TransWest Express and Gateway South

Co-developed by four leading entities:

Arizona Public Service
PacifiCorp
National Grid
Wyoming Infrastructure Authority

Regional Stakeholder Meeting
January 23, 2008
Las Vegas, Nevada

APS
PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY
nationalgrid
WYOMING INFRASTRUCTURE AUTHORITY

Standards of Conduct Non-Disclosure Statement

The following procedures have been implemented to provide Standards of Conduct Safeguards:

- Ten day advance notice of public meeting
- All eligible customers invited
- Telephone participation provided
- Handouts posted on OASIS prior to meeting
- Meeting notes will be taken and posted
- One eligible customer must be in attendance
- Meetings no more than twice per month

Our agenda for today…

1. **Welcome**

2. **Co-Development Partnership**

3. **Conceptual Technical Report**
   a. Overview
   b. Project Alternatives
   c. Project Components and Unit Costs
   d. Assessment of Alternatives
   e. Findings and Recommendations

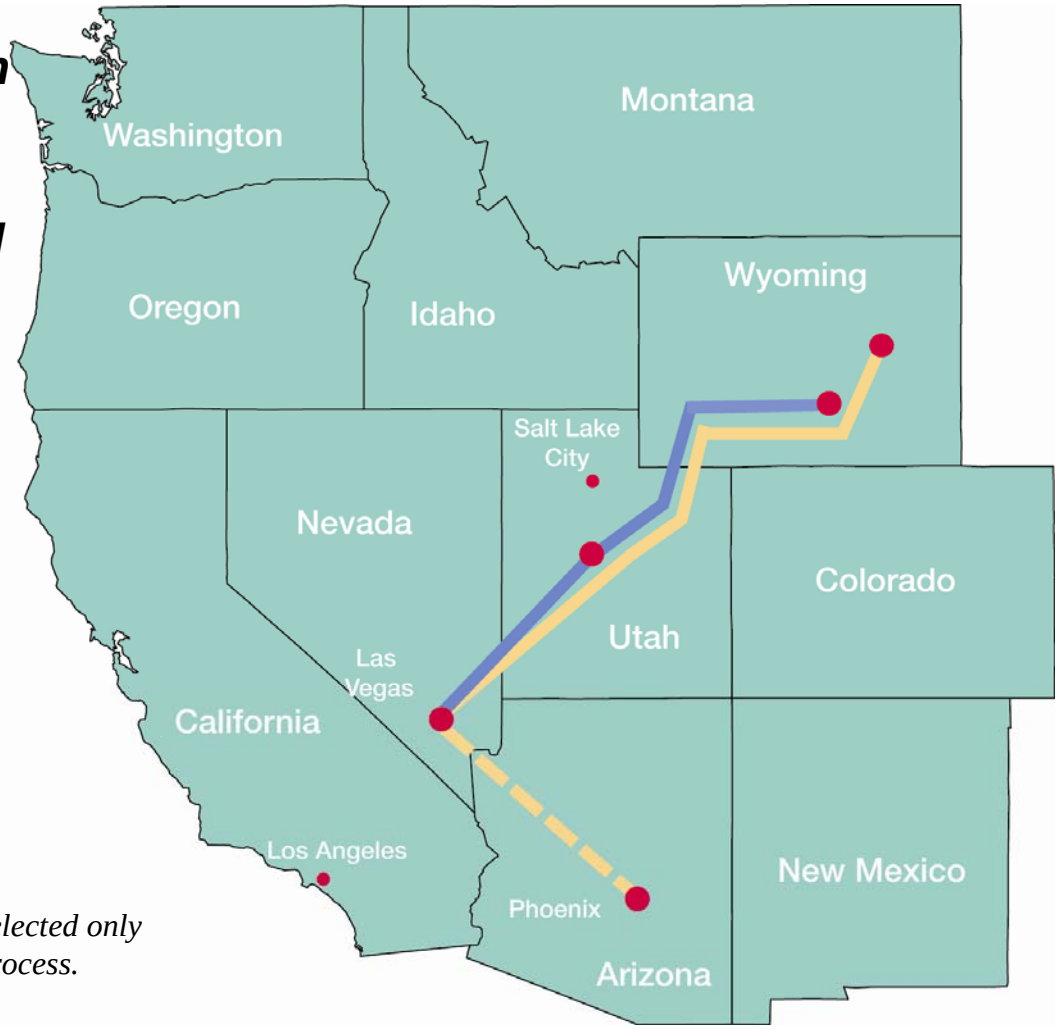
4. **Co-Development Status Update**

   Lunch Break

5. **Stakeholder Forum**

Welcome and Introductions

APS, PacifiCorp, National Grid, and the WIA in accordance with the WECC Regional Planning Review Process, the NTTG and SWAT planning processes, and FERC Order 890, request stakeholder feedback on the TransWest Express and Gateway South projects



Routes shown are for illustrative only and will be selected only following a comprehensive environmental review process.

About Arizona Public Service

Regions Served

- 11 of 15 counties within Arizona
- Fastest growing state at 3.5%
- 3 times the U.S. average

APS

- Largest electric utility in Arizona
- Growth 4 times the U.S. average
- More than 1 million customers
- 6,600+ employees
- $1B 10-year Transmission Plan

