NORTHERN TIER TRANSMISSION GROUP

2008-2009 Biennial Transmission Plan

Final Report

High-Voltage Transmission Construction in Montana

November 25, 2009

NORTHERN TIER TRANSMISSION GROUP

Approved: December 8, 2009

Preface

This report was prepared by Comprehensive Power Solutions, LLC, ("CPS") as part of its facilitation and coordination work for the Northern Tier Transmission Group. The members and other stakeholders participating in the effort to provide coordinated, efficient and effective planning for expansion of transmission within the Northern Tier footprint played critical roles in developing the content of this report.

Particularly important to the studies underlying this report is the work done by the members of the Northern Tier Planning Committee's Technical Work Group and Economic Studies Project Team, whose participants are engineers from the member Transmission Providers.

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

Figure 1: Map Illustrating Northern Tier Members' Principal Transmission Lines

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

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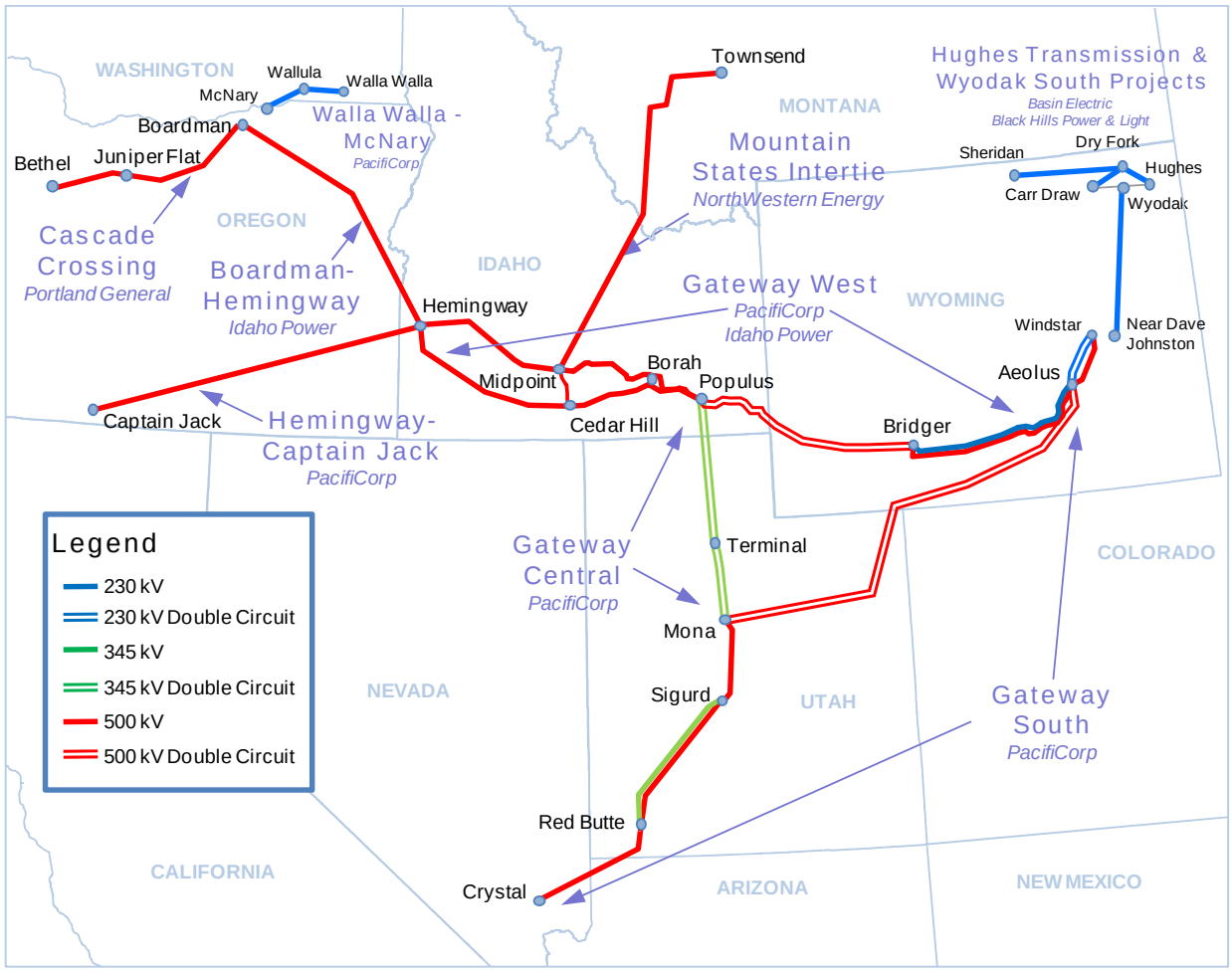
The Northern Tier Transmission Group's (NTTG's or Northern Tier's) 2008-2009 biennial plan was produced through its public processes in conjunction with related activities of the NTTG Cost Allocation Committee and NTTG Transmission Use Committee. Technical studies have demonstrated the resulting plan to be capable of reliably meeting the identified needs established in the study plan.

Figure 2: Northern Tier Transmission Group Planned Transmission Additions



Planning is an iterative process and must work in concert with local transmission plans and Integrated Resource Plans, where they exist. This Northern Tier transmission plan is a result of a 'bottom-up' load service process to ensure that the transmission planned for the Northern Tier footprint can reliably serve forecasted load growth and conditions established by data submittals and stakeholder input during the process. There may be broader regional needs outside of the Northern Tier footprint unmet by this plan, which are expected to be addressed as part of regional, interconnection-wide efforts reconciling 'bottom-up' and 'top-down' study efforts.

This plan establishes the baseline main grid transmission configuration for the Northern Tier footprint for the planning horizon ending in 2018. This planned transmission should be used as a 'base plan' to inform other planning processes. While we cannot assure the plan will be implemented as designed, it represents the best information available during the current planning cycle. Changing needs or new information will be accommodated through appropriate data submittals during the next planning cycle.

This plan identifies a number of specific projects. However, the technical analysis was performed on the premise that the entire transmission plan is in service in 2018. Path and project ratings are determined separately through Western Electricity Coordinating Council (WECC) processes and are the responsibility of each project's sponsor(s). Commercial subscription and capacity commitments are administered by each Transmission Provider under their Open Access Transmission Tariff (OATT).

Summary

The Northern Tier Transmission Group was created in the autumn of 2006 as a forum where all interested parties, including transmission providers, customers and state regulators might participate in planning, coordinating and implementing a robust transmission system.

The Northern Tier Transmission Group Planning Committee was formed to coordinate transmission planning for the Northern Tier footprint[1] and to coordinate with other sub-regional planning groups and the Western Electricity Coordinating Council's planning committees. Northern Tier's planning process is designed to be open, transparent and participatory, with transmission providers, regulators, customers and other stakeholders encouraged to join the committees' activities and meetings and attending semi-annual stakeholder meetings.

Execution of the Planning Committee's charter is through the biennial planning process that is broken into eight quarters and is paralleled by a four-quarter economic studies process that repeats annually to cover the two years of the biennial planning cycle. The biennial plan spans ten years and its purpose is to coordinate the bulk electric system transmission plans of member transmission providers, to provide for the integration of new generation, and to reduce transmission congestion. This final plan reports the efforts and results of the first biennial cycle.

The cycle began in January 2008 with a three-month window of opportunity for stakeholders to submit data for loads, resources and transmission projects to be studied, and to submit requests for economic congestion studies. Through this window, Northern Tier received a significant dataset for proposed 230, 345 and 500 kV transmission projects. The purposes and needs for the proposed projects range from providing access to generation to serving future network load growth, relieving congestion between member utilities and allowing other Western utilities to access resource-rich areas within the Northern Tier footprint.

[1] The Northern Tier footprint encompasses service territories of NTTG Funding Agreement signatories.

Through the economic study window, Northern Tier members received two requests for economic studies (one determined to be local and one regional) and one request for study of a hypothetical transmission project that was determined to be best studied within the power flow-based biennial analysis.

Based on this information, the second quarter was dedicated to developing a study plan and the appropriate study assumptions. The Planning Committee decided to focus power flow studies on two seasons – a heavy summer case where demands would be at their greatest, and a light autumn case, where the resource-rich areas in the Northern Tier footprint would produce the largest surplus of generation over low seasonal loads for export to other areas in the West. The absence of sub-regional economic study requests in the first quarter allowed work to focus on developing data and processes for the power flow studies.

The third and fourth quarters were allotted to development of these coordinated heavy summer and light autumn base cases. A Technical Work Group, consisting of planning engineers from the member transmission providers, began with formal base cases developed by the Western Electricity Coordinating Council (WECC) which were then modified to include the agreed loads and resources and correctly-defined transmission projects.

The completed base cases were then subjected to contingency analyses (N-1 and credible N-2 contingencies, as provided by participating transmission engineers for their respective companies) and any resulting departures from NERC Standard and WECC Standard requirements were examined. All thermal overloads and voltage excursions were verified and the resulting power flow studies were deemed acceptable.

Work in 2009 (the second half of the biennial cycle) began with preparation and review of the draft transmission report, and with conduct of the second economic study request.

Again, there were no economic study requests that would require production cost modeling or congestion analysis. However, the Planning Committee elected to perform an economic analysis using the WECC Transmission Expansion Planning Policy Committee's published case, with the addition of the Northern Tier portfolio of planned transmission projects. This was primarily intended to establish and test the modeling process, but provided useful information on path utilization and congestion.

The Planning Committee also decided to perform additional power flow studies. After examining the ability of the Northern Tier transmission system to serve loads in the Northern Tier footprint, a series of power flow scenario studies was undertaken to examine the impacts of exporting additional generation out of the Northern Tier footprint to the Pacific Northwest and the Desert Southwest. The scenarios were not intended to probe the limits of the transmission projects to carry power, as that function is being undertaken in considerable detail by the project sponsors via their WECC Project Rating Review processes. The Technical Work Group found that the additional generation and exports did not result in unresolved voltage or flow violations.

The biennial planning process concludes with the preparation, review and acceptance of this report. In January, 2010, the second biennial planning cycle will begin, with data, models and processes enhanced by the experiences and results of the first cycle.

Introduction

This is the final report of the 2008-2009 Biennial Transmission Plan of the Northern Tier Transmission Group. The eight-quarter planning process is designed to develop a coordinated transmission plan for a sub-region of the Western Interconnection defined by participating transmission providers with common issues and interests. The process solicits and incorporates anticipated loads, resources and transmission projects that impact the Northern Tier footprint on a sub-regional level.

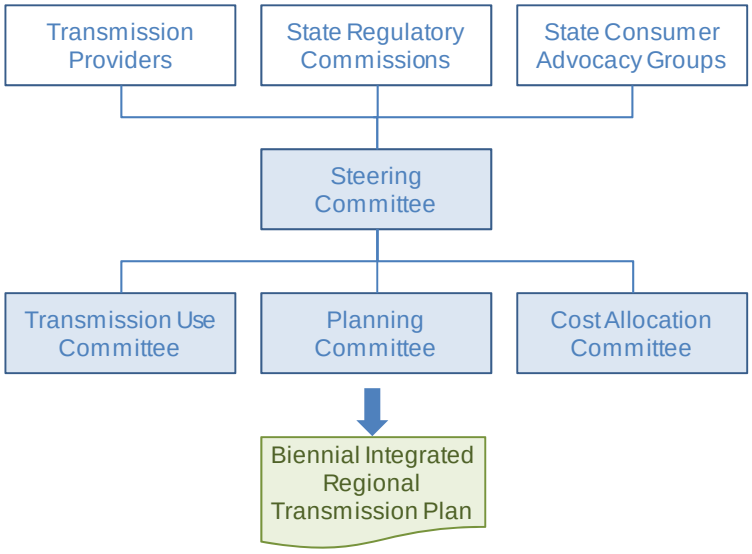
The report begins with a review of the background and evolution of the Northern Tier Transmission Group, its current organization, and the planning process it is undertaking. The relationship between the Northern Tier Transmission Group and other sub-regional and regional activities is outlined and their synchronized planning cycles described.

