Regional Transmission Planning in the West

State-Federal RPS Collaborative Webinar
Hosted by Clean Energy States Alliance
October 5, 2011

CleanEnergy States Alliance

CEG State-Federal RPS Collaborative

- With funding from the Energy Foundation and the U.S. Department of Energy, the Clean Energy States Alliance has established and facilitated the **State-Federal RPS Collaborative** over the last three years.
- Includes **state RPS administrators and regulators**, **federal agency representatives**, and other RPS stakeholders.
- Goal is to advance dialogue and learning about RPS programs by **examining the challenges and potential solutions** for successful implementation of state RPS programs, including **identification of best practices**.

CleanEnergy States Alliance

Regional Transmission Planning

Presenters:

Thomas Carr, Attorney, Western Interstate Energy Board

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CleanEnergy States Alliance

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Western States RPS and Transmission Planning

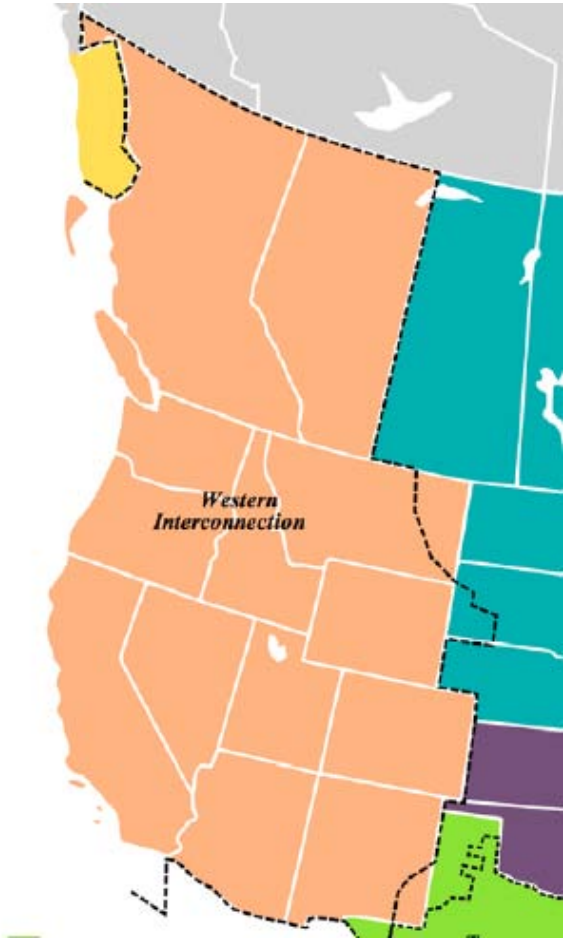
Thomas Carr
Western Interstate Energy Board

October 5, 2011
Webinar for the State-Federal RPS Collaborative

Outline

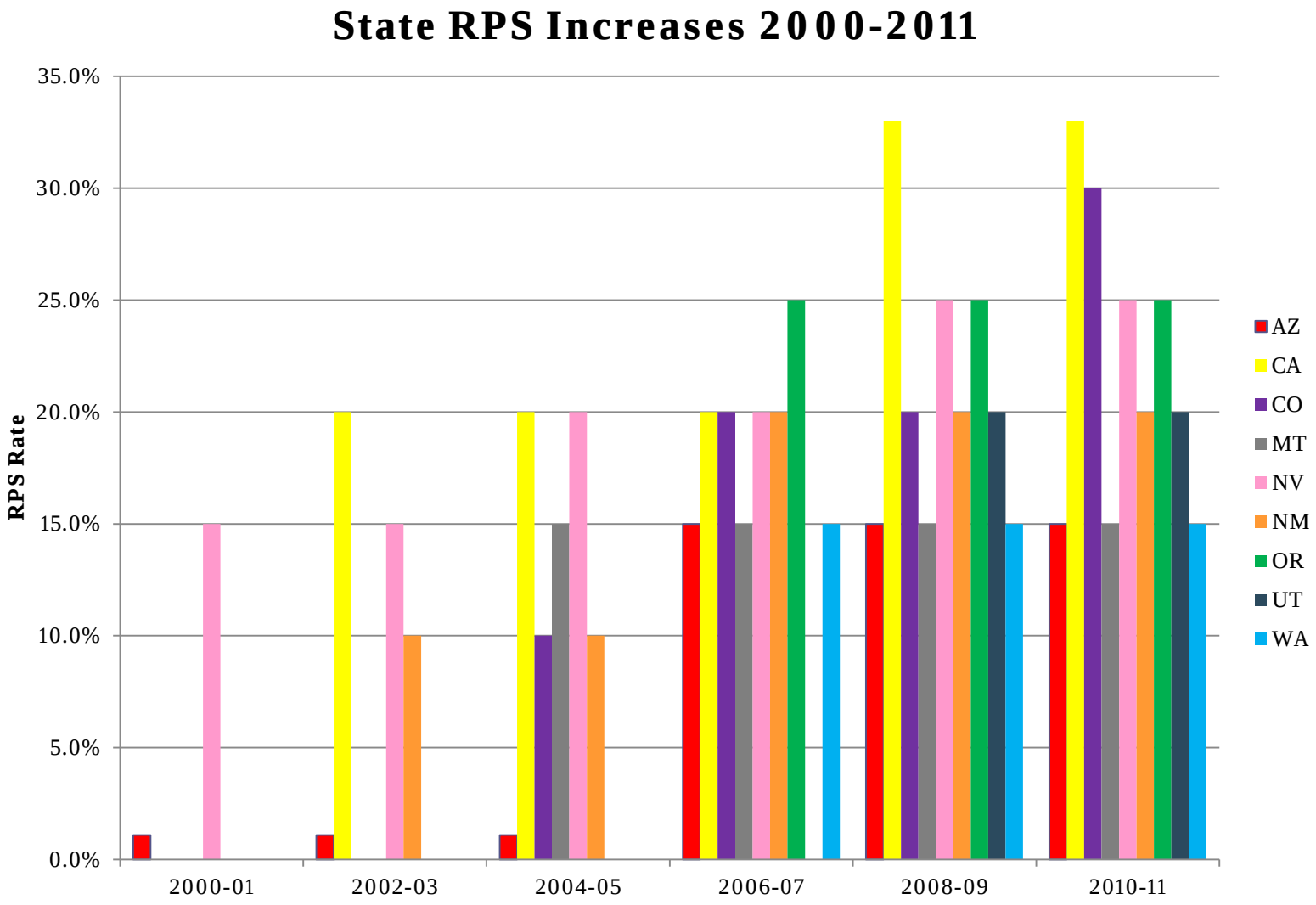
- Renewable Portfolio Standard (RPS) Impacts in the Western Interconnection
- Western Governors' Energy Initiatives
- State-Provincial Role in Interconnection-wide Transmission Planning