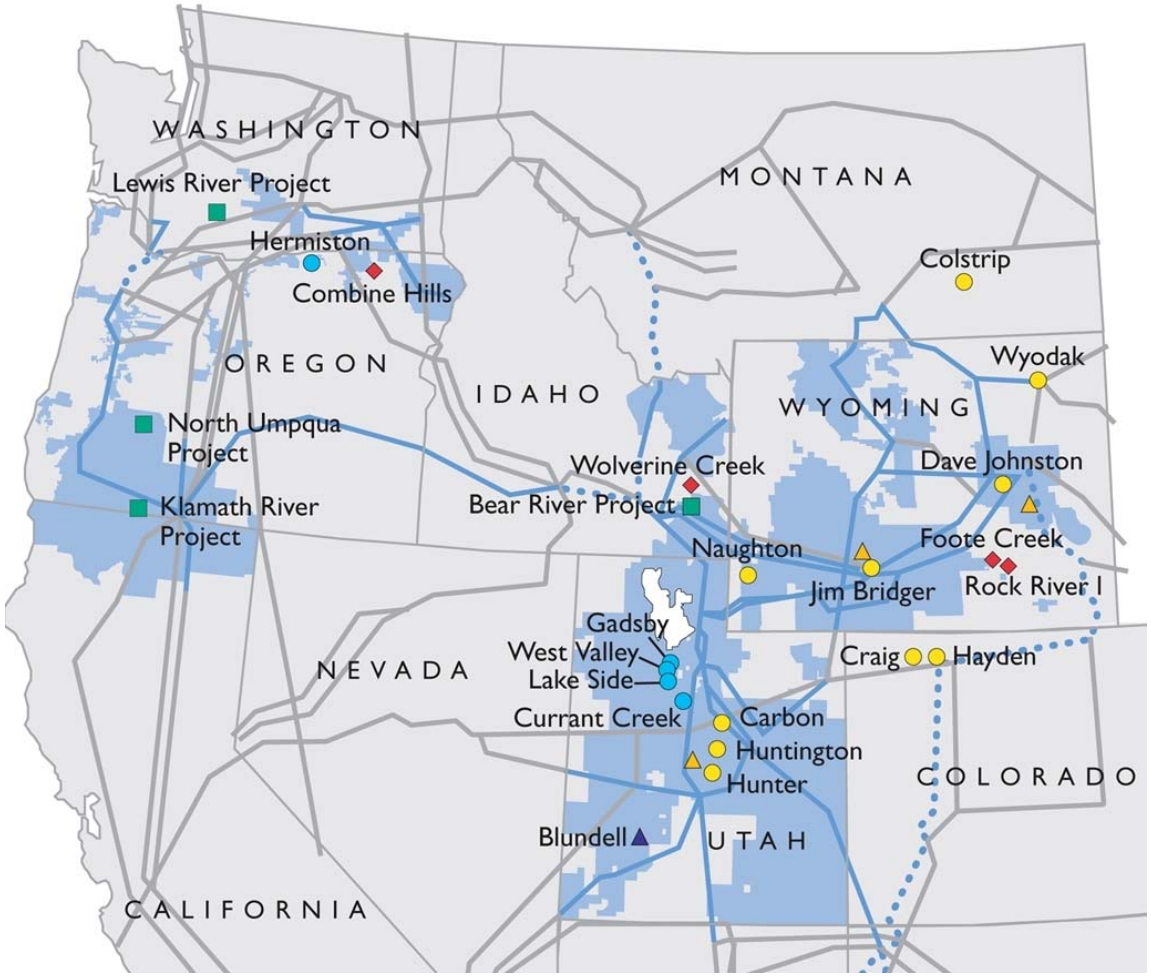
About PacifiCorp

Regions Served

- Oregon, Washington and California (Pacific Power)
- Utah, Wyoming and Idaho (Rocky Mountain Power)

PacifiCorp

- 15,000 miles transmission
- 1.7 million customers
- 6,600+ employees
- 9,062 MW of generation



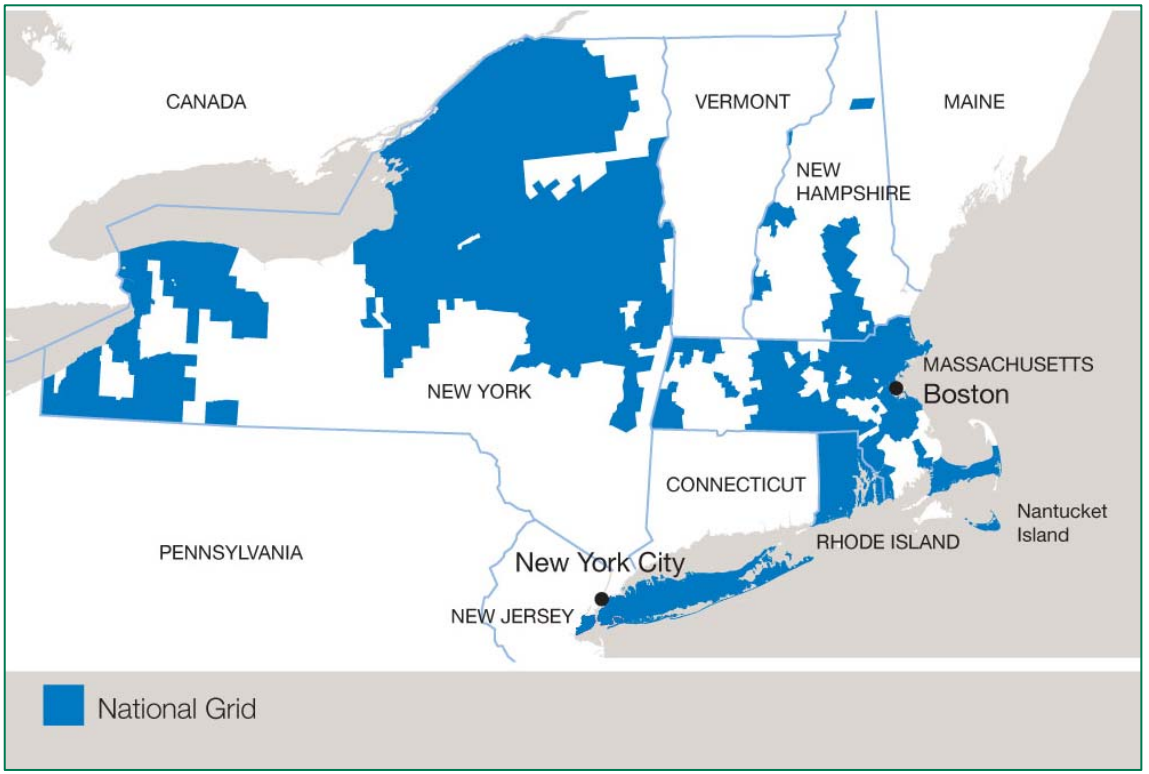
About National Grid

Regions Served

- Northeast US
- All of UK

National Grid

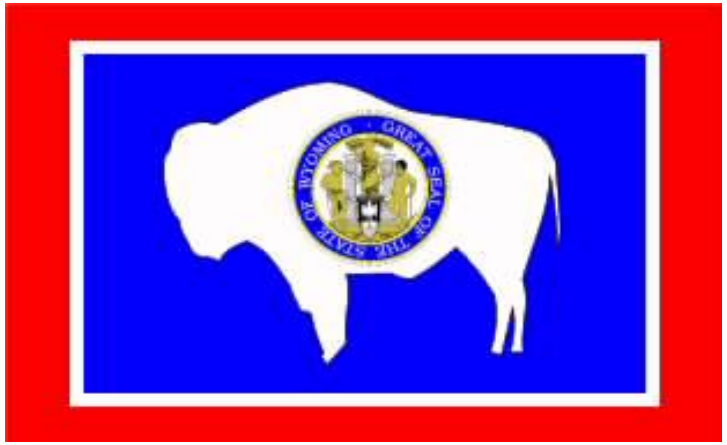
- Transmission Operator and System Operator in U.K.
- > 4 million electric customers in US
- > 20,000 employees
- > 2,000 electric transmission staff
- Capital investment of ~$4.5B per year



About Wyoming

Wyoming

- Largest energy exporting state in US
  - Largest producer of coal
  - Largest producer of uranium
  - Second largest producer of natural gas
- Estimated 3.4GW of > Class 6 wind and over 14GW of developable wind
- Governor Freudenthal chair of the Western Governors Association



Wyoming Infrastructure Authority

- Formed in 2004
- Mission to diversify and expand the state's economy through improvements in electric transmission infrastructure
- Authority to issue bonds to finance transmission facilities

Gateway South and TransWest Express Co-Development Agreement Overview

Interim Agreement

- Executed August 2007 – valid through March 2008
- Longer term business agreement targeted for 2008 if parties agree this makes sense

Purpose

- Established governance arrangements, with a common steering committee
- National Grid as lead developer of TWE and Gateway South, responsible for deploying the project team
- Allows initial development steps to be taken while more complex technical and regulatory issues considered

Activities undertaken jointly

- Common project team implementation strategy and deployment
- Coordinate Regional Planning and Rating Review processes
- Coordinate Environmental Permitting
- Stakeholder and public outreach

Activities undertaken separately

- ROW filings - purpose and need case, approvals
- WECC Rating Process
- Regulatory Filings