The report then looks at the study methodology, assumptions, data, and analyses underlying the planning effort in the 2008-2009 cycle. The studies performed during the biennium are reviewed and their results summarized.

Background

The Northern Tier Transmission Group (Northern Tier or NTTG) began its work in 2007 as the next step in a series of regional and sub-regional organizations working to evolve a coordinated inter-utility and stakeholder-involved transmission planning process.

Figure 3: Structure of the Northern Tier Transmission Group



One founding principle of Northern Tier is to fulfill FERC Order 890 requirements that local Transmission Providers participate in regional and sub-regional planning. Additional detail on the history underlying the current organization is available in the 2007 Annual Planning Report published April 2, 2008 and accessible on the Northern Tier web site, at http://www.nttg.biz.

The Northern Tier Transmission Group

NTTG focuses its efforts on the evaluation of transmission projects that move power across the sub-regional bulk electric transmission system, servicing load in its footprint and delivering electricity to external markets. The transmission providers belonging to Northern Tier serve

over 3 million retail customers with nearly 3,000 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 the WECC Planning Coordination Committee for reliability planning, the WECC TEPPC for economic planning, and is working to implement a framework for cooperation with neighboring sub-regional planning entities.

Northern Tier Members

The Northern Tier Transmission Group's organizational structure has multiple levels, as shown in Figure 3 above. With regard to planning, overall direction is provided by the Steering Committee, whose membership at the end of 2009 was as follows:

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

The Planning Committee executes the planning process defined by the Planning Committee Charter and at the end of 2008 had members from the following organizations:

- Basin Electric
- Black Hills Power
- Deseret Power Electric Cooperative
- Horizon Wind
- Idaho Power
- NorthWestern Energy
- PacifiCorp
- Portland General Electric
- TransCanada
- Utah Associated Municipal Power Systems
- Idaho Office of Energy Resources
- Montana Public Service Commission
- Wyoming Public Service Commission

Coordination within the Northern Tier Footprint

Each of the Transmission Providers belonging to Northern Tier is also responsible for transmission planning for its own service area and for any Balancing Authority Areas it administers. This local transmission planning process is, for each Transmission Provider in Northern Tier, designed to parallel and interact with the planning done at Northern Tier.

The local planning process is conducted in greater depth than the sub-regional process, both in terms of its analysis of finer detail (lower voltages and system dynamics), and more extensive construction detail, as the Transmission Provider is responsible for path ratings, project financing, permitting and approvals, and execution of the build.

Northern Tier provides a mechanism for coordinating appropriate load and resource data and for coordinating the analysis of the existing sub-regional transmission system augmented by a number of proposed transmission projects that impact the planning decisions, system adequacy and operation of multiple Transmission Providers. These are commonly high voltage projects. Throughout 2008 and 2009, efforts were made to ensure proper coordination among the Northern Tier Transmission Providers' transmission plans.

Coordination with Others in the Western Interconnection

NTTG is committed to coordinating sub-regional planning efforts with adjacent sub-regional groups and other planning entities. In addition to working directly with the ColumbiaGrid and WestConnect sub-regional planning groups, Northern Tier relies on the data collection, validation and transmission modeling work done by the Western Electricity Coordinating Council (WECC, the Regional Reliability Organization) and the Northern Tier biennial transmission plan reported here is consistent with the work of the WECC.

The WECC provides valuable service to transmission planners across the Western Interconnection through its role in regional reliability planning and facility rating, and by providing economic planning data and analysis to its members through its Transmission Expansion Planning Policy Committee.

Relationships among Planning Entities in the West

Transmission planning in the Western Interconnection has evolved to incorporate three distinct organizational levels of activity: Transmission providers, sub-regional transmission groups, and regional planning entities. The relationships among regional, sub-regional and individual transmission entities are illustrated in Individual Transmission Providers were once (for the most part) fully-integrated generation, transmission and distribution utilities that, with deregulation, have now changed focus to provide equal access to all markets and customers.

Figure 4

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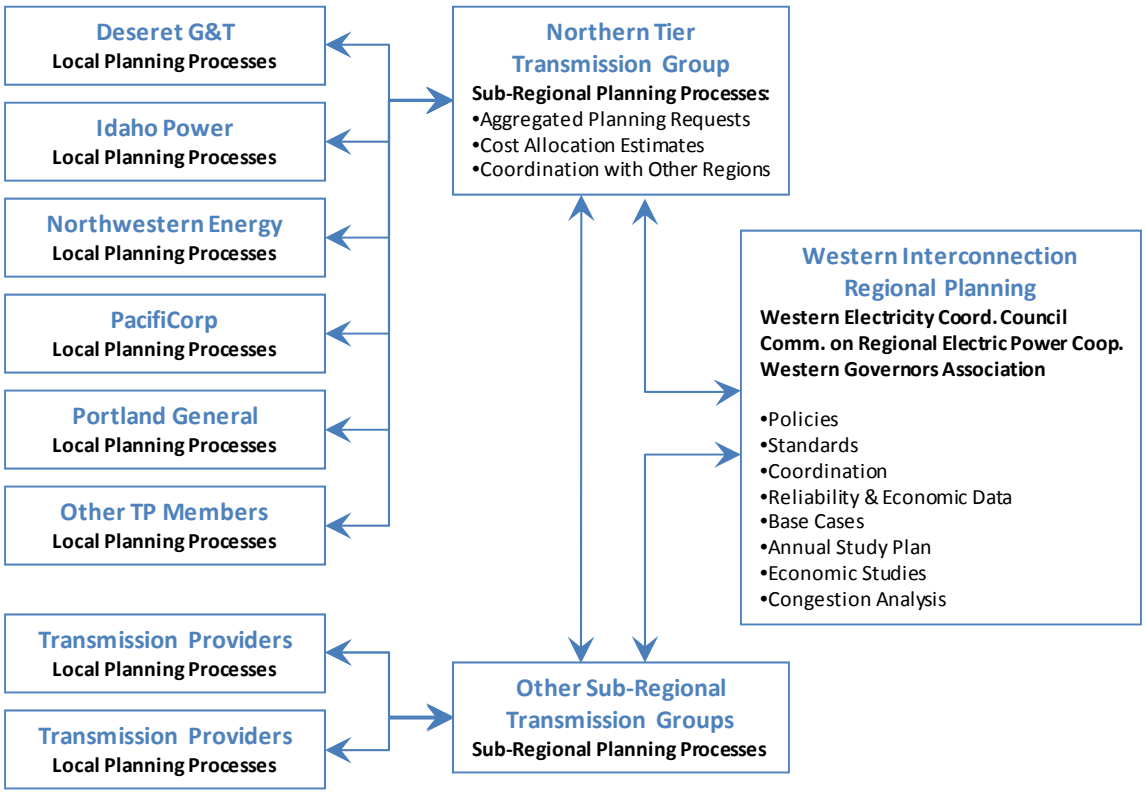
Figure 4: Three-level Planning Process in the Western Interconnection



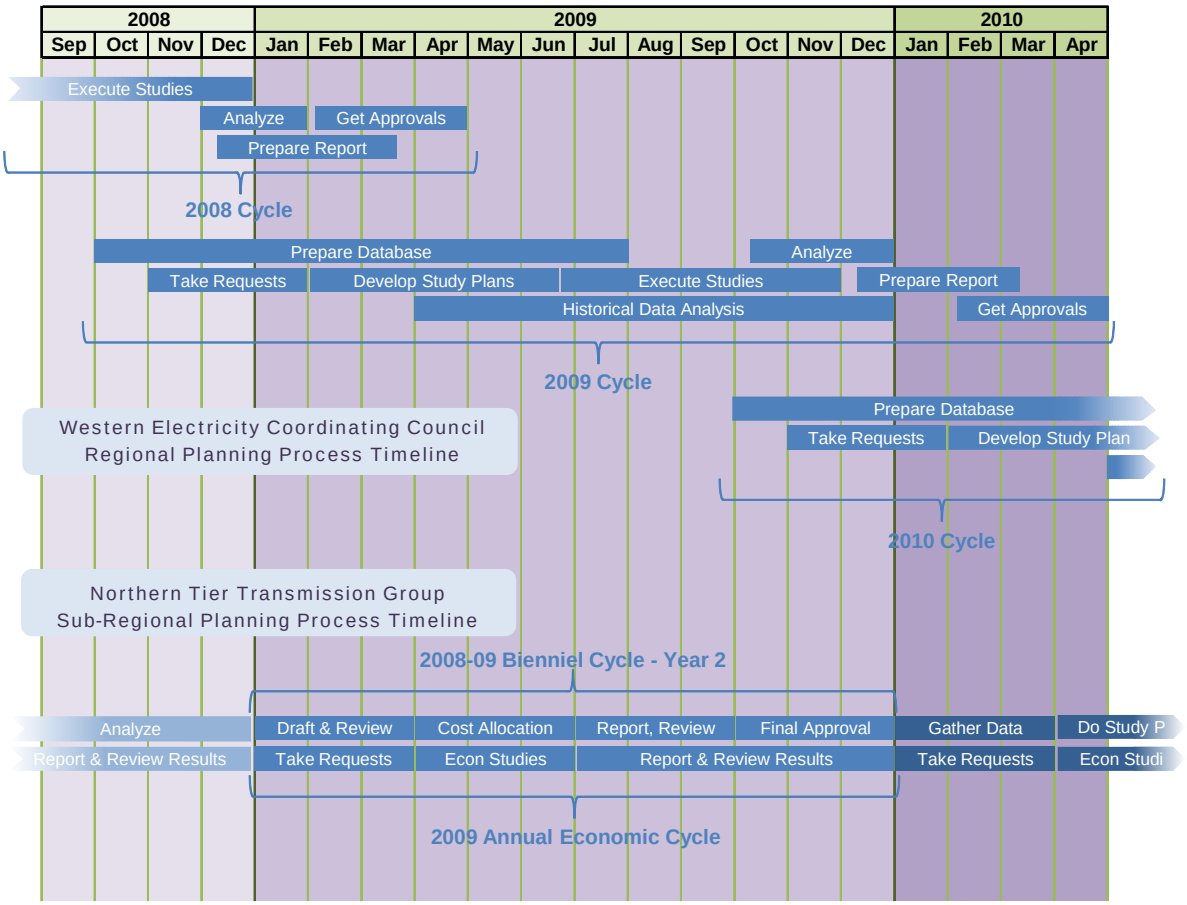
The Transmission Providers each develop and maintain an Open Access Transmission Tariff process that receives and acts on requests for transmission service in accordance with a well-defined procedure. The Transmission Providers also assess future load and resource developments to plan the evolution of an efficient transmission system, and undertake reliability analysis and improvements.

Where service requests and other identified needs call for the development of transmission that involves participation of multiple Transmission Providers within a sub-regional transmission group's footprint, the planning and analysis of improvements are coordinated at the sub-regional level. 2008 was a startup year for sub-regional planning groups and as Northern Tier and others undertook their first sub-regional planning cycles, relationships and coordination were forged among Transmission Providers in the sub-regional groups.

At the regional level, establishment of the WECC's Transmission Expansion Planning Policy Committee provided a foundation for coordination on regional issues and completes a framework that addresses regional, sub-regional and local issues.

The Northern Tier Transmission Group's planning timelines are designed to coordinate with those of the Western Electricity Coordinating Council, with a two-year cycle for transmission expansion and reliability and a one-year economic study cycle that examines preliminary plans during the first year of the biennial cycle, and draft plans during the second year of the cycle.

Figure 5: Timelines for Regional & Sub-Regional Planning



NTTG – Review of 2008-2009 Planning Activities

Stakeholder participation is important to the processes of the Northern Tier Transmission Group and all interested parties are encouraged to attend and contribute to the many stakeholder meetings conducted by the Transmission Use, Planning and Cost Allocation committees, and in preparing, developing and analyzing planning studies. A chronology of activities in the 2008-2009 biennial planning cycle is provided below.

The Northern Tier Planning Committee conducted conference calls on a frequent basis during the biennium, where the planning process was developed and managed, and assumptions, data and methodology were discussed and agreed.