RPS in the Western Interconnection



RPS variations across states

- California RPS (33% in 2020)
  - 33% RPS applies to all sectors (IOUs, munis, coops)
  - 3 categories of generation delivery from instate, out-of-state, RECs
- Colorado RPS (30% in 2020)
  - IOUs at 30% while Coops and Munis have a lower 10% requirement
  - grants 125% credit to instate generation
- Nevada RPS (25% BY 2025)
  - allows ¼ to be met through energy efficiency
- Arizona RPS (15% in 2025)
  - 30 % of RPS from distributed generation
- Oregon RPS (25% in 2025)
  - 25% applies to largest utilities; 10% small utilities; 5% smallest utilities
- Utah RPS (20% in 2025)
  - No interim targets prior to 2025


State RPS Increases 2000-2011
RPS Rate
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
2000-01
2002-03
2004-05
2006-07
2008-09
2010-11
AZ
CA
CO
MT
NV
NM
OR
UT
WA

RPS Energy in 2020

- RPS the key driver of renewable development in the West
  - Sets minimum amount (GWh)
  - Where to develop?
  - Transmission?

REFERENCE CASE: 2020 Loads and RPS Requirements in Western Interconnection

State/ Province	2020 Load Forecast (GWh) by Balancing Areas	RPS% for IOUs in 2020 (a)	RPS% for other entities in 2020 (b)	Total RPS Energy (GWh) in 2020	State % of Total RPS Energy (GWh) in 2020
AB	108,555				
AZ	92,283	10.0%	10.0%	5,238	3.7%
BC	63,241				
CA	307,183	33.0%	33.0%	89,055	63.5%
CO	68,639	30.0%	10.0%	11,632	8.3%
ID	27,250				
MEX	17,484				
MT	13,527	15.0%		995	0.7%
NV	39,426	22.0%		5,359	3.8%
NM	18,871	20.0%	10.0%	2,777	2.0%
OR	56,717	20.0%	6.7%	8,368	6.0%
TX	8,104	5.0%		405	0.3%
UT	37,415	13.3%	13.3%	4,668	3.3%
WA	99,539	15.0%		11,789	8.4%
WY	23,387				
Total	**981,620**			**140,288**	**100.0%**

Note:

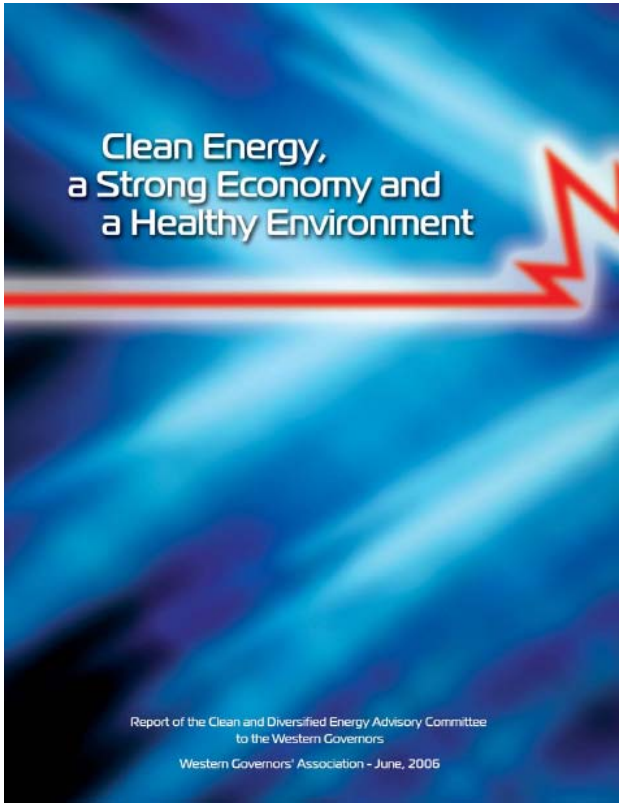
(a) IOU RPS% reflects path of RPS% for IOUs smoothed across years

(b) Muncipals, publics, cooperatives, or smaller utilities

Western Governors' Energy Initiatives

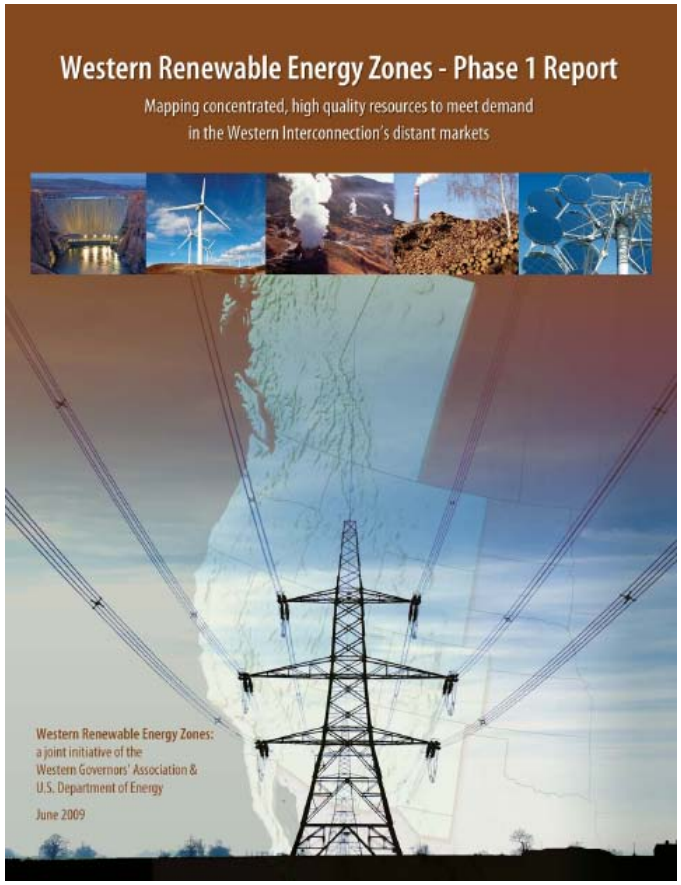
WGA's Clean and Diversified Energy Initiative (2006)