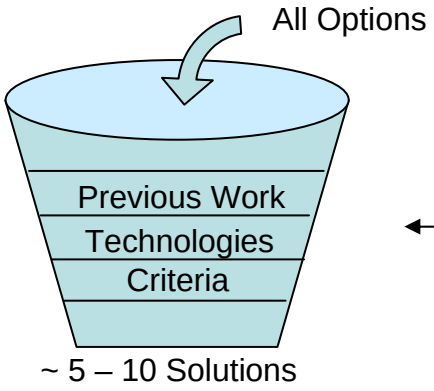
Gateway South and TransWest Express Conceptual Technical Report

- Engineering Work Group (EWG) formed amongst partners to:
  - Progress Regional Planning Process
  - Evaluate project alternatives
  - Initiate studies for entry into WECC Rating process

- Black & Veatch hired to assist EWG by providing a Conceptual Technical Report

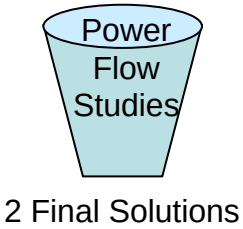
- Report includes:
  - Key findings from previous analysis
  - Technical and economic considerations of alternatives
  - Common framework for evaluation of alternatives
  - Analysis of evaluations and
  - Recommended Alternatives and Next Steps

Gateway South and TransWest Express Evaluation Approach – Study Funnels



Define objectives and constraints
Consider previous studies
Identify range of solutions for comparative evaluation
Determine technical/financial evaluation parameters

Develop base model and study parameters
Perform high level cost analysis
Input from WECC Regional Planning Project Review
Identify TWE and GS cases for WECC rating process



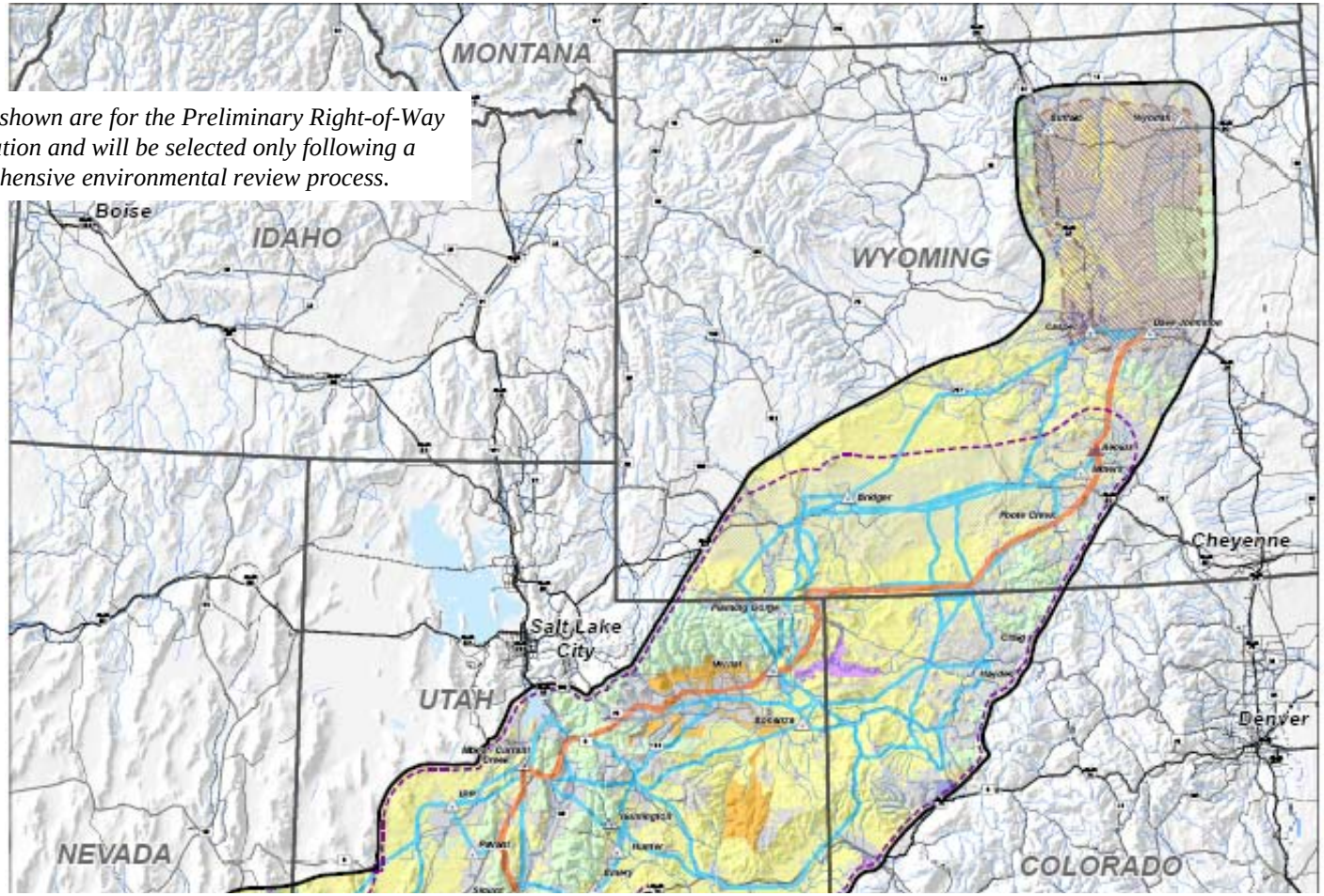
Perform power flow analysis & stability studies
WECC Phase I non-simultaneous detailed studies
WECC Phase II simultaneous studies

Gateway South and TransWest Express Project Variables Under Review

- Combined export transfer capacity: 4500, 6000, or 7500 MW
- Line voltage: 500 kV AC, 765 kV AC, and 500 kV HVDC
- Tower configuration: Single circuit, double circuit
- Right-of-Way usage: Independent rights-of-way, common corridors
- Generation location: NE Wyoming, SE Wyoming, SW Wyoming
- Transmission interconnection/end points: Mona, Red Butte, southern Nevada (e.g. Crystal or Marketplace areas), Phoenix (Pinnacle Peak area)

Gateway South and TransWest Express Proposed Northern Study Area and Route

Routes shown are for the Preliminary Right-of-Way Application and will be selected only following a comprehensive environmental review process.