The Planning Committee decided to perform studies using the staff of member Transmission Providers, taking advantage of their internal expertise and software tools. A Technical Work Group was formed, to separate detailed technical and model discussions from the policy-level Planning Committee, and to provide proper control of confidential information.

At the end of 2008, an Economic Studies Project Team was similarly formed to plan and perform any needed economic studies resulting from its request for studies during the first quarter of 2009.

Table 1: Chronology of Northern Tier Activities in 2008 and 2009

2008	Jan	16-17	Public Semi-Annual Stakeholder Meeting
	Mar	6	Planning Data Posted
	Apr	8	Public Stakeholder Meeting
	May	20	Draft Study Plan Posted
	May	30	Public Stakeholder Webinar
	Jun	16	Public Stakeholder Webinar
	Jul	24-25	Public Semi-Annual Stakeholder Meeting
	Sep	18	Final Study Plan Posted
	Oct	17	Work Plan Supplement Posted
	Nov	12	Public Stakeholder Webinar
2009	Jan	28	Public Semi-Annual Stakeholder Meeting
	Feb	06	Transmission Plan Draft Report Posted
	Feb	25	Public Stakeholder Webinar
	May	27	NTTG Planning Overview Meeting with FERC OER
	Jun	3	Public Stakeholder Webinar
	Jul	22	Public Semi-Annual Stakeholder Meeting

Details of the Eight-Quarter Northern Tier Planning Process

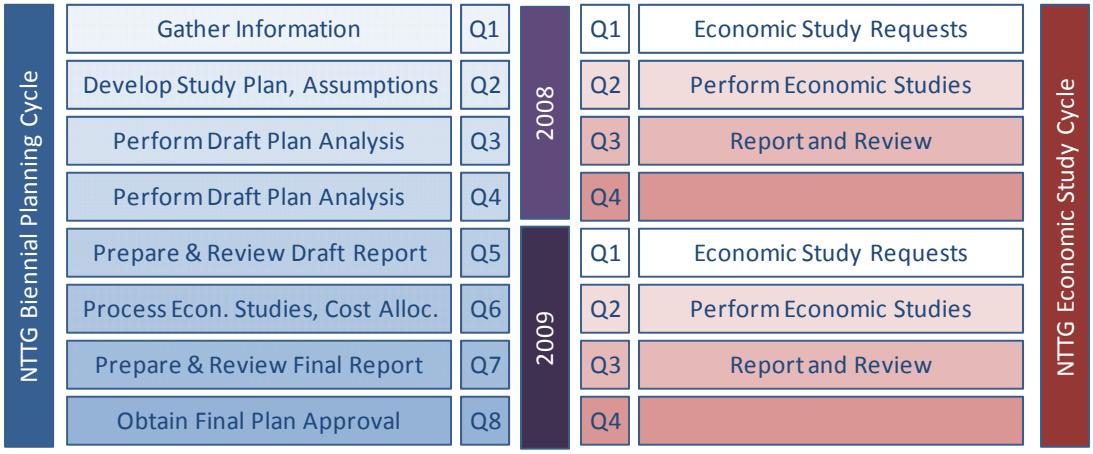
The overall biennial transmission planning process at Northern Tier is broken down into eight quarters and two tracks. A four-quarter economic study cycle is repeated twice during the biennial cycle; the first iteration evolves from the previous biennial cycle's final plan and provides guidance to the next biennial plan's development; while the second economic study

cycle analyzes the draft plan and informs decisions made in creating the final plan of the current cycle.

Figure 6 diagrams this process for the current 2008-2009 cycle. The overall planning process runs across all eight quarters and is described in further detail in the Northern Tier Transmission Group's Planning Committee Charter.

A four-quarter economic study cycle is repeated twice during the biennial cycle; the first iteration evolves from the previous biennial cycle's final plan and provides guidance to the next biennial plan's development; while the second economic study cycle analyzes the draft plan and informs decisions made in creating the final plan of the current cycle.

Figure 6: NTTG Eight-Quarter Biennial Process



Adequacy Study – Methodology

Time Frame and Time Scale

The Northern Tier Planning Committee Charter and the Attachments K to most of the member Transmission Providers' Open Access Transmission Tariffs place the planning horizon at least ten years out. Consequently, this study examines the year 2018.

Demand forecasts prepared for integrated resource plans and other electricity planning processes most often use integrated one-hour demands, that is, the average demand for electricity over a one-hour period. Loads and resources used in this study are consistent with this practice.

Base Cases Selected

Northern Tier relied, for its study development, on power flow base cases developed by the WECC and its members. Standard practice across the Western Interconnection, use of the WECC base cases provides the benefit of a massive data collection and vetting process that would otherwise be impossible to match by the sub-regional groups individually.

The Northern Tier Planning Committee chose two base cases appropriate to the Northern Tier footprint from those made available by the WECC. WECC Base Cases are developed for the four seasons, and designed to stress the transmission system at times of heaviest demand in the winter and summer, and at times of lowest demand in spring and autumn when power is moved from remote low-cost resource areas to high-cost population centers.

Annual maximum one-hour demands for the WECC occur during the summer months of June to August, principally due to high levels of air conditioning and other cooling, and so the Planning Committee decided to use a heavy summer case. The WECC had recently prepared such a case for the 2018 operating year, and so the 2018 Heavy Summer Base Case, 18HS1A1, was used as the basis for the Northern Tier analysis.

With forecasts calling for the likely construction of substantial resources in the Northern Tier footprint – well in excess of local demands – significant transmission will be required to move power to distant demand centers. This need is exacerbated by the lack of correlation between wind generation and local demand patterns, and the presence of large amounts of base-load, or flat-loaded, thermal generation. Consequently, the greatest need for inter-regional transmission may occur at times when local load is at its minimum, and so a light autumn case was also selected.

Most WECC base cases are developed for times of overall stress for the Western Interconnection (heavy summer and heavy winter), limiting the selection of cases on which to base the Northern Tier light autumn analysis. The 2010 Light Autumn Base Case, 10LA1SA1, is the most recent WECC case for the season and formed the basis for the NTTG light autumn case.

Modifications & Procedure

Development of the Northern Tier cases by the Technical Work Group was divided into four tasks, led by Transmission Provider engineers. The tasks were focused on loads, resources, and the two base cases. Participating engineers determined the load and resource modifications to be made for their own Balancing Areas, based on data submitted in the Q1 collection and updated to reflect improved information. The engineers then submitted them to the load and the resource task teams.

Each Transmission Provider's participating engineer also provided a definition of the transmission projects they were responsible for, in the form of what were termed 'mod-decks' that consisted of text files defined in either the '.raw' format used by the PTI PSS/E model, or the '.epc' format used by the GE PSLF model. These mod-decks were converted as necessary and incorporated into the developing base cases.

After the addition of each set of transmission modifications, the model was solved (without the load and resource modifications) and passed on to the next engineer. After the projects were

included and checked, the loads and resources were enabled and the resulting 2018 case solved. The case was then subjected to contingency analysis.

This process was completed for the heavy summer case, but encountered difficulties when the light autumn case was undertaken. It was evident that conversion of the case between PTI and GE models was introducing instabilities that were difficult to remedy. Consequently, development of the light autumn case was completed and the case analyzed entirely on the PTI platform.

Contingencies Considered

The power flow analyses performed in developing this plan were done in a manner consistent with those done in the Transmission Providers' local planning studies. They began with all transmission elements available in a so-called N-0 run. Non-governor power flow analyses were run on the heavy summer and light autumn base cases, with thermal overloads and voltage excursions examined and addressed. By design, no post-transient voltage stability or transient stability studies were run.

Single-contingency (N-1) studies were then performed, wherein individual transmission line segments or transformers were taken out of service to determine whether the resulting network could properly serve loads with available resources. Again, non-governor power flow runs were examined for thermal overloads and excessive voltage excursions. A limited number of credible common-mode (N-2) outages were also examined.

Details regarding the contingencies studied are not reported here in order to comply with Confidential Energy Infrastructure Information (CEII) requirements. Such details are available, following proper security clearance, from member Transmission Providers and project sponsors.

Economic and Congestion Studies – Methodology

Objective

In accordance with its charter, the Northern Tier Planning Committee will perform a limited number of economic and congestion studies of the sub-regional grid under requested configurations of loads, resources and transmission. In assessing the economic value of potential generation additions and load changes, as well as new transmission projects, it is important to have an indication of how much economical energy generation is unable to reach loads due to congested transmission and the economic benefit of relieving that congestion. The Planning Committee's Economic Studies Project Team will use appropriate tools (whether spreadsheet models or complex hourly commitment and dispatch simulators) to provide such estimates for agreed studies.

Base Case Selected

The WECC Transmission Expansion Planning Policy Committee's Technical Advisory Subcommittee undertook a substantial study program in 2008 to develop and exercise an hourly security-constrained economic dispatch model for the entire Western Interconnection. The subcommittee and its several work groups developed and incorporated detailed modeling data for over 3,000 generating units, over 15,000 transmission buses and more than 20,000 transmission line segments in 43 load areas. The 2017 PC1A1' TEPPC case was selected for the Northern Tier study. That case included the level of renewable resources mandated for the 2017 time frame by Renewable Portfolio Standards in effect at the time the case was developed, amounting to about

Modeling Platform

Northern Tier relies on its transmission provider members to perform necessary studies, including engineers and computer systems. The Economic Studies Program Team chose to employ the models and staff of PacifiCorp and Idaho Power to perform economic studies. The companies use the GridView and PROMOD models, respectively, which are complex hourly electricity commitment and dispatch programs which incorporate detailed transmission calculations and are designed to minimize production costs.

Procedure

Engineers added the portfolio of studied transmission projects to the TEPPC case using modification files developed by project sponsors. On one platform, the modification files were successfully imported directly into the model, while the other required manual modeling of the projects.

Each simulation was then run through one iteration over the 8,760 hours of the 2017 study year. Flows over monitored interfaces were then exported and examined.

Assumptions and Data

As described above, the power flow studies performed by Northern Tier were derived from base cases developed by the WECC. Modifications were made only to the loads, resources and transmission network of the Northern Tier member Transmission Providers, except where specifically noted below.

Load Modeling

Loads in the selected WECC Base Cases were modified to reflect the data submitted in the Quarter 1 data collection process and the forecasts produced by Transmission Providers as part of their Integrated Resource Planning or, where no IRP was done, official load forecasts used in other published planning processes. The non-coincidental summer peak loads submitted by Transmission Providers were used as the basis for calculating corresponding light autumn off-peak loads.

The Technical Work Group used hourly loads reported to the Federal Energy Regulatory Commission on Form 714 for the five years 2003 to 2007. These were averaged for the Rocky Mountain Power Pool (which is approximately representative of the Northern Tier footprint) and the specific hours at which the minimum autumn and maximum summer loads occurred were identified. The ratio of loads on these hours for each of the Transmission Providers' sub-areas were calculated and that ratio applied to the forecasted 2018 summer peak load to derive a light autumn demand forecast. This calculation and the resulting loads used in the Northern Tier studies are summarized in The forecasted loads for each sub-area were distributed to the modeled buses within the sub-area using the autumn and summer factors applied to the bus-level loads in the heavy summer case.

Table 3. The forecasted loads for each sub-area were distributed to the modeled buses within the sub-area using the autumn and summer factors applied to the bus-level loads in the heavy summer case.

Table 2: Determination of representative heavy summer and light autumn hours

Region	Regional Autumn Minimum	Day	Hour	Regional Summer Peak	Day	Hour	Ratio: Autumn / Summer
WECC Total	83,161	22-Oct	4	174,243	26-Jul	16	48%
AZNMNV	10,322	29-Oct	5	36,662	16-Aug	17	28%
CAISO	25,172	2-Apr	5	67,575	26-Jul	16	37%
NWPP	13,153	4-Sep	4	24,647	15-Aug	16	53%
RMPP	14,190	24-Sep	4	30,110	18-Jul	16	47%
CANADA-AL	7,627	22-May	5	9,035	28-Jun	15	58%
CANADA-BC	5,210	2-Jul	6	12,120	14-Jul	13	63%

The forecasted loads for each sub-area were distributed to the modeled buses within the sub-area using the autumn and summer factors applied to the bus-level loads in the heavy summer case.