- Goals
  - 30,000 MW of clean energy by 2015
  - 20% energy efficiency by 2020
  - Reliable grid for next 25 years
- West has abundant resources
- Policy recommendations
  - Renewable energy development
  - Transmission



WGA's Western Renewable Energy Zone (WREZ) Project

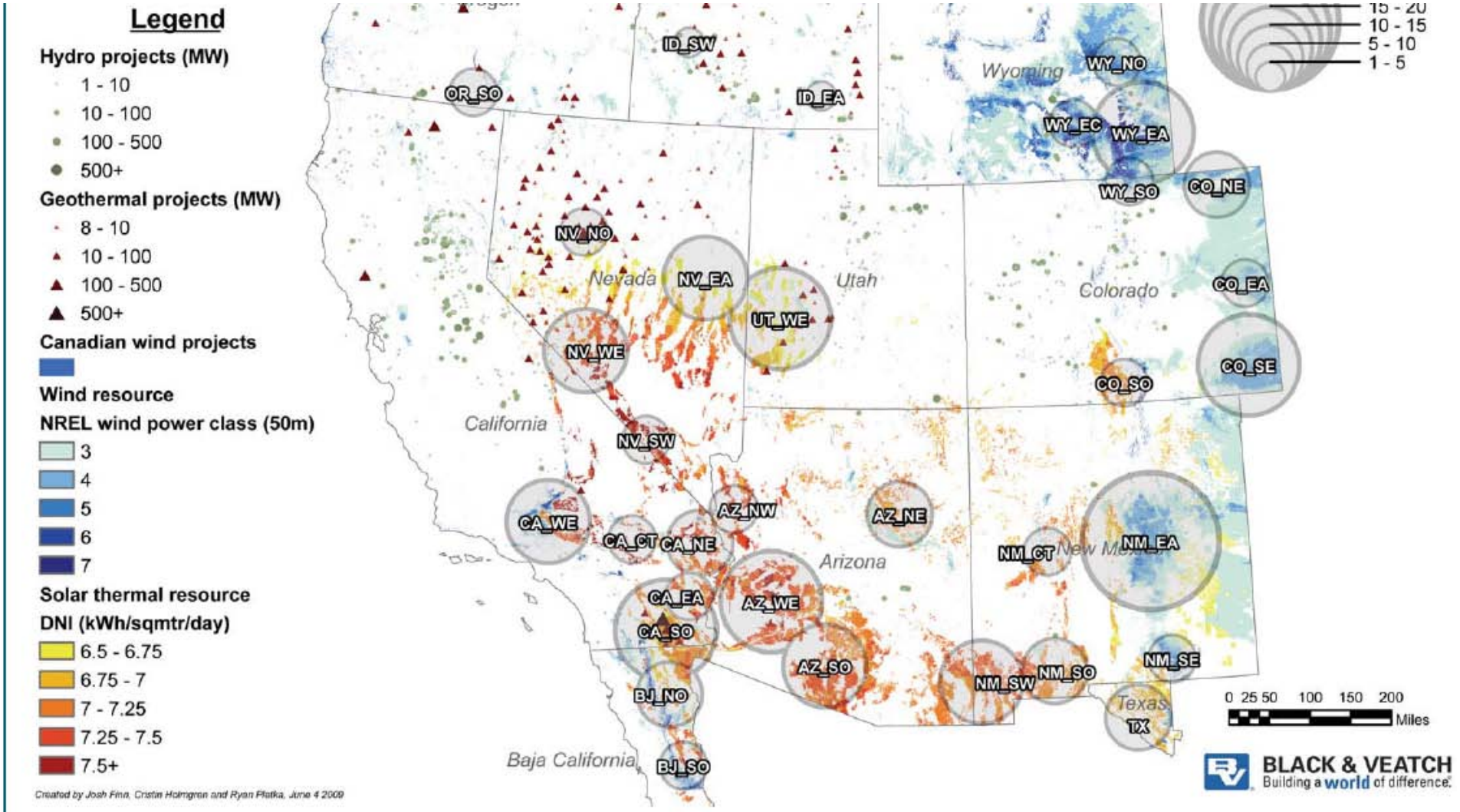
- WREZ Phases
  - Phase 1: Identification of WREZ Hubs (2009)
  - Phase 2: Plan for Transmission between renewable energy zones and load centers (2010)
  - Phase 3: Collaborate with load serving entities on opportunities (current)
  - Phase 4: Siting projects and cost allocation (current)