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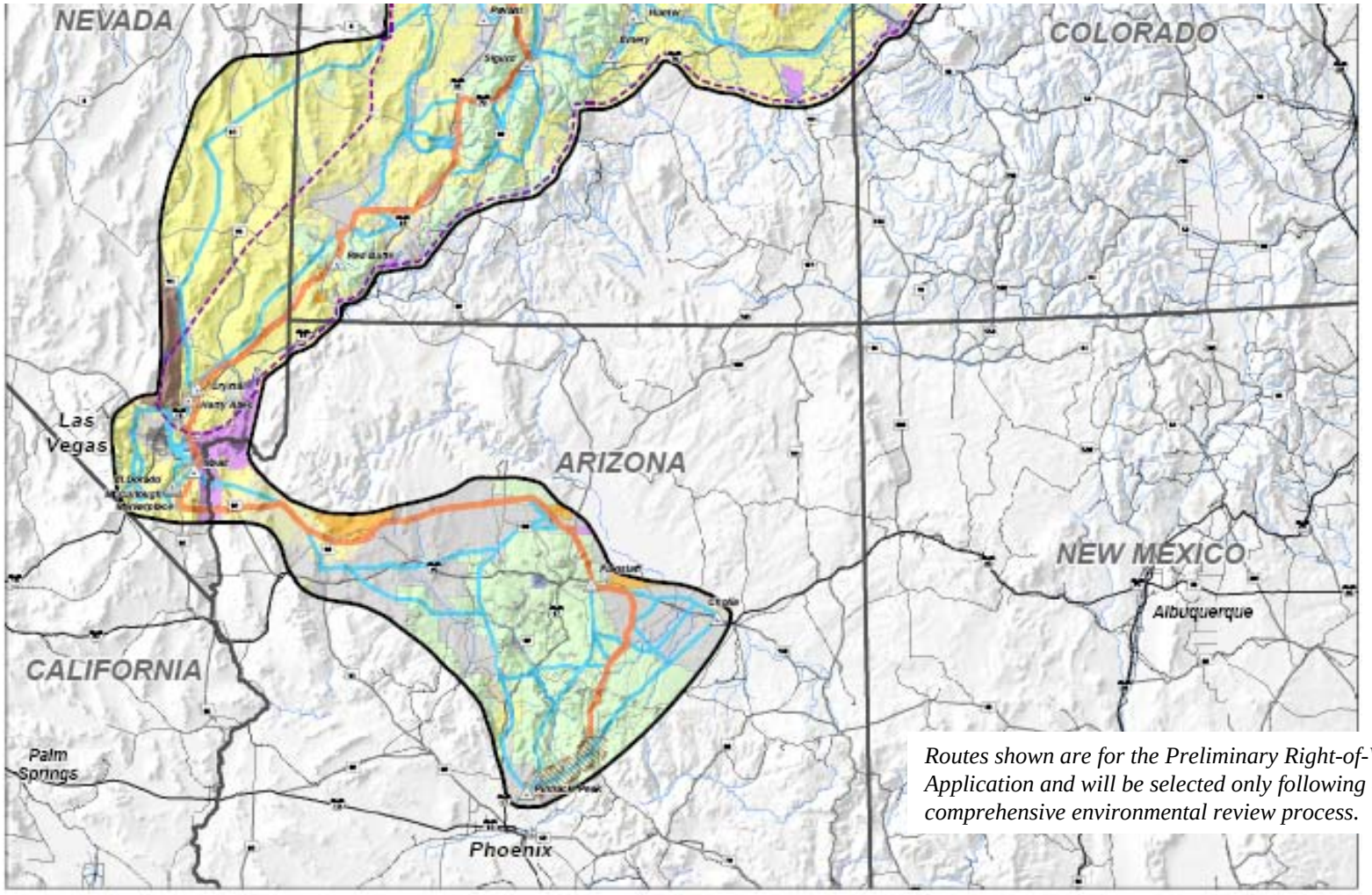
Gateway South and TransWest Express Proposed Southern Study Area and Route



Routes shown are for the Preliminary Right-of-Way Application and will be selected only following a comprehensive environmental review process.

Gateway and TransWest Express Transmission Study Loads & Resources

- **Transmission Study Loads**
  - WECC 2015 High Summer Case
  - Reduce Las Vegas and western Arizona generation to stress paths

- **Transmission Study Resources**
  - These are not the proposed resources for the projects
  - Developed (partially) from Integrated Resource Plans
  - Includes renewable resources above existing RPS levels
  - Wind resource level sufficient to test impacts of non-synchronous generation

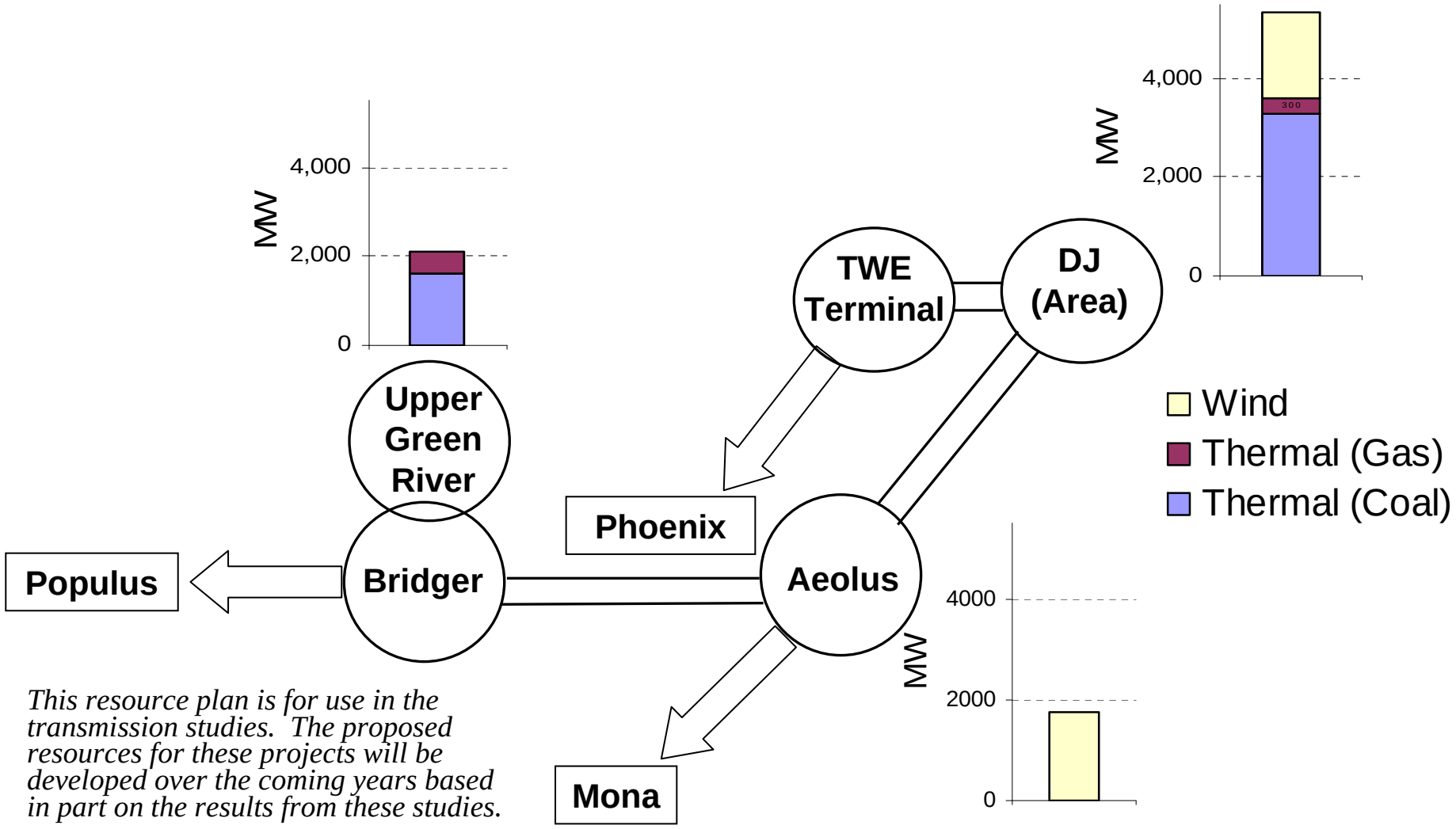
- **Actual Resource Development for Projects**
  - Will be responsive to energy policies currently under review by utilities, regulators and other stakeholders
  - Specific economic and technology evaluations and siting/permitting processes also need to run their course

Gateway and TransWest Express Transmission Study Wyoming Resource Plan

Project	Resource Type	Jim Bridger	Upper Green River	Aeolus	Dave Johnston	Total
Gateway	Coal	1,600			1,800	3,400
	Wind			1,100	1,100	2,200
	Natural Gas		500			500
	Total	1,600	500	1,100	2,900	6,100
TransWest Express	Coal				1,500	1,500
	Wind			650	650	1,300
	Natural Gas				300	300
	Total			650	2,450	3,100
Wyoming Total	Coal	1,600			3,300	4,900
	Wind			1,750	1,750	3,500
	Natural Gas		500		300	800
	Total	1,600	500	1,750	5, 050	9,200

This resource plan is for use in the transmission studies. The proposed resources for these projects will be developed over the coming years based in part on the results from these studies.