Table 3: Computation and application of Autumn/Summer ratios by sub-area

State(s)	TEPPC Area	24 Sep 04:00	18 Jul 16:00	Autumn/ Summer	Summer Forecast	Autumn Estimate
ID	FAR EAST	215	471	46%	1,144	526
ID	GOSH	199	518	38%	2,274	874

ID	MAGIC VLY	471	941	50%	521	261
ID	TREAS VLY	909	2,155	42%	2,288	961
MT	NWMT	915	1,727	53%	1,906	1,010
OR	PGN	1,791	3,596	50%	4,331	2,166
OR, WA	PACW	1,668	3,115	54%	3,651	1,972
WY	SW WYO	762	873	87%	1,056	921
WY	BIG HORN	245	235	104%	858	895
WY	CENTL WYO	242	311	78%	723	563
UT N	UT N	2,499	5,663	44%	7,679	3,389
UT S	UT S	297	584	51%	3,132	1,593

Resource Modeling

Resources established in the selected WECC Base Cases were modified to reflect the data submitted in the Quarter 1 data collection process. Data were examined to eliminate duplication or differences in size, location, or characteristics. Resources were coordinated and agreed among the study analysts and, upon proper protection via aggregation or labeling, were reviewed and agreed to by stakeholders.

Each Transmission Provider was responsible for matching loads, resources and interchanges for its Balancing Authority Area. For the conceptual power line from Montana to the Mid-Columbia area (see the Transmission Modeling section below), generation from selected turbines at large hydroelectric projects on the Upper, Middle and Lower Columbia River was reduced by 1,000 megawatts to allow study of the impact resulting from a transfer of that magnitude from Central Montana to the Northwest.

Transmission Modeling

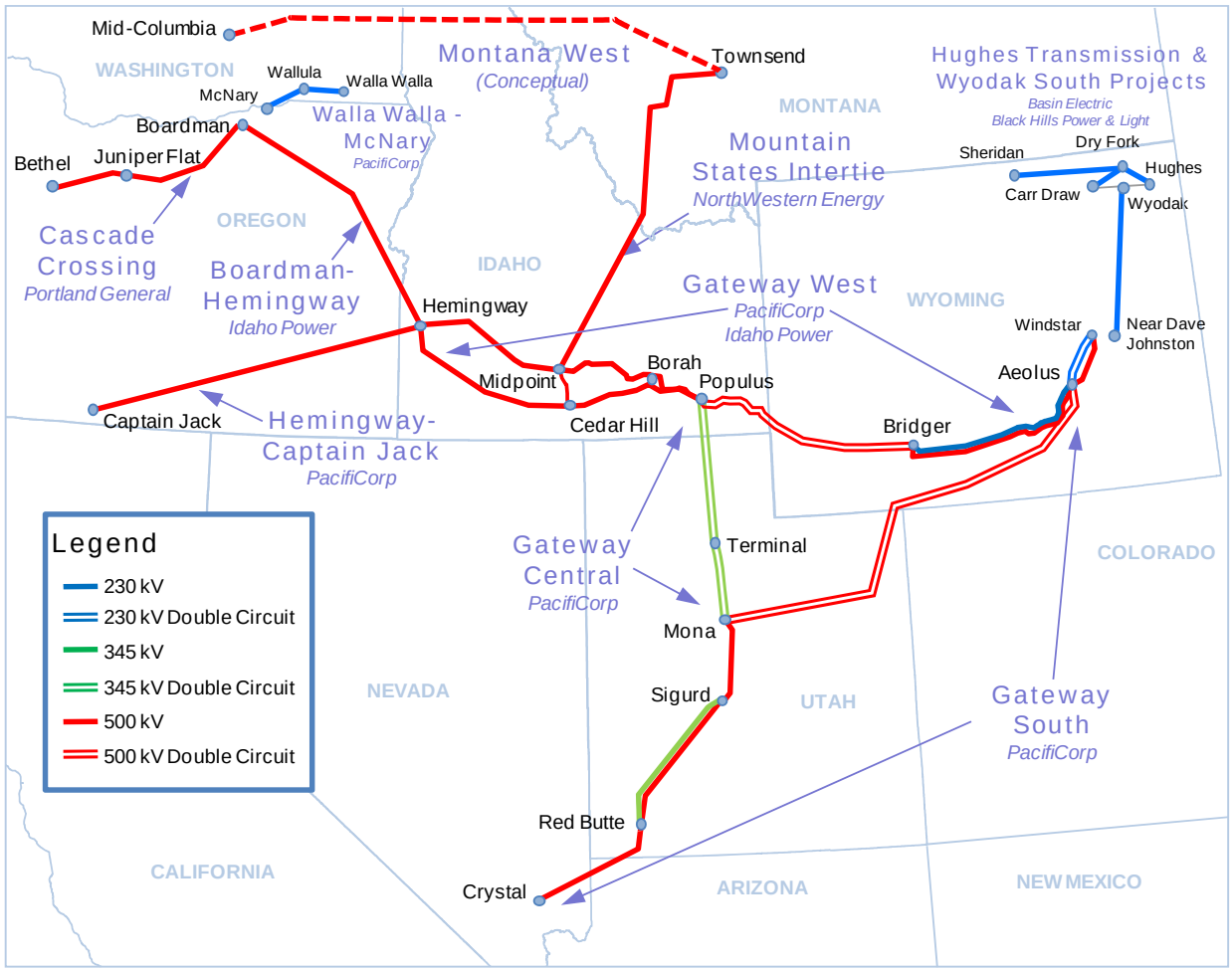
For proposed projects to be considered in the Northern Tier planning process and 10-year planning case reliability performance modeling, sponsors must provide planning data for their projects on a basis comparable to transmission providers that are obligated to serve in or across the Northern Tier footprint. This planning data needs, at a minimum, to include source and ultimate sink identification and transfer requirements such that the appropriate generation and load patterns may be modeled in the studies.

Participants in the Technical Work Group exchange planning data in the first and second quarters of the biennial cycle, whereupon generation and load scenarios are identified and transmission options determined and studied. The Technical Work Group received the required technical data for the projects modeled in the draft plan process. Transmission lines included in the studies were those for which such technical details were made available and for which loads

and resources that would make use of the project were identified, together with their points of delivery and receipt.

Further description of the projects studied is located in Appendix B of this report. The details provided there include links to the projects' web sites.

Figure 7: Projects analyzed for the Northern Tier transmission study



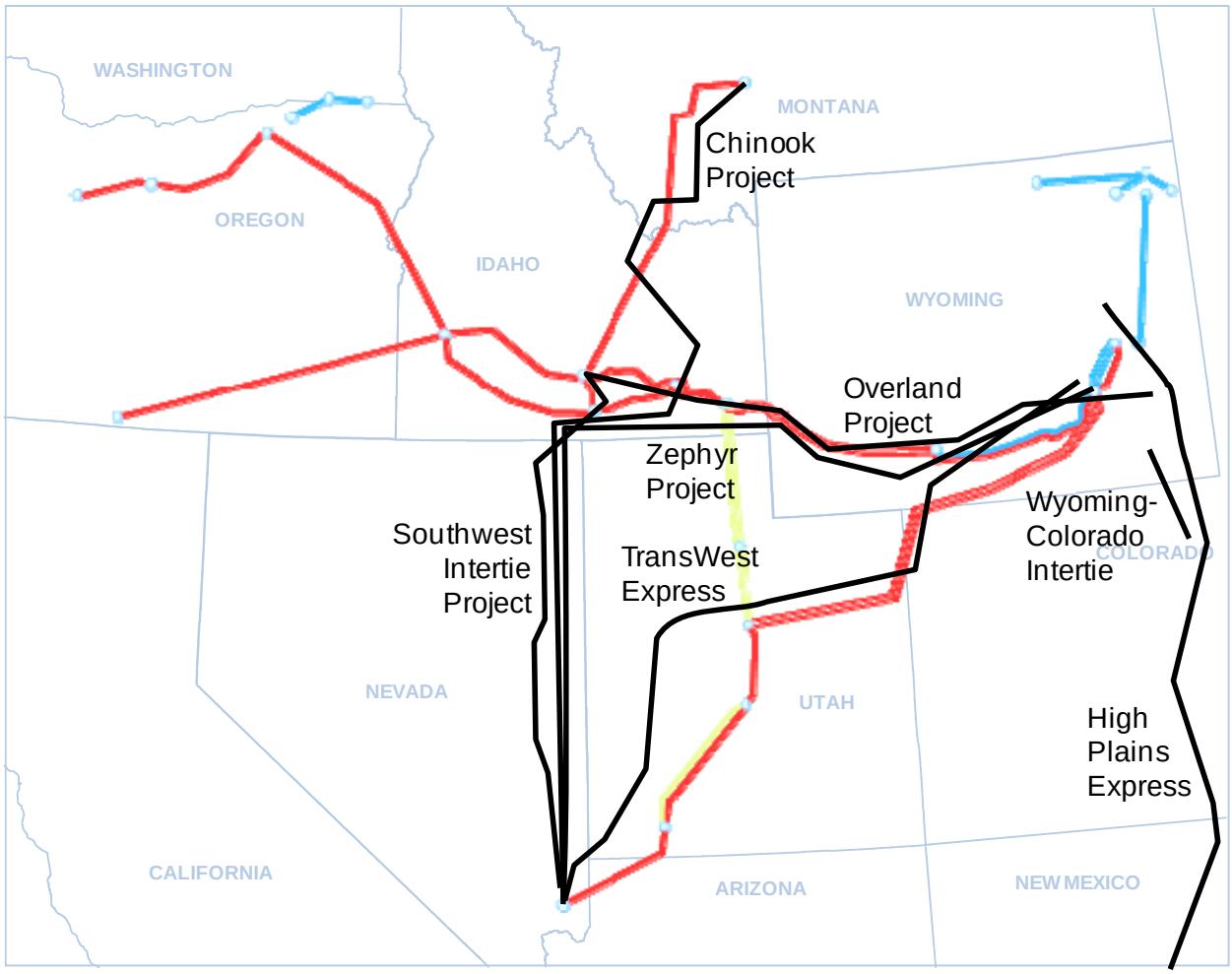
The 2007 Annual Planning Report also included four transmission projects, not sponsored by Northern Tier members, which are focused on serving load requirements outside of the Northern Tier footprint. These projects include the Southwest Intertie Project (North), the TransWest Express project, and the Chinook and Zephyr projects (identified in the 2007 Report as the 'Northern Lights Transmission Project – Inland Project'). These projects are in various stages of the WECC Regional Project Planning Review and Rating processes and have made progress on siting and permitting similar to progress by the projects analyzed by Northern Tier. However, required planning data as defined in the Planning Committee Charter was not made

available for these projects during the Northern Tier study process for the 2008-2009 biennial cycle.

In addition to the independent projects (those not sponsored by NTTG members) identified in the 2007 Annual Planning Report, there several other projects with terminals within the Northern Tier footprint that are also being pursued by independent developers including the High Plains Express project, the Overland Intertie project, and the Wyoming-Colorado Intertie project. The general routing plans for these projects are sketched in Figure 8. As these projects develop and planning data is made available, they can be included in upcoming biennial planning cycles.

Sponsors of these projects may also elect to ask (during the appropriate request window) a member Transmission Provider, Northern Tier, or TEPPC to perform an economic planning study including their proposal that would determine the effect of their project on congestion and economic performance. No such requests were received by NTTG from these projects for the current cycle, though some projects are included in this year's TEPPC study process.

Figure 8: Additional projects not included in the Northern Tier study cycle



Results and Observations

Power Flow Studies

The studies performed during the first year of modeling at Northern Tier were focused on the adequacy of proposed transmission in meeting projected loads and resources ten years in the future. Integrating a number of projects into a case developed by multiple parties was challenging but was successfully accomplished. During the second year, a set of scenarios was designed to determine the ability of the network to export additional generation to adjoining sub-regions.