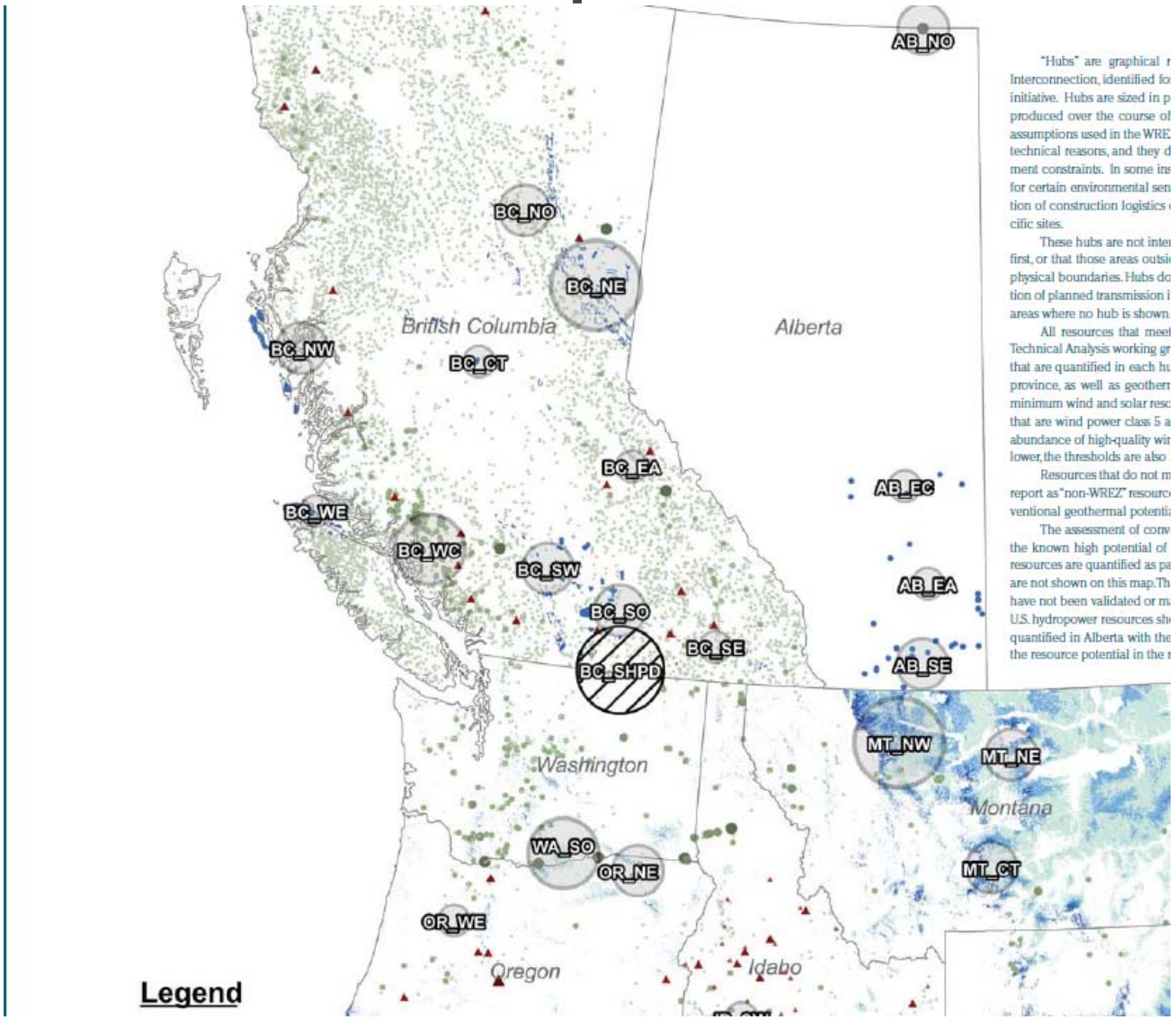
WREZ Phase 1

- Identified renewable energy zones (“Hubs”)
  - Areas of renewable resource potential that would support interstate transmission (500 kV AC)
  - 1500 MW of high quality renewable energy within a 100 mile radius
  - Hub size proportional to annual energy potential
- Exclusions
  - Statutory and regulatory exclusions (e.g., national parks, monuments, wilderness areas) and other exclusions

WREZ Phase 1 Map – South



WREZ Phase 1 Map – North



"Hubs" are graphical r
Interconnection, identified fo
initiative. Hubs are sized in p
produced over the course of
assumptions used in the WRE
technical reasons, and they d
ment constraints. In some ins
for certain environmental sen
tion of construction logistics
cific sites.

These hubs are not inte
first, or that those areas outsi
physical boundaries. Hubs do
tion of planned transmission
areas where no hub is shown.

All resources that meet
Technical Analysis working gr
that are quantified in each hu
province, as well as geotherm
minimum wind and solar resc
that are wind power class 5 a
abundance of high-quality wi
lower, the thresholds are also

Resources that do not m
report as "non-WREZ" resourc
ventional geothermal potenti

The assessment of conv
the known high potential of
resources are quantified as pa
are not shown on this map. Th
have not been validated or m
U.S. hydropower resources sh
quantified in Alberta with the
the resource potential in the

State-Provincial Role in Interconnection-wide Transmission Planning

New Interconnection-wide Transmission Planning

- 2009 U.S. DOE proposed funding for interconnection-wide transmission planning under the American Recovery and Reinvestment Act
- Western Interconnection recipients:
  - Topic A: Western Electricity Coordinating Council
  - Topic B: WGA, Western PUCs, Provinces
- New era:
  - Obligation to produce transmission “plans”
  - Increase in resources and stakeholder participation

State-Provincial Role in the West

- State-Provincial Steering Committee (SPSC)
  - 2 members per state appointed by Governor and PUC
  - Premier appointees for provinces
  - Ex Officio members from Western States Water Council and Western Governors' Wildlife Council
- Wildlife decision support system
- Energy-water nexus

Western Governors

WGA Staff Council

WGETAC

Western Conference of Public Service Commissioners

Western States Water Council

(water/energy nexus)

Western Governors' Wildlife Council

(decisions support system)

State-Provincial Steering Committee

- Transmission planning
- Integration of variable generation
- Grid utilization

Topic A

National Lab support

- **Water consumption modeling**

National lab support

- **Energy efficiency / demand response/ distributed generation**
- **WREZ model**
- **Support in IRP reviews**
- **Future technology costs**

SPSC Study Requests to WECC 2010

- Reference Case
  - Based on utility IRP/resource plans with review by state regulators
- High DSM Scenario
  - Energy efficiency, demand response, combined heat and power resources
  - Targets: economic potential and technological potential
- Carbon Reduction Scenario
  - Targets from Waxman-Markey
  - Tools: DSM and carbon adder
- Technological Breakthrough
  - Impacts from breakthroughs on PV, nuclear, IGCC, DSM, transmission, and other

Resource Planner Forum

- Outreach to utility resource planners to inform transmission planning efforts
- WECC, WGA, western PUCs organized the first meetings of utility resource planners in Feb. 2009 and June 2010
- Objectives:
  - Feedback on IRP/plans for future generation additions
  - WREZ Phase 3 launch with planners
  - Facilitate discussion and problem solving among planners on common challenges/issues

Emerging Issues

- WECC's transmission plans
  - 10-Year Plan released Sept. 2011
  - 20-Year Plan due 2013
- Future development of renewable resources
  - Remote v. local– local dominating 10-year outlook
  - Changes in public policies: RPS or climate change
  - Wind v. solar – falling PV prices
  - Distributed generation – growing factor
  - DSM & demand response – slower load growth
  - Future technological changes in 20 year time horizon

Bradley Nickell
Director of Transmission Planning

10-Year Regional Transmission Plan
WECC Overview
September 2011

Glossary

ECC – Enhanced Curtailment Calculator
EDTTRS – Efficient Dispatch Toolkit Technical Review Subcommittee
EIM – Energy Imbalance Market
EDT – Efficient Dispatch Toolkit
FERC – Federal Energy Regulatory Commission
IRP – Integrated Resource Plan
FOA – Funding Opportunity Announcement
MIC – Market Interface Committee
NERC – North American Electric Reliability Corporation
NGO – non-profit, Non-governmental Organization
RPS – Renewable Portfolio Standard
RTEP – Regional Transmission Expansion Planning Project (activities funded by the DOE grant)
SCED – Security Constrained Economic Dispatch
SCG – Subregional Coordination Group (group of SPGs)
SPG – Subregional Planning Group
SPSG – Scenario Planning Steering Group (WECC multi-constituency steering group)
SPSC – State and Provincial Steering Committee (State steering group)
TEPPC – Transmission Expansion Planning and Policy Committee
TSS – WECC Technical Studies Subcommittee
VGS – Variable Generation Subcommittee
WGA – Western Governors' Association
WIEB – Western Interstate Energy Board
WREZ – Western Renewable Energy Zone

RTEP

What have we been asked to do?