Gateway and TransWest Express Transmission Study Resource Bubble Diagram



This resource plan is for use in the transmission studies. The proposed resources for these projects will be developed over the coming years based in part on the results from these studies.

Gateway South and TransWest Express Technical and Economic Considerations

- **HVDC technology confirmed as economic solution for long distance (> 500 mile) point to point delivery**
- **AC technology, particularly with double circuit structures, is economic for shorter distance delivery with potential for future mid-point taps**
- **765 kV AC technology would need to be de-rated below optimal loading to meet WECC Performance Criteria**
  - **Largest single transmission contingency just above 3,100 MW**
  - **Adjacent 3,000 MW Circuit would require more separation distance**
  - **Utilization of four 1,500 MW circuits within adjacent 300 ft Rights of Way utilizes less land**
- **Economic Conductor Sizing**
  - **500 kV AC: 3 Lapwing – ACSR/TWD (1943 kcmil) per phase**
  - **500 kV DC: 4 Lapwing – ACSR/TWD (1943 kcmil) per phase**

Gateway South - AC
Project Configuration Building Blocks

- Double Circuit 500 kV WY-UT in all AC Cases
- UT-NV:
  - 345 kV (Case 1) or
  - 500 kV (Cases 2, 5-7, 9-12)
- 4,500 MW and 7,500 MW Cases (6, 7, 12) options utilize:
  - Additional 500 kV WY-UT
  - Double Circuit 500 kV UY-NV

TransWest Express - DC
Project Configuration Building Blocks

- 500 kV Bi-pole HVDC in all DC Cases
- Southern Terminal Locations:
  - Las Vegas (Cases 4, 5, 8, 10-12)
  - Phoenix (Cases 3, 7,9)
  - Las Vegas and Phoenix (Case 11)
- Single Circuit 500 kV AC NV-AZ (Cases 8,10,12)

Gateway South and TransWest Express Studied Alternatives

Case No.	Case Description	Combined Cases
1	GS - 345 kV	
2	GS - 500 kV	
3	TWE – HVDC to PHX	
4	TWE – HVDC to LV	
5	GS 500 + HVDC to LV	2 + 4
6	GS – 4500 MW	
7	GS 4500 MW + HVDC to PHX (total 7500 MW)	6 + 3
8	TWE – HVDC to LV + LV-PHX AC	
9	GS 500kV + HVDC to PHX	2 + 3
10	GS 500kV + HVDC to LV + LV-PHX AC	2 + 8
11	GS 500kV + HVDC to LV + 3rd Terminal at LV	
12	GS 4500 MW + HVDC to LV + LV-PHX AC (total 7500 MW)	6 + 8

Gateway South and TransWest Express Conceptual Unit Costs

- Line Construction Capital Costs ($/mile)

	345 kV Single Circuit	500 kV Single Circuit	500 kV Double Circuit	500 kV HVDC Bipole
Construction Cost	$0.96 M	$1.45 M	$2.60 M	$1.24 M
Construction Cost + Right-of-Way	$1.27 M	$1.89 M	$3.00 M	$1.65 M
Const. Cost + ROW + Development + Taxes	$1.40 M	$2.03 M	$3.18 M	$1.79 M
Const. Cost + ROW + Development + Taxes + 10% Contingency	$1.53 M	$2.22 M	$3.48 M	$1.96 M

- AC Substation, Converter Terminal, System Impact, and Project Development costs are also included with Capital Cost Estimates

Alternative Configurations
Cost Estimates and Capacity Levels

- Capacity on Gateway South to Mona is 3,000 MW for all cases
- Load at Mona assumed to be 1,500 MW

Cost Summary				Capacity (MW) WY to:			
Case No.	Case Description	Circuit Miles	Project Cost ($M)	Wyoming Export	Las Vegas Crystal	Las Vegas Marketplace	Phoenix
1	GS - 345 kV	1,050	$2,510	3,000	800		
2	GS - 500 kV	1,125	$2,890	3,000	1,500		
3	TWE – HVDC to PHX	1,375	$4,160	3,000			3,000
4	TWE – HVDC to LV	1,000	$3,080	3,000		3,000	
5	Reference Case: GS 500kV + HVDC to LV	2,100	$5,970	6,000	1,500	3,000	
6	GS – 4500 MW	1,900	$4,670	4,500	3,000		
7	GS 4500 MW + HVDC to PHX	3,300	$8,820	7,500	3,000		3,000
8	TWE – HVDC to LV + LV-PHX AC	1,275	$4,040	3,000		3,000	1,500
9	GS 500kV + HVDC to PHX	2,500	$7,050	6,000	1,500		3,000
10	GS 500kV + HVDC to LV + LV-PHX AC	2,500	$6,930	6,000	1,500	3,000	1,500
11	GS 500kV + HVDC to LV + 3rd Terminal at LV	2,500	$7,470	6,000	1,500	3,000	3,000
12	GS 4500 MW + HVDC to LV + LV-PHX AC	3,300	$8,710	7,500	3,000	3,000	1,500