Table 4: Matrix of export scenarios to be considered

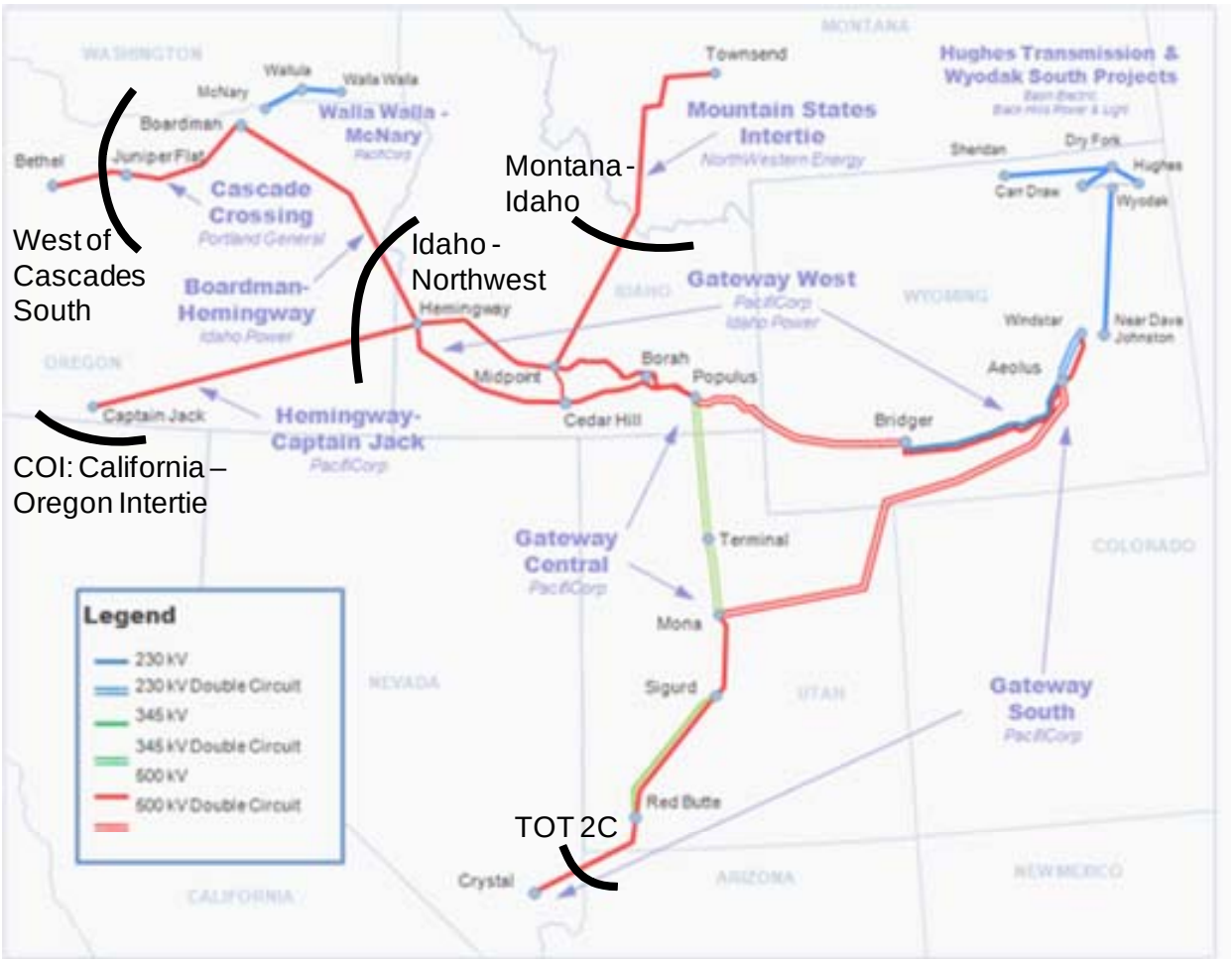
Potential Resource Capacity (MW) available in case for export to specified Sink					
Transfers to the Pacific Northwest - Puget Sound area					
Source	**BA**		**Heavy Summer Case**	**Light Autumn Case**	**Comment**
IDAHO POWER					
Borah 500	IPC		250 MW	250 MW	
Midpoint 500	IPC		450 MW	950 MW	
Heminway 500	IPC		750 MW	750 MW	
NORTHWESTERN ENERGY					
Townsend	NWE		1000 MW	1000 MW	In addition to WECC Path 9
PACIFICORP					
Jim Bridger 500	PACE		1,000 MW	1,000 MW	
PORTLAND GENERAL					
Lower Columbia	PGE			400 MW	
Central Oregon	PGE			300 MW	
Portland Area	PGE			900 MW	

Potential Resource Capacity (MW) available in case for export to specified Sink					
Transfers to the Arizona - Phoenix area					
PORTLAND GENERAL					
Lower Columbia	PGE			400 MW	
Central Oregon	PGE			300 MW	
Portland Area	PGE			900 MW	

The cases run were subjected to contingency analysis, which revealed voltage or flow excursions that were either rectified or identified as artifacts of the computer modeling. Nearly all such anomalies were associated with planned facilities for which final and detailed specifications are not yet available, voltages which can be adjusted by switching capacitors or

reactors, or which occur at non-load buses. Participating engineers reviewed the results of the studies with regard to their own transmission systems and reported their acceptance of the studies.

Figure 9: Significant paths for which flows are reported



The following table summarizes megawatt flows in the base study and representative scenarios across several significant interfaces within and at the boundaries of the Northern Tier footprint.

Figure 10: Megawatt flows on significant paths under alternative export scenarios

Scenario	MT-ID	ID-NW	TOT-2C	WOCS	COI
Base Case (No Additional Exports)	-172	1,013	714	3,852	-2,801
Hemingway 750 MW to Puget Sound	-189	1,578	810	3,934	-2,923
Townsend 1,000 MW to Puget Sound	871	1,781	814	3,935	-2,937
Bridger 1,000 MW to Puget Sound	-355	1,498	835	3,934	-2,984

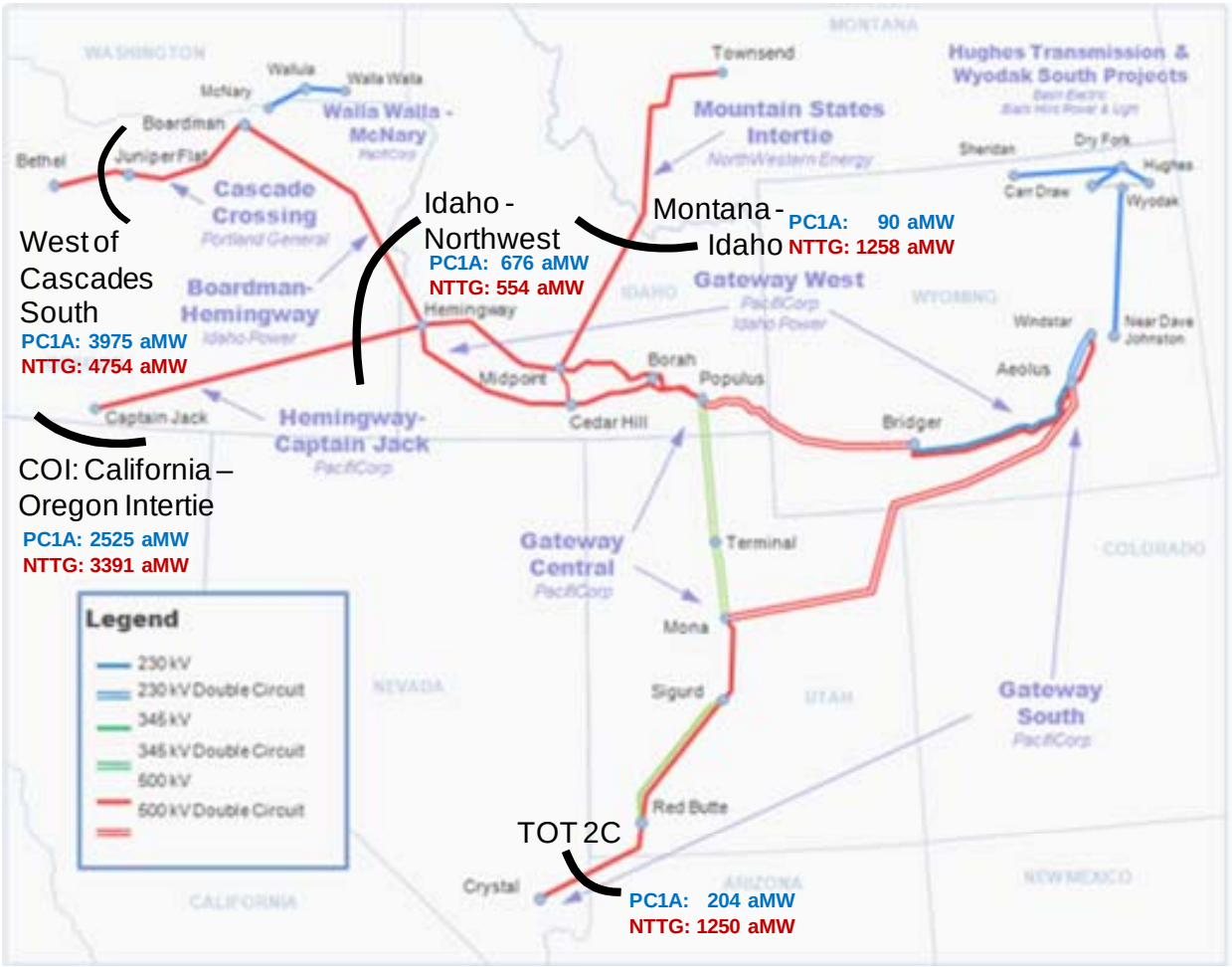
Portland 900 MW to Puget Sound	-187	1,001	738	3,715	-2,794
Portland 900 MW to Phoenix Area	-48	790	922	3,839	-2,312

Economic and Congestion Studies

No economic congestion studies were performed at Northern Tier in 2008, as no viable requests were received. In 2009, the Planning Committee elected to perform an hourly study of the transmission portfolio included in the reliability studies. The study provided an opportunity to test the modeling systems used by the committee, to examine the model-reported use of transmission paths, and to gain confidence in the ability of the models to address Northern Tier economic and congestion issues.

The Economic Studies Project Team extracted and studied the hourly flows across the same set of interfaces reported above for the power flow studies. The diagram below shows the average annual energy flows across the paths, with and without the portfolio projects.