Regional Transmission Expansion Planning (RTEP)

Expand the breadth and depth of WECC's existing Regional Transmission Planning processes under TEPPC.

- 2011 Deliverables
  - Create a multi-constituency Steering Group
  - **10-Year Regional Transmission Plan**
  - Acquire new long-term planning tools
  - Create educational materials

WECC

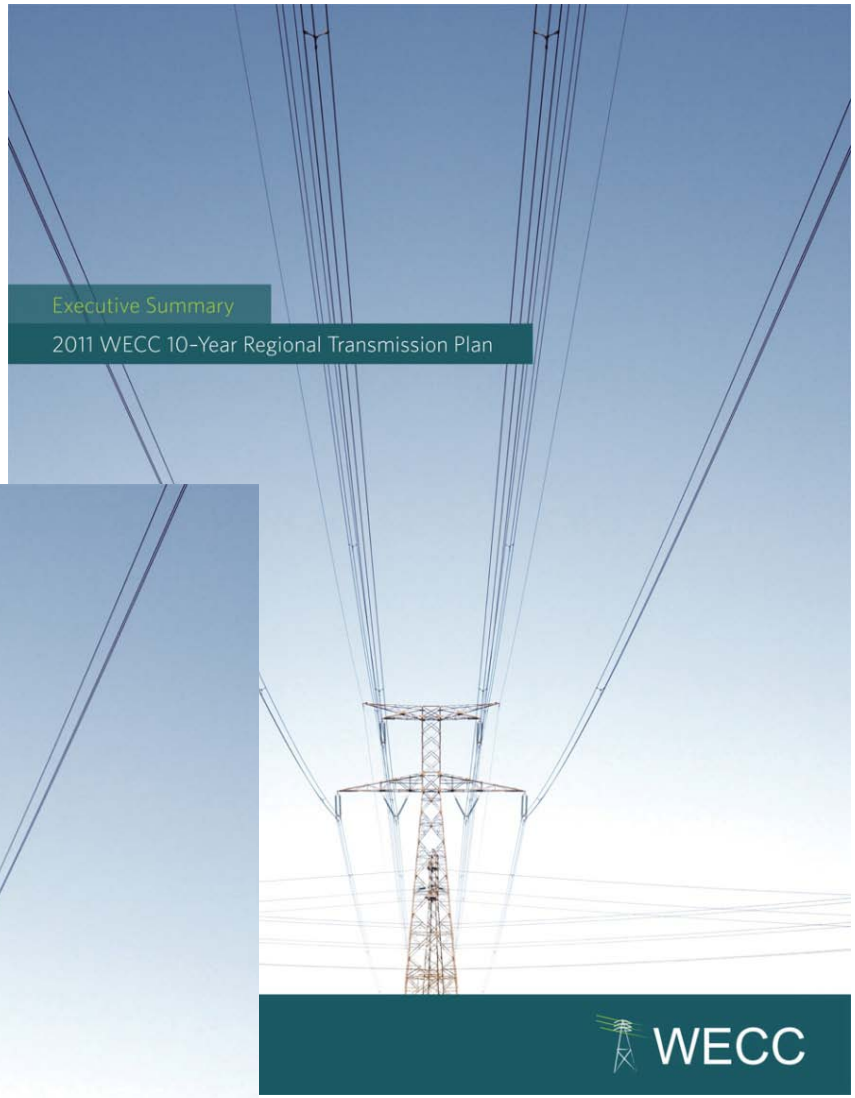
10-Year Regional Transmission Plan
Documentation Package

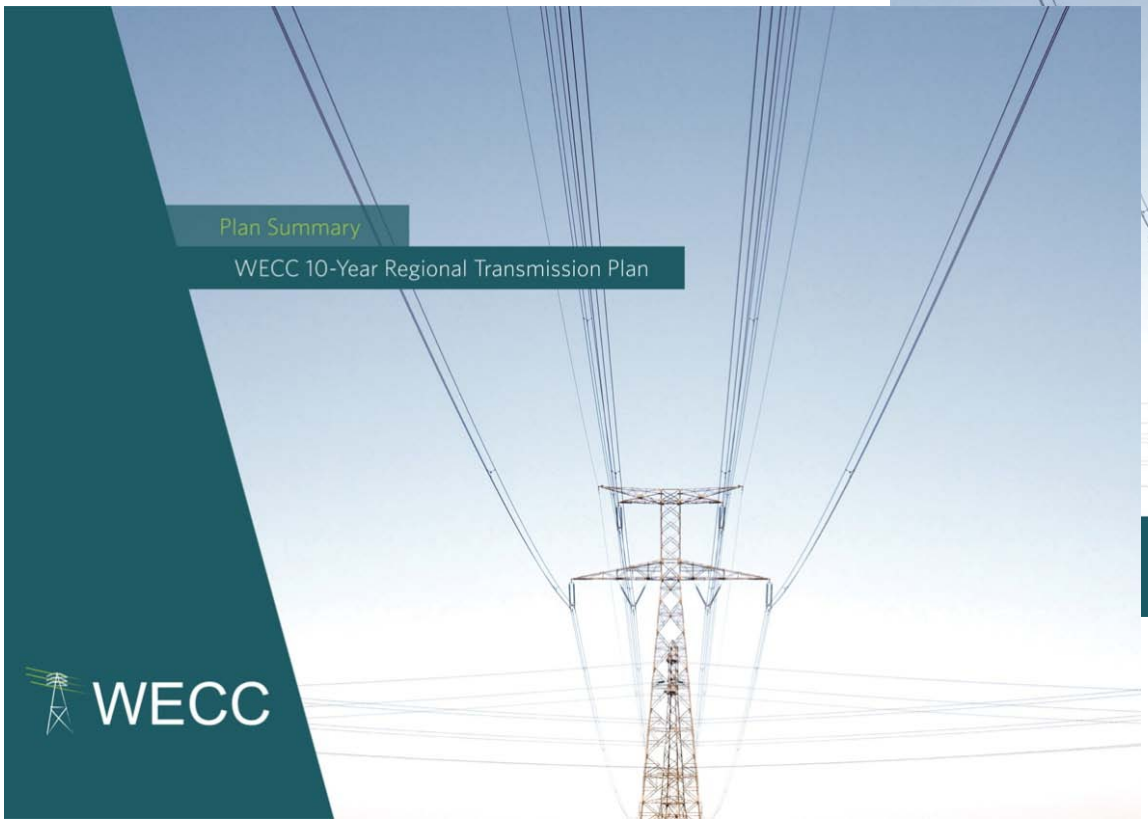
- Executive Summary Brochure
  - o High-level document with the major observations, recommendations, and overview of the Western Interconnection.
- Plan Summary Brochure
  - o Details on the study approach, process, caveats, observations, recommendations, and related information
- Plan Study Reports – electronic-only
  - o 2019 and 2020 Study Reports
  - o Path Reports
  - o EDTF Report
- Links to related documents by other organizations