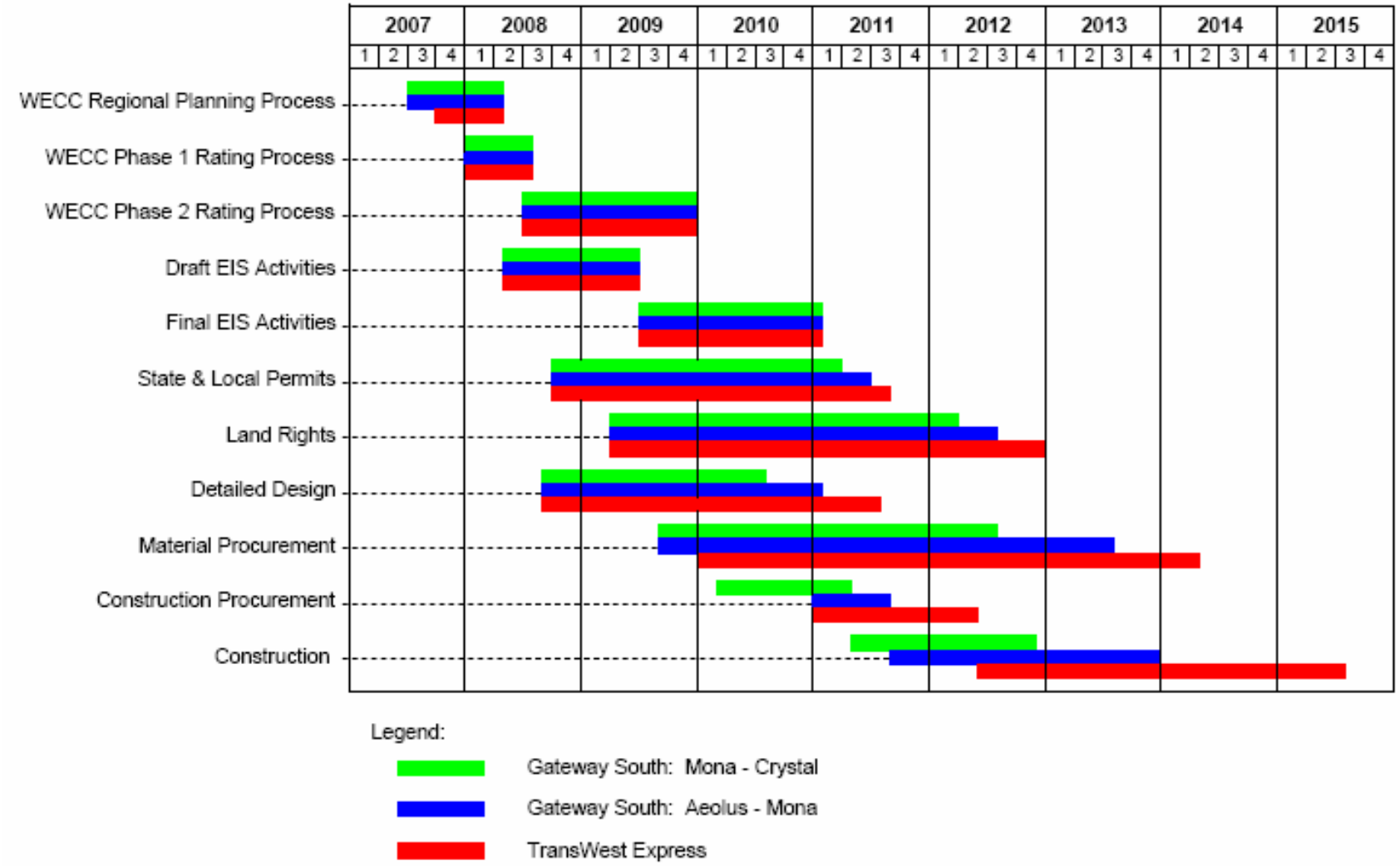
Wyoming to Desert Southwest
Capacity Cost & Delivery Charge Comparisons

		Capacity Cost ($M/MW) WY to:			Delivery Charge ($/MWhr)* WY to:		
Case No.	Case Description	Las Vegas Crystal	Las Vegas Marketplace	Phoenix	Las Vegas Crystal	Las Vegas Marketplace	Phoenix
1	GS - 345 kV	$1.41			$28.04		
2	GS - 500 kV	$1.34			$26.62		
3	TWE – HVDC to PHX			$1.38			$28.29
4	TWE – HVDC to LV		$1.03			$20.99	
5	Reference Case: GS 500kV + HVDC to LV	$1.34	$1.03		$26.62	$20.99	
6	GS – 4500 MW	$1.24			$24.66		
7	GS 4500 MW + HVDC to PHX	$1.24		$1.38	$24.66		$28.29
8	TWE – HVDC to LV + LV-PHX AC		$0.99	$1.70		$20.31	$34.73
9	GS 500kV + HVDC to PHX	$1.34		$1.38	$26.62		$28.29
10	GS 500kV + HVDC to LV + LV-PHX AC	$1.34	$0.99	$1.70	$26.62	$20.31	$34.73
11	GS 500kV + HVDC to LV + 3rd Terminal at LV	$1.34	$0.99	$1.53	$26.62	$20.22	$31.20
12	GS 4500 MW + HVDC to LV + LV-PHX AC	$1.24	$0.99	$1.70	$24.66	$20.31	$34.73

This comparison does not take into account the benefits of south to north flow nor other network impacts.

**Assumes 12.55% Capital Carrying Charge, 75% Load Factor, 4.0% losses for Gateway South and 6.5% losses for TransWest Express*

Conceptual Project Schedule
Potential Synergies Between Project Developments



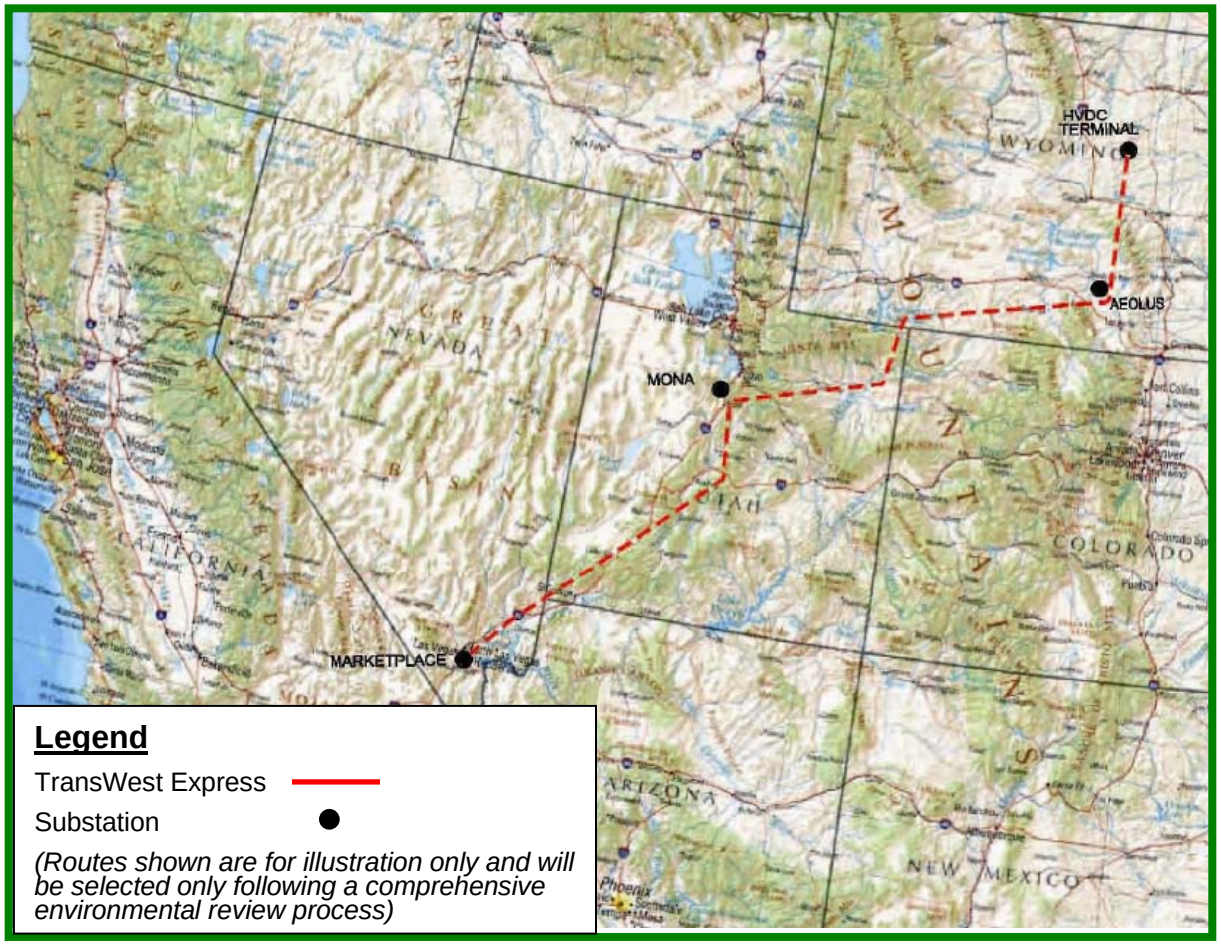
Gateway South and TransWest Express Conceptual Technical Report Findings

- Generally flat cost per MW of capacity for various alternatives. However HVDC has a lower cost per MW for Wyoming to Nevada point to point delivery.
- The 4,500 MW and 7,500 MW Cases increase the cost on a $/MW basis.
- 500 kV design for UT-NV segment of Gateway South results in a lower cost per MW of capacity.
- Estimated shared cost savings associated with joint project development through conceptual planning and permitting may be in the $10M-$30M range.
- The estimated capital cost savings from collaborative development is 5% or more.
- Utilizing shared Right-of-Way is very beneficial from an environmental impact perspective for initial construction and for ongoing line maintenance access.
- Anticipate improved performance with the presence of both the HVDC and AC. The level of improvement is larger with the TWE termination in Southern Nevada.