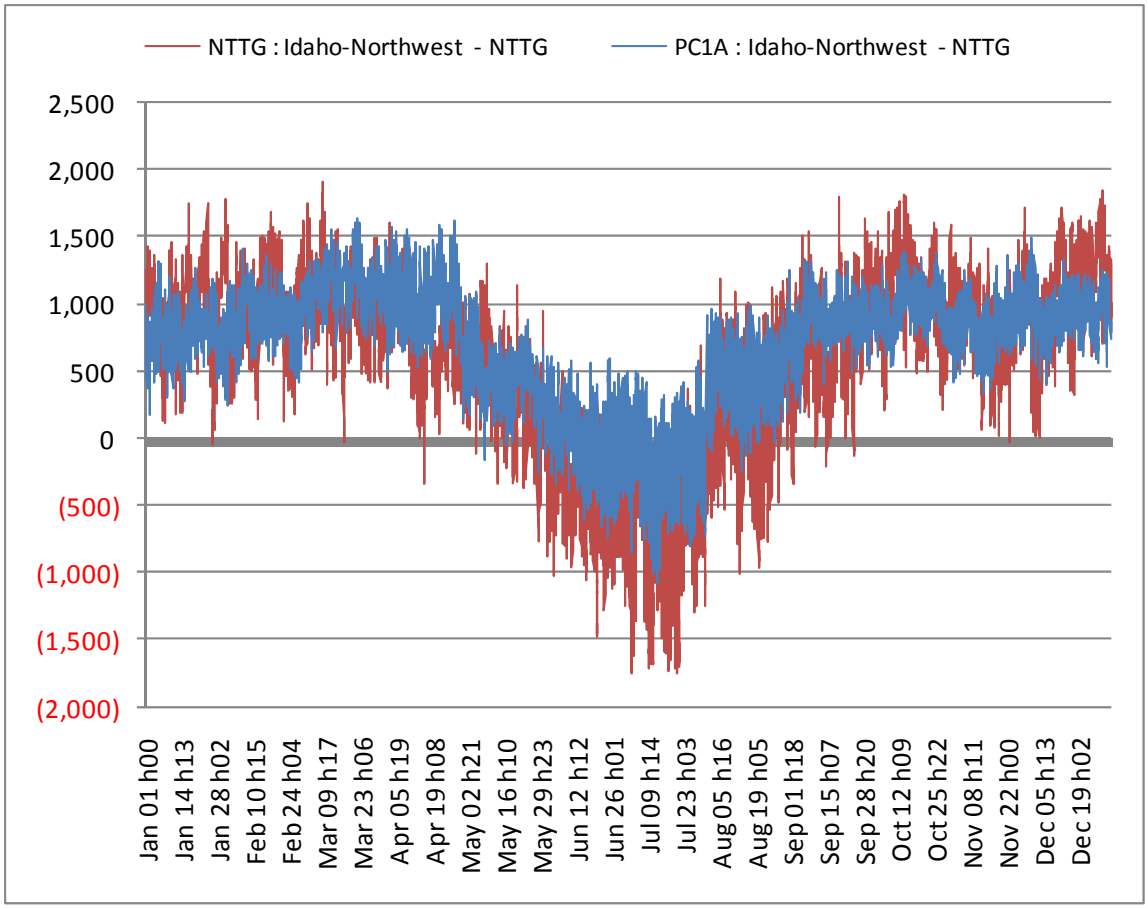
Figure 11: Energy flows on significant paths with and without portfolio transmission



The MSTI line was added to the WECC Montana-Idaho path, the Gateway South project to the TOT-2C path, Gateway West to the Bridger West path, the Boardman-Hemingway and Hemingway-Captain Jack lines to the Idaho-Northwest path, and the Cascade Crossing project to the West of Cascades South path in calculating flows.

The following chart shows the chronological flows across one of the interfaces, from Idaho to the Northwest (and from the Northwest to Idaho when negative), for the hours of the study year. The red line shows flows with the portfolio transmission, and indicates increased flows into Idaho during the summer months and increased diurnal exchanges across the entire year (to the Northwest during off-peak hours and to Idaho during on-peak hours).

Figure 12: Hourly flows across the Idaho-Northwest path with & without studied projects



Execution of the two security-constrained economic commitment and optimal dispatch models produced comparable results, though model evaluation and comparison was not an objective of the project. The Economic Studies Project Team reviewed and accepted the study, which was presented at the Northern Tier Stakeholders' Meeting in July, 2009.

NORTHERN TIER TRANSMISSION GROUP

2008-2009 Biennial Plan

Appendices

Gateway Central Project under Construction at the Populus Substation in Idaho

NORTHERN TIER
TRANSMISSION GROUP

Appendix A: Internet Links and Other References

Regional Planning

- Western Electricity Coordinating Council
  (http://www.wecc.biz)
  - Transmission Expansion Planning Policy Committee
    (http://www.wecc.biz/committees/BOD/TEPPC/default.aspx)
  - Planning Coordination Committee
    (http://www.wecc.biz/committees/StandingCommittees/PCC/default.aspx)
- Western Interstate Energy Board (WIEB)
  (http://www.westgov.org/wieb /)
  The energy arm of the Western Governors Association

Sub-Regional Planning

- Northern Tier Transmission Group
  (http://www.nttg.biz)
- ColumbiaGrid
  (http://www.columbiagrid.org)
- WestConnect (and Sub-Groups)
  (http://www.westconnect.com/planning.php)
  - Colorado Coordinated Planning Group
  - National Renewable Energy Laboratory
  - Sierra Pacific Planning Group
  - Southwest Area Transmission
- Transmission Coordination Working Group (TCWG)
  (http://www.nwpp.org/tcwg/)

Northern Tier Transmission Group Members

- Deseret Generation & Transmission
  (http://www.oasis.pacificorp.com/oasis/dgt/main.html)
- Idaho Power Company
  (http http://www.oatioasis.com/ipco/index.html)
- Northwestern Energy
  (http://www.oatioasis.com/NWMT/index.html)

- PacifiCorp
  (http://www.oasis.pacificorp.com/oasis/ppw/main.htmlx)

- Portland General Electric
  (http://www.oatioasis.com/pge/index.html)

- Utah Associated Municipal Power Systems
  (http://www.uamps.com)

Integrated Resource Plans

- Idaho Power Company
  (http://www.idahopower.com/AboutUs/PlanningForFuture/irp/default.cfm)
  Idaho Power is undertaking development of its 2009 Integrated Resource Plan, which should be complete by the end of 2009.

- NorthWestern Energy
  (http://www.northwesternenergy.com/display.aspx?Page=Default_Supply_Electric&Item=16)
  NorthWestern does not produce an 'Integrated Resource Plan', *per se*, but they maintain and make available an "Electric Default Supply Resource Procurement Plan.'

- PacifiCorp
  (http://www.pacificorp.com/es/irp.html)
  PacifiCorp's currently posted plan was completed in May of 2007, and development of the 2008 IRP is currently underway.

Additional Information for Transmission Projects

- Boardman to Hemingway
  (http://www.boardmantohemingway.com/)

- Cascade Crossing
  (http://www.oatioasis.com/pge/index.html) Click on 'Cascade Crossing Project' in the left-side column.

- Hemingway to Captain Jack
  (http://www.pacificorp.com/tran/tp/eg/shhtcj.html)

- Gateway Central
  (http://www.pacificorp.com/tran/tp/eg/gc.html)

- Gateway South
  (http://www.pacificorp.com/tran/tp/eg/gs.html)

- Gateway West
  (http://www.pacificorp.com/tran/tp/eg/gw.html)

- High Plains Express
  (https://www.highplainsexpress.com/)

- Mountain States Transmission Intertie
  (http://www.msti500kv.com/)

- Overland Intertie
  (http://www.swipos.com/overland_intertie.htm)
- Southwest Intertie Project
  (http://www.swipos.com/index.htm)
- TransCanada Zephy and Chinook Transmission Lines
  (http://www.transcanada.com/company/zephyr_chinook.html)
- Transwest Express
  (https://transwestexpress.net/)
- Wyoming-Colorado Intertie
  (http://wcintertie.com/)

Appendix B: Project Details

This appendix provides detail for the projects included in the 2008 adequacy studies, in the format designed within the context of the WECC TEPPC data collection process.

NOTE: The information provided in this appendix is dynamic and may not reflect current project configurations or the assumptions used at the time Northern Tier analyses were performed. The information is collected and provided here for convenience; specific data should be confirmed on the project sponsor's Web site or via processes posted on their respective OASIS systems.

The segments collected here include (in generally east-to-west order):

(To jump to the first page for a given project, hold the CTRL key down and click on the name.)

[2] Project 8 is now the same as Project 4: Gateway South, Mona – Crystal.

[3] Portland General's Cascade Crossing project was previously referred to as Southern Crossing.

Project 1: Hughes Transmission Project

Project name: (TEPPC #49)	**Hughes Transmission Project**
Project overview:	
• Purpose (renewable delivery, etc.)	Meet load growth needs in Northeastern Wyoming, increased system reliability.
• New or upgrade	New
• Estimated in-service date	2009
• Estimated transfer capability/rating (MW)	
Project sponsor(s):	
• Organization name(s)	Basin Electric Power Cooperative
• Project website (hyperlink)	
• Project information contact for updates (name, phone and e-mail)	Matthew Stoltz (Basin Electric Power Cooperative) 701-557-5647 mstoltz@bepc.com
• Date of last information update	February 6, 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	230 kV
• Point of origin	Hughes and Carr Draw Substations, WY
• Point of termination	Sheridan Substation, WY
• Intermediate points of interconnection	Dry Fork Substation, WY
• General route	
• Length in miles	Approximately 140 miles (105 miles Hughes to Sheridan and 35 miles Dry Fork to Carr Draw)
• Conductor size and % compensation	
• Estimated cost (optional)	

• Other related projects	
Project map: (website hyperlink)	
Project status:	
(provide information as applicable indicating both current status and next steps) • Type project – conceptual, planned, or under-construction	Under Construction
• WECC Regional Planning and Project Rating Review Status	Not Applicable
• WECC reports submitted (Significant Additions and/or Annual Progress)	Yes
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	June 2008 to August 2009
Analytic studies: (provide information as available)	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	
• Siting studies	
• Environmental impact statement	

Project 2: Wyodak South Project

Project name: (TEPPC #50)	**Wyodak South 230 kV Project**
Project overview:	
• Purpose (renewable delivery, etc.)	Meet load growth, provide increased reliability, increase transfer capability into and out of system.
• New or upgrade	New
• Estimated in-service date	2010
• Estimated transfer capability/rating (MW)	550 MW
Project sponsor(s):	
• Organization name(s)	Black Hills Power
• Project website (hyperlink)	
• Project information contact for updates (name, phone and e-mail)	Eric Egge (Black Hills Corp) 605-721-2646 eric.egge@blackhillscorp.com
• Date of last information update	February 5, 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	230 kV
• Point of origin	Donkey Creek (near Gillette), WY
• Point of termination	Near Dave Johnston (near Glenrock), WY
• Intermediate points of interconnection	Pumpkin Buttes (near Wright), WY
• General route	South and east from Donkey Creek to Pumpkin Buttes and south to the DJ area.
• Length in miles	Approximately 110 miles (50 miles Donkey Creek to Pumpkin Buttes and 60 miles Pumpkin Buttes to DJ Area)
• Conductor size and % compensation	1272 ACSR

• Estimated cost (optional)	
• Other related projects	
Project map: (website hyperlink)	
Project status:	
• Type project – conceptual, planned, or under-construction	Planned/Under Construction
• WECC Regional Planning and Project Rating Review Status	
• WECC reports submitted (Significant Additions and/or Annual Progress)	
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	2008 to mid-2010
Analytic studies: (provide information as available)	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	
• Siting studies	
• Environmental impact statement	

Project 3: Mountain States Transmission Intertie

Project name: (TEPPC #22)	**Mountain States Transmission Intertie** (MISTI) (Townsend-Midpoint 500 kV)
Project overview:	
• Purpose (renewable delivery, etc.)	MSTI will relieve transmission constraints between Montana and Idaho and promote the development and delivery of the substantial renewable energy resources in NorthWestern's service area to customers in the West.
• New or upgrade	New
• Estimated in-service date	2014
• Estimated transfer capability/rating (MW)	1500 MW north to south 950 MW south to north
Project sponsor(s):	
• Organization name(s)	Northwestern Energy
• Project website (hyperlink)	http://www.msti500kv.com/about/aboutproject_nav.html
• Project information contact for updates (name, phone and e-mail)	John Leland (406) 497-3383 John.Leland@NorthWestern.com
• Date of last information update	14 Nov 2009
Other project participant(s):	None
Project characteristics:	
• Voltage class	500 kV
• Point of origin	Townsend, MT
• Point of termination	Midpoint, ID
• Intermediate points of interconnection	None
• General route	See maps.
• Length in miles	Approx 430 Miles
• Conductor size and % compensation	70% compensation
• Estimated cost (optional)	
• Other related projects	NorthWestern will construct a series of generator lead lines from high wind areas in Montana to Townsend. The size, location and routing of these lines will be determined through an open season solicitation to be

	conducted in the first quarter of 2010.
Project map: (website hyperlink)	http://www.msti500kv.com/routes_maps/alternatives.html and eliminated routes at http://www.msti500kv.com/routes_maps/consideredElim.html
Project status:	
• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Completed Regional Planning and Phase 1 Path Rating Review processes, and expect to finish Phase 2 by year-end 2009.
• WECC reports submitted (Significant Additions and/or Annual Progress)	Regional Planning Report, Phase 1 Comprehensive Progress Report, Annual Progress Reports, and Significant Additions Report.
• WECC power flow base cases where represented	Not included in WECC base cases at this time.
• Regulatory applications and approvals (permitting, siting, etc.)	Final EIS is expected Sep. 2010. Substantially all federal, state and county permits and approvals are expected to be obtained by fall of 2011.
• Estimated construction schedule	2011-2014; in-service 2014.
Analytic studies:	
• Economic screening with assumptions	The successful open season participants will provide the economic screening.
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	The economic analysis for MSTI will be a result of an open season solicitation for Transmission Service from customers. MSTI is not a transmission line for serving network load from a vertically integrated utility.
• Power flow and stability analysis	NWE has completed power flow and stability analysis for MSTI. These studies were necessary to progress through the WECC Regional Planning Process and the WECC Phase 1 Path Rating studies necessary for the Comprehensive Progress Report.
• WECC Path Rating studies	MSTI is in Phase 2 of the WECC Path Rating process, with completion expected by year-end 2009. Phase 1 and the Regional Planning Process are complete.
• Siting studies	Siting application submitted in MT and ID, expect completion in 2010.