All information at www.wecc.biz/10yrplan

10-Year Regional Transmission Plan

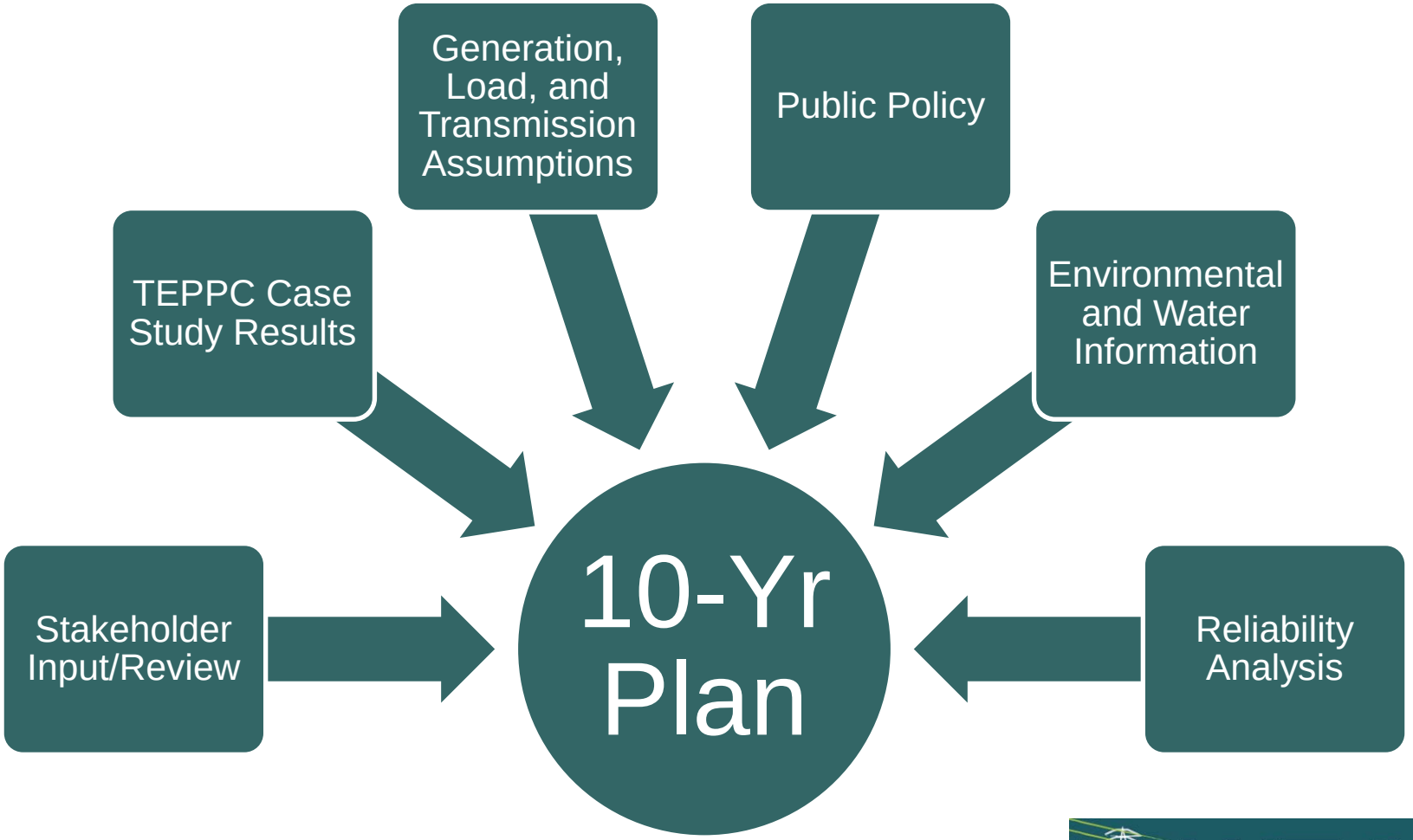
Printed Material





10-Year Regional Transmission Plan

Plan Inputs



10-Year Regional Transmission Plan

Key Messages

- The Plan is a regional perspective
  - o Expected future network
  - o Alternative futures
  - o Other insights
- The Plan is stakeholder-driven
  - o Assumptions, studies, results
- This is the first-time for this product

Expected Future Network

- Based on stakeholder-provided assumptions regarding loads, generation, and transmission
- The generation mix is a significant departure from the past
- The transmission network, including assumed additions, enabled energy to flow without significant congestion except in two areas