TransWest Express
Reference Case (Case 4)

Wyoming - Nevada

- 3,000 MW
- 875 - 900 miles
- 500kV bi-pole HVDC
- 2015 in-service date



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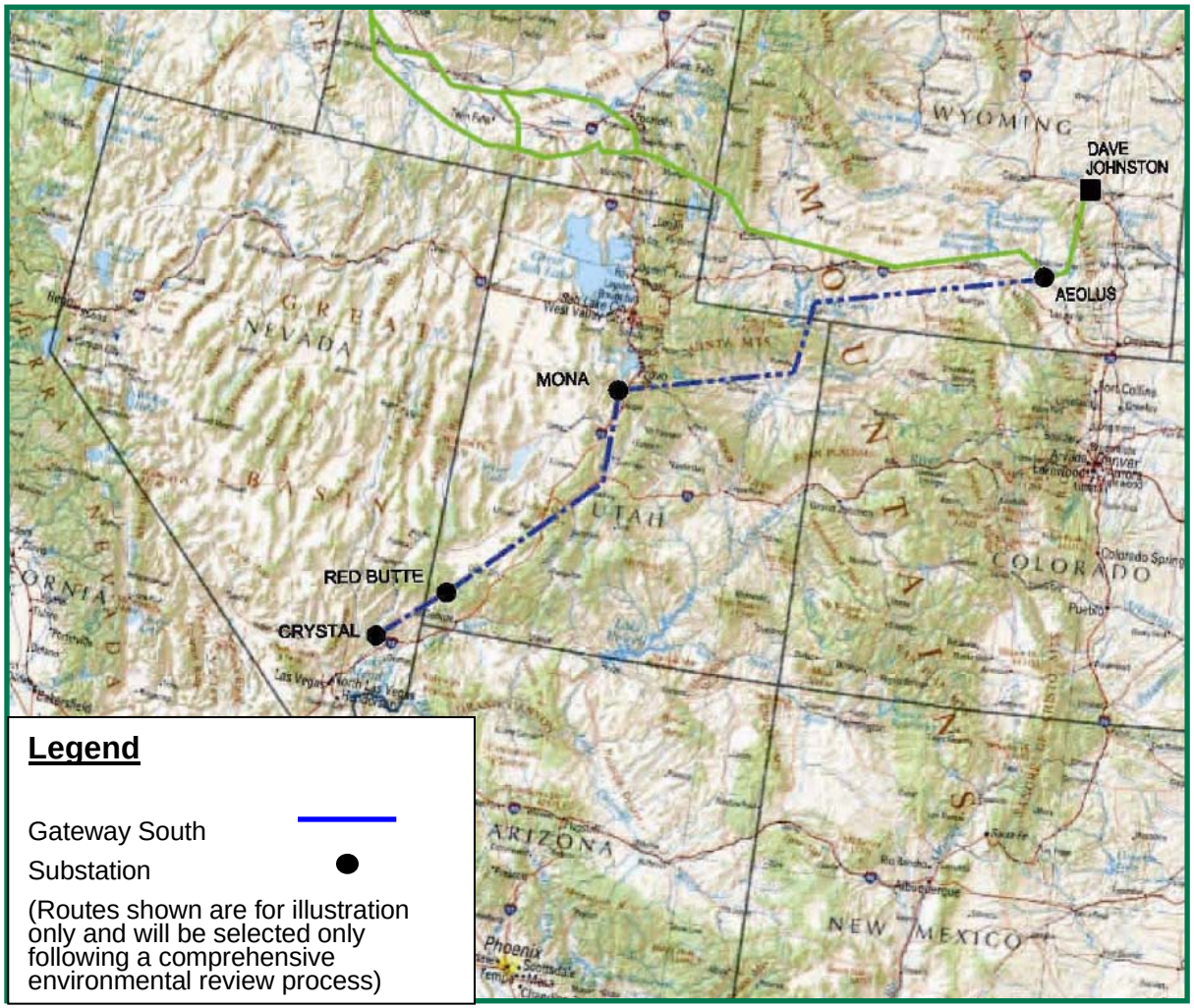
Gateway South
Reference Case (Case 2)

Wyoming - Utah

- 3,000 MW
- 400 miles
- 2 - 500kV AC
- 2013 in-service date

Utah - Nevada

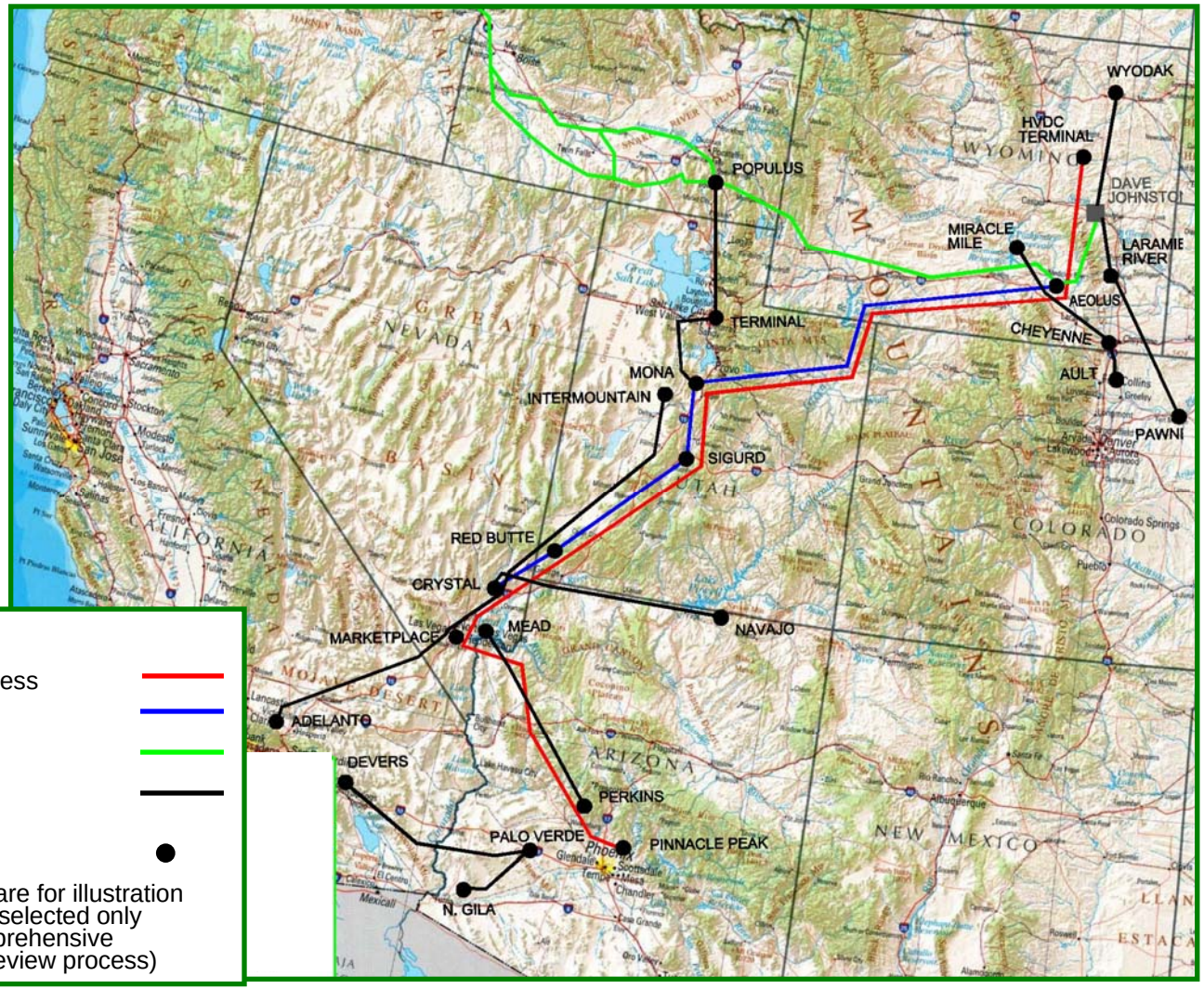
- 1,500 MW
- 330 miles
- 1 - 500 kV AC
- 2012 in-service Date



