern Energy
- Oregon Public Utility Commission
- PacifiCorp
- Portland General Electric
- Utah Associated Municipal Power Systems
- Utah Office of Consumer Services
- Utah Public Service Commission
- Wyoming Office of Consumer Advocate
- Wyoming Public Service Commission

Below: Workers install the mid-section of a 500-kV tower for PacifiCorp's Energy Gateway Transmission Expansion project in Utah.

On the back cover: NorthWestern Energy's 500-Kv transmission line skirts the northern edge of the Crazy Mountains in Montana.

NORTHERN TIER
TRANSMISSION GROUP