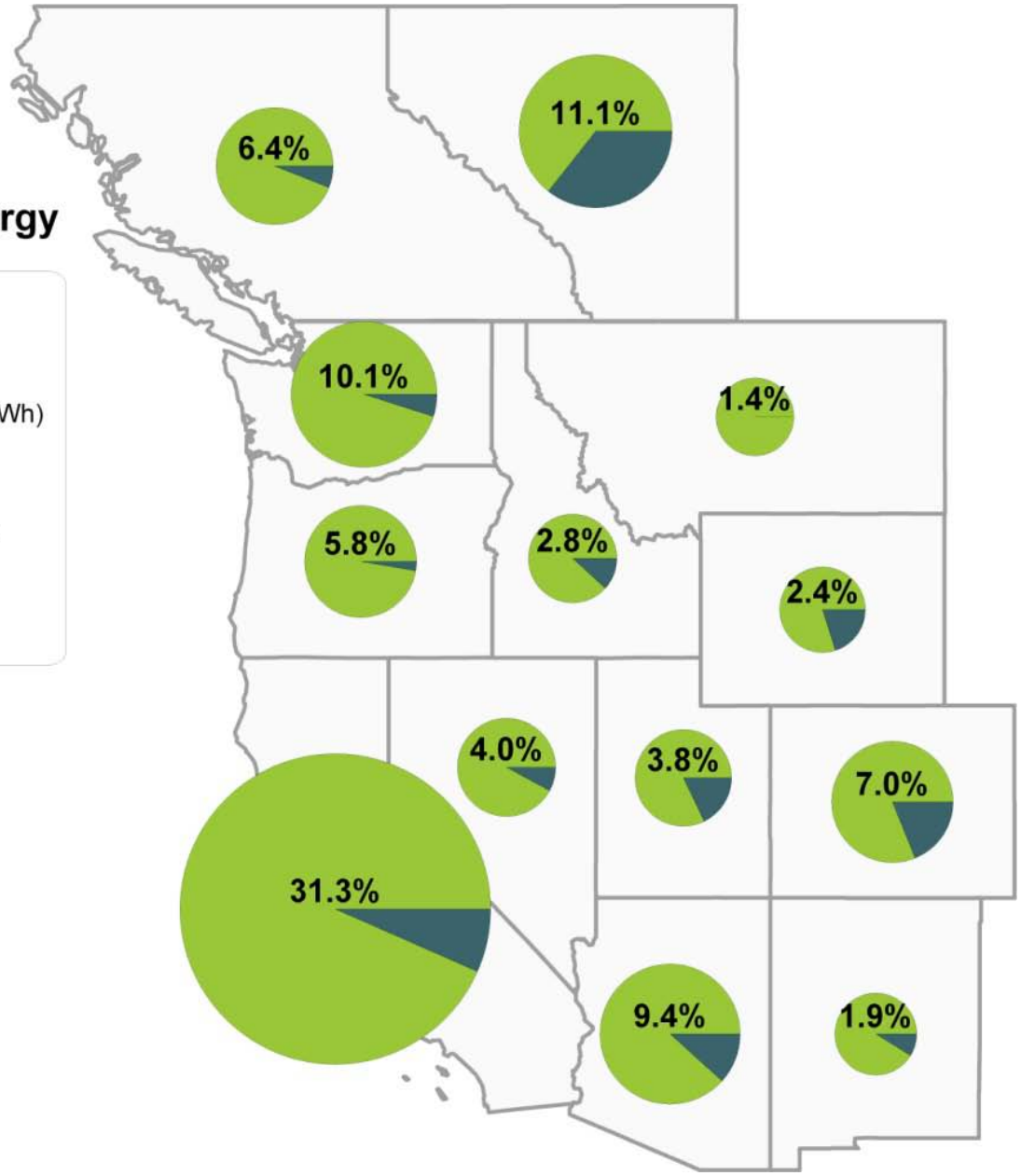
2020 Expected Future Load Forecast by State in Annual Energy

Legend

- 2009 Actual Load (GWh)
- 2009 - 2020 Incremental Load Forecast (GWh)
- % State percent of total WECC 2020 load

Expected Future Load (Total): 981,460 GWh

Note: Mexico (CFE) = 1.8%
Texas (El Paso) = 0.8%



Generation Capacity Additions and Retirements by State and Province 2010-2020

Retired Resources

Coal Gas

Installed Resources

Coal Gas Hydro Solar

Geothermal Wind Other

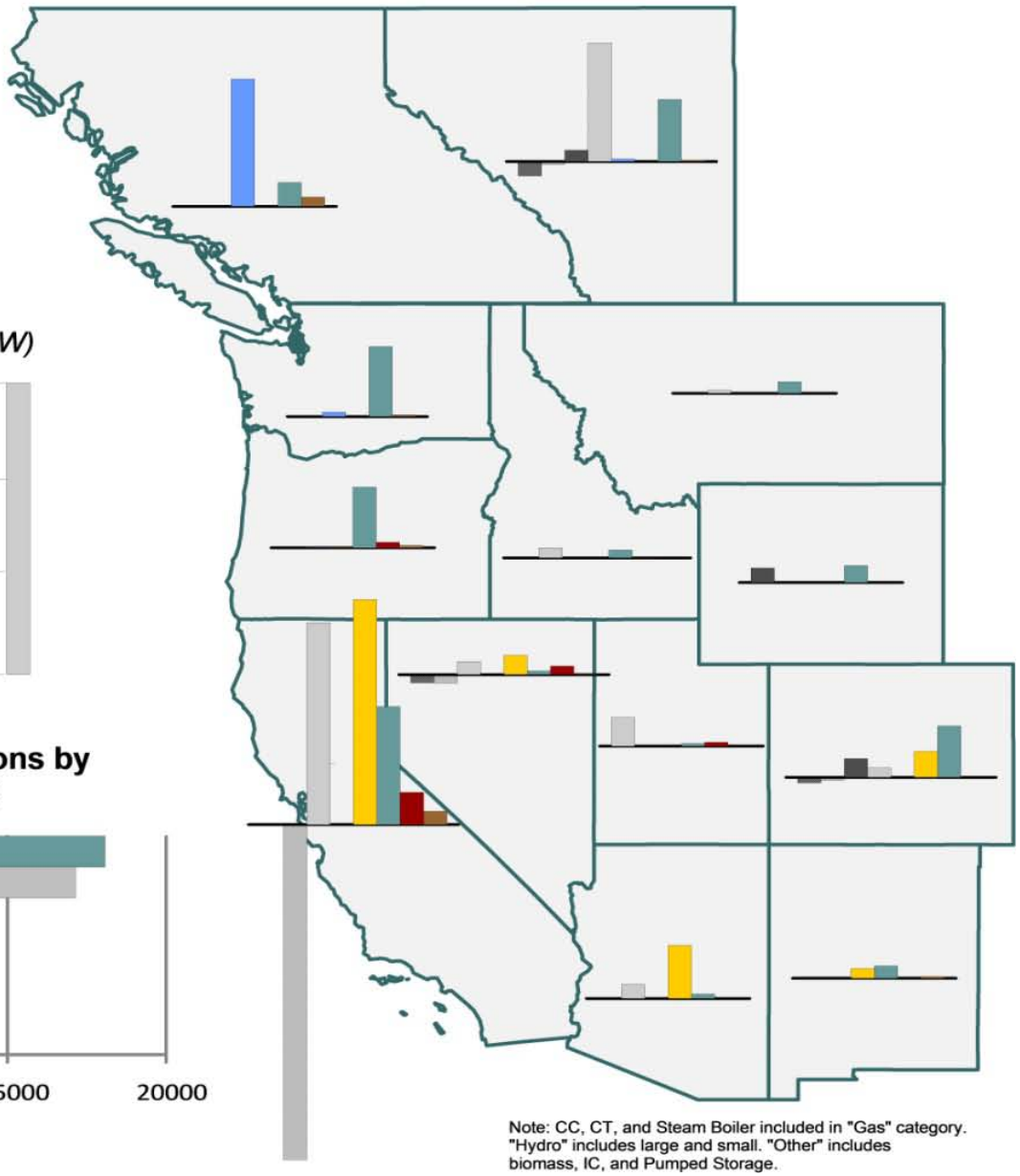
Scale (MW)