Gateway South and TransWest Express Conceptual Technical Report Recommendations

- Take forward three alternatives for subsequent system studies, business case evaluation, and within WECC Rating Process.
- Gateway South with double circuit 500 kV between Wyoming and Utah and single Circuit 500 kV between Utah and Nevada (Case 2)
- TransWest Express with 500 kV HVDC between Wyoming and Nevada (Case 4)
- An integrated solution with both projects (Case 5)
- Next Steps
  - Continue system studies to confirm the statements made in the report regarding Project performance and ratings.
  - Ensure that N-2 and common corridor impact and outage cases are fully vetted.
  - Confirm the estimated costs and predicted project schedule with additional input from equipment and material suppliers and construction companies.

Gateway South and TransWest Express Complementary Projects



Legend

- TransWest Express
- Gateway South
- Gateway West
- Complementary Projects
- Substation

(Routes shown are for illustration only and will be selected only following a comprehensive environmental review process)

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Gateway South and TransWest Express Status Update

Organizational

- **Project team, governance, budget and business arrangements established**
- **Aggressive project delivery schedule established**
- **Potential extension of Co-Development Agreement under discussion**

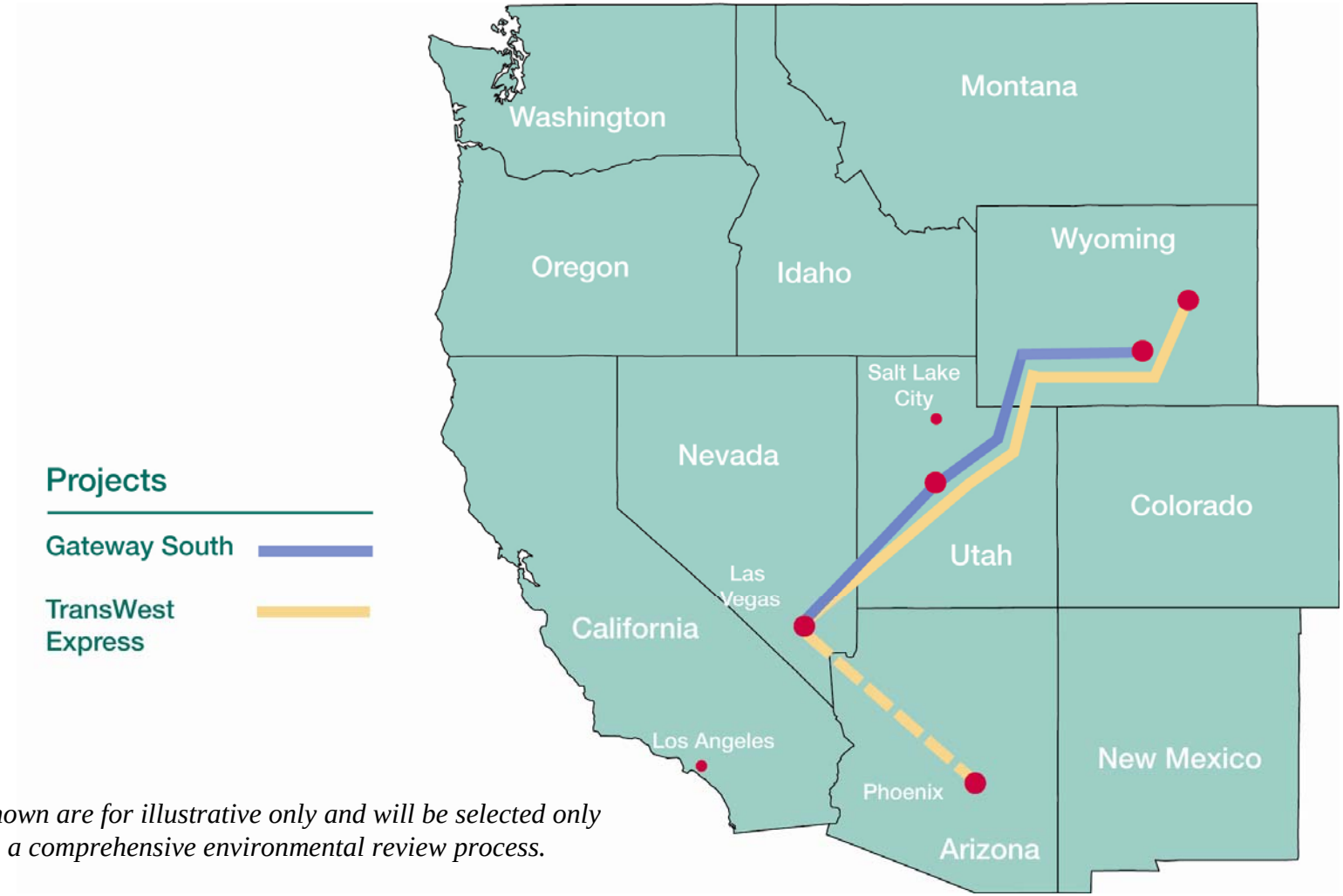
Engineering

- **Conceptual design report completed**
- **Preliminary resource review and need case's developed**
- **Initiated WECC Rating Process (Phase 1) in January 2008**
- **WECC Regional Planning Project Review**
  - Conducted four Stakeholder Meetings
    - Salt Lake City - October 17, 2007
    - Cheyenne – November 7, 2007
    - Phoenix – December 5, 2007
    - Las Vegas - Today
  - Draft Report to be issued in February 2008

Environmental and Permitting

- **Preliminary corridor analysis complete**
- **Preferred and alternate corridors identified**
- **Right of way applications filed with BLM in November 2007**
  - Bureau of Land Management to be Lead Agency
  - Common Environmental Impact Statement likely for both projects

Stakeholder Forum



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