• Environmental impact statement	Draft EIS expected 1st quarter 2010, Final by Sep 2010.

Project 4: Gateway South, Sigurd – Crystal

Project name: (TEPPC #9)	**Gateway South Project, Sigurd – Crystal 500 kV**
Project overview:	
• Purpose (renewable delivery, etc.)	Delivery of renewable energy; increased capacity to reliably serve load
• New or upgrade	New
• Estimated in-service date	2014 for 345 kV Sigurd – Red Butte (Red Butte – Crystal under review)
• Estimated transfer capability/rating (MW)	600 MW for Sigurd – Red Butte in 2014; up to 1500 MW bidirectional with Red Butte – Crystal and Mona to Sigurd
Project sponsor(s):	
• Organization name(s)	PacifiCorp
• Project website (hyperlink)	http://www.pacificorp.com/Article/Article79647.html
• Project information contact for updates (name, phone and e-mail)	Jamie Austin (PacifiCorp) 503-813-5396 jamie.austin@pacificorp.com
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	345 kV for Sigurd – Red Butte, 500kV for later segments
• Point of origin	Sigurd, UT
• Point of termination	Crystal (near Las Vegas), NV
• Intermediate points of interconnection	None
• General route	
• Length in miles	About 330 miles (160 miles for Sigurd – Red Butte)
• Conductor size and % compensation	
• Estimated cost (optional)	
• Other related projects	Gateway West and Gateway South
Project map: (website hyperlink)	http://www.pacificorp.com/Article/Article79554.html
Project status:	

• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 2
• WECC reports submitted (Significant Additions and/or Annual Progress)	
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	
Analytic studies:	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	
• Siting studies	
• Environmental impact statement	

Project 5: Gateway South, Aeolus – Mona

Project name: (TEPPC #10)	**Gateway South Project, Aeolus - Mona**
Project overview:	
• Purpose (renewable delivery, etc.)	Delivery of renewable energy from Wyoming to Utah and Desert Southwest and provides backup for Gateway west. In addition, the proposed line will help to maintain system reliability and support new renewable energy development.
• New or upgrade	New
• Estimated in-service date	2017-2019
• Estimated transfer capability/rating (MW)	1500 MW, up to 3000 MW bidirectional
Project sponsor(s):	
• Organization name(s)	PacifiCorp
• Project website (hyperlink)	http://www.pacificorp.com/Article/Article82892.html
• Project information contact for updates (name, phone and e-mail)	Jamie Austin (PacifiCorp) 503-813-5396 jamie.austin@pacificorp.com
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	500 kV
• Point of origin	Aeolus (near Medicine Bow), WY
• Point of termination	Mona, UT
• Intermediate points of interconnection	None
• General route	
• Length in miles	Approximately 395 miles
• Conductor size and % compensation	
• Estimated cost (optional)	
• Other related projects	Gateway West and Gateway South
Project map: (website hyperlink)	http://www.pacificorp.com/Article/Article79554.html
Project status:	

• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 2
• WECC reports submitted (Significant Additions and/or Annual Progress)	
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	
Analytic studies: (provide information as available)	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	
• Siting studies	
• Environmental impact statement	

Project 6: Gateway Central, Populus – Terminal

Project name: (TEPPC #11.1)	**Gateway Central Project, Populus-Terminal**
Project overview:	
• Purpose (renewable delivery, etc.)	Meet load growth, provide increased reliability, increase transfer capability between the east and west control area, facilitate delivery of power and provide greater operational flexibility.
• New or upgrade	New
• Estimated in-service date	2010
• Estimated transfer capability/rating (MW)	700 MW up to 1,400 MW
Project sponsor(s):	
• Organization name(s)	PacifiCorp
• Project website (hyperlink)	http://www.pacificorp.com/Article/Article79647.html
• Project information contact for updates (name, phone and e-mail)	Jamie Austin (PacifiCorp) 503-813-5396 Jamie.austin@pacificorp.com
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	345 kV
• Point of origin	Populus (near Downey), ID
• Point of termination	Terminal (near Salt Lake), UT
• Intermediate points of interconnection	Ben Lomond (near Ogden), UT
• General route	Along the I-15 corridor.
• Length in miles	Approximately 135 miles
• Conductor size and % compensation	
• Estimated cost (optional)	
• Other related projects	Gateway West projects, Gateway South projects
Project map: (website hyperlink)	http://www.pacificorp.com/File/File84707.pdf
Project status:	

• Type project – conceptual, planned, or under-construction	Under Construction
• WECC Regional Planning and Project Rating Review Status	Phase 3
• WECC reports submitted (Significant Additions and/or Annual Progress)	
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	2009-2010
Analytic studies:	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	
• Siting studies	
• Environmental impact statement	

Project 7: Gateway Central, Mona – Oquirrh

Project name: (TEPPC #11.2)	**Gateway Central Project, Mona -Oquirrh**
Project overview:	
• Purpose (renewable delivery, etc.)	Meet load growth, provide increased reliability and improved operational flexibility in conjunction with future generation resources, including renewable resources such as wind.
• New or upgrade	New
• Estimated in-service date	2012
• Estimated transfer capability/rating (MW)	700 MW up to 1,500 MW
Project sponsor(s):	
• Organization name(s)	PacifiCorp
• Project website (hyperlink)	http://www.pacificorp.com/Article/Article77800.html
• Project information contact for updates (name, phone and e-mail)	Jamie Austin (PacifiCorp) 503-813-5396 jamie.austin@pacificorp.com
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	500 kV and 345 kV
• Point of origin	Mona substation near Mona, in Juab County
• Point of termination	Oquirrh (West Jordan), UT
• Intermediate points of interconnection	
• General route	.
• Length in miles	Approximately 86 miles
• Conductor size and % compensation	
• Estimated cost (optional)	
• Other related projects	Gateway West projects, Gateway South projects
Project map: (website hyperlink)	http://www.pacificorp.com/Article/Article79554.html
Project status:	

• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 2
• WECC reports submitted (Significant Additions and/or Annual Progress)	
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	2012
Analytic studies: (provide information as available)	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	
• Siting studies	
• Environmental impact statement	

Project 8: Gateway Central, Sigurd – Red Butte – Crystal

This project is now the same as Project 4: Gateway South, Sigurd – Crystal.

Project 9: Gateway West, Windstar – Jim Bridger

Project name: (TEPPC #20.1)	**Gateway West Transmission Project, Windstar – Jim Bridger**
Project overview:	
• Purpose (renewable delivery, etc.)	Delivery of new resources in transmission service request queues, to ensure reliable electric service to customers and to also accommodate regional needs for integrating renewable and other resource development.
• New or upgrade	New
• Estimated in-service date	2017
• Estimated transfer capability/rating (MW)	700 MW, Windstar to Aeolus 700 MW up to 1500 MW, Aeolus to Bridger, 3000 MW with full plan
Project sponsor(s):	
• Organization name(s)	PacifiCorp and Idaho Power
• Project website (hyperlink)	http://www.tops.pacificorp.com/oasis/ppw/energygateway.html http://www.oatioasis.com/IPCO/IPCOdocs/OASIS_Transmission_Projects.pdf http://www.gatewaywestproject.com/
• Project information contact for updates (name, phone and e-mail)	Jamie Austin (PacifiCorp) 503-813-5396 Jamie.austin@pacificorp.com
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	230 kV and 500 kV
• Point of origin	Windstar (near Casper), WY
• Point of termination	Jim Bridger (near Rock Springs), WY
• Intermediate points of interconnection	Aeolus (near Medicine Bow), WY
• General route	Southeast Windstar-Aeolus and west Aeolus-Jim Bridger
• Length in miles	298 miles (approximately)

• Conductor size and % compensation	
• Estimated cost (optional)	
• Other related projects	Other Gateway West segments, Gateway South, and Populus-Terminal
Project map: (website hyperlink)	http://www.oatioasis.com/IPCO/IPCOdocs/GW_Corridor_Map_04-01-08.pdf
Project status:	
• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 2
• WECC reports submitted (Significant Additions and/or Annual Progress)	Comprehensive Progress Report was approved February 9, 2009 and is available at: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3203
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	
Analytic studies:	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	Comprehensive Progress Report was approved February 9, 2009 and is available at: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3203
• Siting studies	BLM is the lead NEPA agency. http://www.wy.blm.gov/nepa/cfodocs/gateway_west/
• Environmental impact statement	Expect the draft EIS spring 2009, final EIS early 2011, and Record of Decision in late 2011

Project 10: Gateway West, Jim Bridger - SE Idaho

Project name: (TEPPC #20.2)	**Gateway West Transmission Project, Jim Bridger – Southeast Idaho**
Project overview:	
• Purpose (renewable delivery, etc.)	Delivery of new resources in transmission service request queues, to ensure reliable electric service to customers and to also accommodate regional needs for integrating renewable and other resource development.
• New or upgrade	New
• Estimated in-service date	2014-2017
• Estimated transfer capability/rating (MW)	700 MW, up to 1500 MW phase 1, 3000 MW full plan
Project sponsor(s):	
• Organization name(s)	PacifiCorp and Idaho Power
• Project website (hyperlink)	http://www.tops.pacificorp.com/oasis/ppw/energygateway.html http://www.oatioasis.com/IPCO/IPCOdocs/OASIS_Transmission_Projects.pdf http://www.gatewaywestproject.com/
• Project information contact for updates (name, phone and e-mail)	Jamie Austin (PacifiCorp) 503-813-5396 Jamie.austin@pacificorp.com
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	500 kV
• Point of origin	Jim Bridger, near Rock Springs, WY
• Point of termination	Populus (near Downey), ID
• Intermediate points of interconnection	None
• General route	Generally near Bridger-Borah and Bridger-Kinport 345 kV lines
• Length in miles	Approximately 191 miles
• Conductor size and % compensation	

• Estimated cost (optional)	
• Other related projects	Other Gateway West segments, Gateway South, and Populus-Terminal
Project map: (website hyperlink)	http://www.gatewaywestproject.com
Project status:	
• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 2
• WECC reports submitted (Significant Additions and/or Annual Progress)	Comprehensive Progress Report was approved February 9, 2009 and is available at: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3203
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	
Analytic studies:	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	Comprehensive Progress Report was approved February 9, 2009 and is available at: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3203
• Siting studies	BLM is the lead NEPA agency. http://www.wy.blm.gov/nepa/cfodocs/gateway_west/ http://www.gatewaywestproject.com/
• Environmental impact statement	Expect the draft EIS spring 2010, final EIS early 2011, and Record of Decision in late 2011

Project 11: Gateway West, SE Idaho – S Central Idaho

Project name: (TEPPC #20.3)	**Gateway West Transmission Project, Southeast Idaho – South Central Idaho**
Project overview:	
• Purpose (renewable delivery, etc.)	Increased capacity to serve and reliably deliver energy to customers; support new renewable and other resource development
• New or upgrade	New
• Estimated in-service date	2016-2017
• Estimated transfer capability/rating (MW)	700 MW, up to 1500 MW in phase 1, 3000 MW full plan
Project sponsor(s):	
• Organization name(s)	PacifiCorp and Idaho Power
• Project website (hyperlink)	http://www.tops.pacificorp.com/oasis/ppw/energygateway.html http://www.oatioasis.com/IPCO/IPCOdocs/OASIS_Transmission_Projects.pdf http://www.gatewaywestproject.com/
• Project information contact for updates (name, phone and e-mail)	Jamie Austin (PacifiCorp) 503-813-5396 Jamie.austin@pacificorp.com
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	500 kV
• Point of origin	Populus (near Downey), ID
• Point of termination	Midpoint, ID
• Intermediate points of interconnection	None
• General route	Populus-Borah-Midpoint or Populus-Cedar Hill-Midpoint
• Length in miles	Approximately 135 miles
• Conductor size and % compensation	
• Estimated cost (optional)	

• Other related projects	Other Gateway West segments, Gateway South, and Populus-Terminal
Project map: (website hyperlink)	http://www.gatewaywestproject.com/
Project status:	
• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 2
• WECC reports submitted (Significant Additions and/or Annual Progress)	
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	Comprehensive Progress Report was approved February 9, 2009 and is available at: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3203
• Estimated construction schedule	
Analytic studies:	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	Comprehensive Progress Report was approved February 9, 2009 and is available at: http://www.gatewaywestproject.com/
• Siting studies	BLM is the lead NEPA agency. http://www.wy.blm.gov/nepa/cfodocs/gateway_west/
• Environmental impact statement	Expect the draft EIS spring 2010, final EIS early 2011, and Record of Decision in late 2011

Project 12: Gateway West, S Central Idaho – SW Idaho

Project name: (TEPPC #20.4)	**Gateway West Transmission Project, South Central Idaho – Southwest Idaho**
Project overview:	
• Purpose (renewable delivery, etc.)	Increased capacity to serve and reliably deliver energy to customers; support new renewable and other resource development
• New or upgrade	New
• Estimated in-service date	2016-2017
• Estimated transfer capability/rating (MW)	700 MW, up to 1500 MW in phase 1, 3000 MW full plan
Project sponsor(s):	
• Organization name(s)	PacifiCorp and Idaho Power
• Project website (hyperlink)	http://www.tops.pacificorp.com/oasis/ppw/energygateway.html http://www.oatioasis.com/IPCO/IPCOdocs/OASIS_Transmission_Projects.pdf http://www.gatewaywestproject.com/
• Project information contact for updates (name, phone and e-mail)	Jamie Austin (PacifiCorp) 503-813-5396 Jamie.austin@pacificorp.com
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	500 kV
• Point of origin	Midpoint, ID and Cedar Hill (near Twin Falls), ID
• Point of termination	Hemingway, ID
• Intermediate points of interconnection	None
• General route	Midpoint-Hemingway, Cedar Hill-Hemingway
• Length in miles	Approximately 149 miles
• Conductor size and % compensation	
• Estimated cost (optional)	

• Other related projects	Other Gateway West segments, Gateway South, and Populus-Terminal
Project map: (website hyperlink)	http://www.gatewaywestproject.com
Project status:	
• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 2
• WECC reports submitted (Significant Additions and/or Annual Progress)	
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	Comprehensive Progress Report was approved February 9, 2009 and is available at: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3203
• Estimated construction schedule	
Analytic studies: (provide information as available)	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	Comprehensive Progress Report was approved February 9, 2009 and is available at: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3203
• Siting studies	BLM is the lead NEPA agency. http://www.wy.blm.gov/nepa/cfodocs/gateway_west/
• Environmental impact statement	Expect the draft EIS spring 2010, final EIS early 2011, and Record of Decision in late 2011

Project 13: Boardman – Hemingway

Project name: (TEPPC #21)	**Boardman-Hemingway** 500 kV (B2H)
Project overview:	
• Purpose (renewable delivery, etc.)	Delivery of generating resources, market access and transmission service requests
• New or upgrade	New
• Estimated in-service date	2015
• Estimated transfer capability/rating (MW)	This project would increase import capability from the Northwest into Idaho by approximately 850 MW and export capabilities by approximately 800 MW (with Gateway West in service). The project is undergoing independent WECC rating with expected ratings of 1300 MW west-to-east and 800 MW east-to-west (1400 MW with the Gateway West project in service providing additional source capabilities, removing constraints near Midpoint).
Project sponsor(s):	
• Organization name(s)	Idaho Power
• Project website (hyperlink)	http://www.boardmantohemingway.com/
• Project information contact for updates (name, phone and e-mail)	Kip Sikes 208-388-2459 dsikes@idahopower.com
• Date of last information update	10/22/2009
Other project participant(s):	
Project characteristics:	
• Voltage class	500 kV
• Point of origin	Boardman, OR
• Point of termination	Hemmingway (near Boise), ID
• Intermediate points of interconnection	
• General route	Northeastern Oregon to Southwestern Idaho
• Length in miles	300 miles (approximately)
• Conductor size and % compensation	Triple-bundle 1272 Bittern (3000 MVA thermal limit), up to 70% compensation – pending under study

• Estimated cost (optional)	$600 million
• Other related projects	None required – being studied independently, as well as with interactions with other projects
Project map: (website hyperlink)	Current maps available at: http://www.boardmantohemingway.com/documents/map_project_location.pdf
Project status:	
• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 2
• WECC reports submitted (Significant Additions and/or Annual Progress)	Comprehensive Progress Report was approved February 9, 2009 and is available at http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3201
• WECC power flow base cases where represented	Rating study cases being used are 2012-HS, and 2010/12-LA, 2015-HS
• Regulatory applications and approvals (permitting, siting, etc.)	BLM NEPA and ODOE-EFSC siting processes have begun public scoping. Permitting and ROW is expected to continue through mid 2011
• Estimated construction schedule	2013-2015
Analytic studies:	
• Economic screening with assumptions	NTTG Cost Allocation process and project review information is included at http://www.oatioasis.com/IPCO/IPCOdocs/IPC_HEMINGWAY_TO_BOARDMAN_Cost_Allocation_Proces.pdf
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	Phase 1 Comprehensive Progress Report at: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3201
• WECC Path Rating studies	Phase 1 Comprehensive Progress Report at: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=getit&lid=3201
• Siting studies	Siting information including preferred and alternative routes are on the web site at:

	http://www.boardmantohemingway.com/maps.aspx
• Environmental impact statement	After company-sponsored public routing is completed, the BLM will re-issue an NOI with Scoping anticipated in early Spring of 2010 and a draft EIS anticipated in Winter 2010.

Project 14: Hemingway – Captain Jack

Project name: (TEPPC #31)	**Hemingway-Captain Jack**
Project overview:	
• Purpose (renewable delivery, etc.)	Increased system flexibility and reliability between PacifiCorp's East and West Control Areas, relieve congested paths Idaho to Northwest and connect to resource centers in Wyoming to Southern Oregon loads; support new renewable energy development.
• New or upgrade	New
• Estimated in-service date	Timing under review
• Estimated transfer capability/rating (MW)	1500 MW bidirectional
Project sponsor(s):	PacifiCorp
• Organization name(s)	http://www.pacificorp.com/Article/Article79647.html
• Project website (hyperlink)	Jamie Austin (PacifiCorp) 503-813-5396 jamie.austin@pacificorp.com
• Project information contact for updates (name, phone and e-mail)	
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	500 kV
• Point of origin	Hemmingway (near Boise), ID
• Point of termination	Captain Jack (near Malin), OR
• Intermediate points of interconnection	None
• General route	South southwest across eastern Oregon
• Length in miles	Approximately 375 miles
• Conductor size and % compensation	
• Estimated cost (optional)	
• Other related projects	Gateway West Projects
Project map: (website hyperlink)	http://www.pacificorp.com/Article/Article79554.html

Project status:	
(provide information as applicable indicating both current status and next steps) • Type project – conceptual, planned, or under-construction	Conceptual
• WECC Regional Planning and Project Rating Review Status	Phase 1
• WECC reports submitted (Significant Additions and/or Annual Progress)	
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	
Analytic studies: (provide information as available)	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	
• Siting studies	
• Environmental impact statement	

Project 15: Walla Walla – McNary

Project name: (TEPPC #32)	**Walla Walla – McNary**
Project overview:	
• Purpose (renewable delivery, etc.)	Reliable service for growing load; support new renewable energy development
• New or upgrade	New
• Estimated in-service date	Timing under review
• Estimated transfer capability/rating (MW)	400 MW bidirectional
Project sponsor(s):	PacifiCorp
• Organization name(s)	http://www.pacificorp.com/Article/Article79865.html
• Project website (hyperlink)	Jamie Austin (PacifiCorp) 503-813-5396 jamie.austin@pacificorp.com
• Project information contact for updates (name, phone and e-mail)	
• Date of last information update	October 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	230 kV
• Point of origin	Walla Walla, WA
• Point of termination	McNary (near Umatilla) OR
• Intermediate points of interconnection	Wallula, WA
• General route	West from Walla Walla substation to Wallula substation then along Columbia River to McNary substation.
• Length in miles	Approximately 56
• Conductor size and % compensation	
• Estimated cost (optional)	
• Other related projects	Gateway West Projects
Project map: (website hyperlink)	http://www.pacificorp.com/File/File82623.pdf
Project status:	

• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 1
• WECC reports submitted (Significant Additions and/or Annual Progress)	
• WECC power flow base cases where represented • Regulatory applications and approvals (permitting, siting, etc.)	
• Estimated construction schedule	
Analytic studies:	
• Economic screening with assumptions	
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	
• Power flow and stability analysis	
• WECC Path Rating studies	
• Siting studies	
• Environmental impact statement	

Project 16: Cascade Crossing

Project name: **(TEPPC #33)**	**Cascade Crossing**
Project overview:	
• Purpose (renewable delivery, etc.)	Meet Generation Interconnection & Network Integration Transmission Service Requests
• New or upgrade	New
• Estimated in-service date	Second quarter, 2015
• Estimated transfer capability/rating (MW)	1500 MW proposed WECC project rating
Project sponsor(s):	
• Organization name(s)	Portland General Electric Company
• Project website (hyperlink)	http://www.oatioasis.com/pge/index.html
• Project information contact for updates	Philip Augustin, 503-464-7783 philip.augustin@pgn.com
• Date of last information update	October 2, 2009
Other project participant(s):	
Project characteristics:	
• Voltage class	500 kV
• Point of origin	Boardman OR, (new substation) near Coyote Springs plant
• Point of termination	Salem OR, existing Bethel substation
• Intermediate points of interconnection	New substations at Juniper Flat , Boardman
• General route	New right-of-way from the Coyote Springs plant to the Boardman plant, then the proposed Project Study Corridor is adjacent to existing transmission corridors as much as possible for the entire route from Boardman to Bethel.
• Length in miles	200 miles
• Conductor size and % compensation	Triple Bundled 1272 ASCR or equivalent, uses 70% compensation
• Estimated cost (optional)	
• Other related projects	See TCWG and NTTG lists of projects
Project map: (website hyperlink)	http://www.oatioasis.com/pge/index.html

Project status:	
• Type project – conceptual, planned, or under-construction	Planned
• WECC Regional Planning and Project Rating Review Status	Phase 1 in progress; Report under review by Project Rating Review group
• WECC reports submitted (Significant Additions and/or Annual Progress)	Submitted in 2008/09 Annual Progress Report
• WECC power flow base cases where represented	Not represented in WECC cases
• Regulatory applications and approvals (permitting, siting, etc.)	Preliminary permitting and siting in progress
• Estimated construction schedule	Begin in 2011
Analytic studies:	
• Economic screening with assumptions	In progress
• Detailed economic analysis and cost/benefit including consideration of alternatives or new technologies	In progress
• Power flow and stability analysis	Studies have been completed and additional studies are underway
• WECC Path Rating studies	Regional Planning finalized, Phase I Studies are in progress
• Siting studies	In progress
• Environmental impact statement	In progress