12,000 MW

8,000 MW

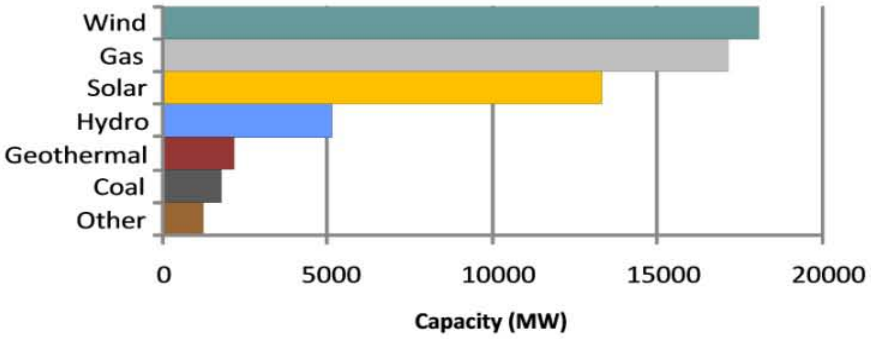
4,000 MW

0 MW



Note: CC, CT, and Steam Boiler included in "Gas" category. "Hydro" includes large and small. "Other" includes biomass, IC, and Pumped Storage.

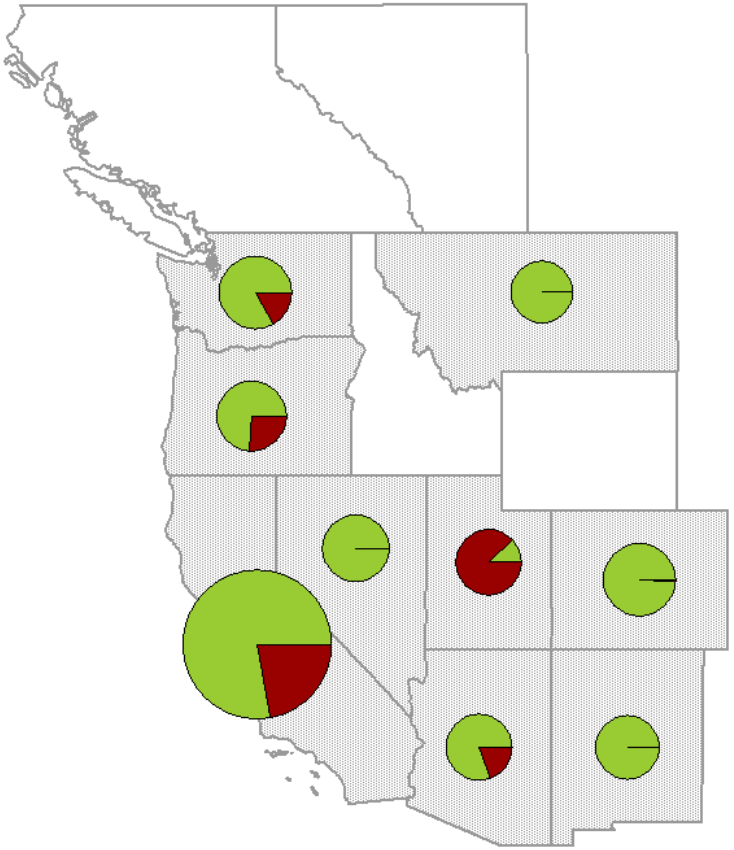
WECC Generation Capacity Additions by Resource Type: 2010 - 2020



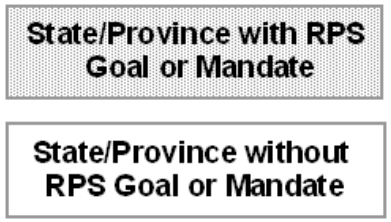
WECC

Renewable Procurement Trends

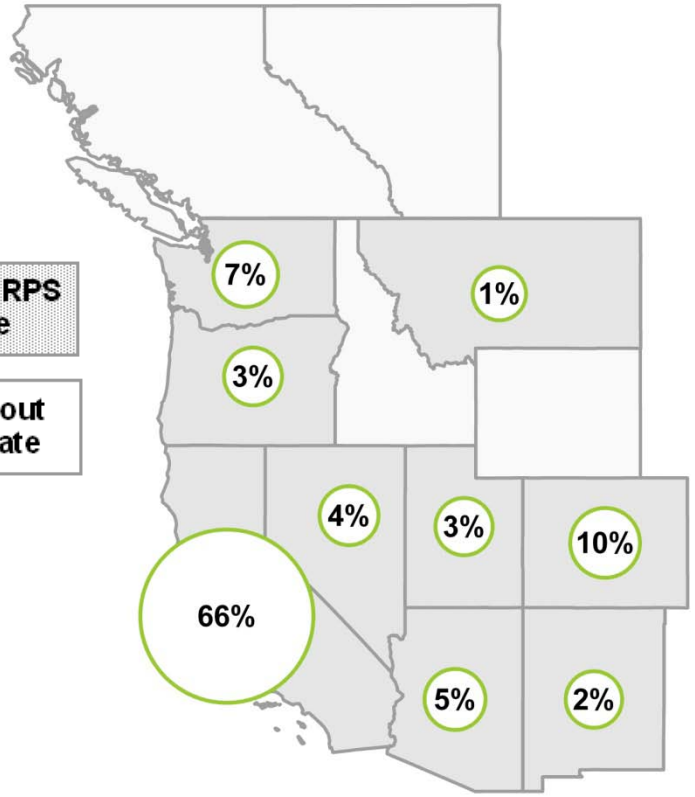
RPS Compliance Using In and Out of State/Province Resources (by Energy)



79% of RPS energy served by in-state resources in 2020 Expected Future



Percentage of WECC Incremental RPS Energy by State/Province: 2010 - 2020

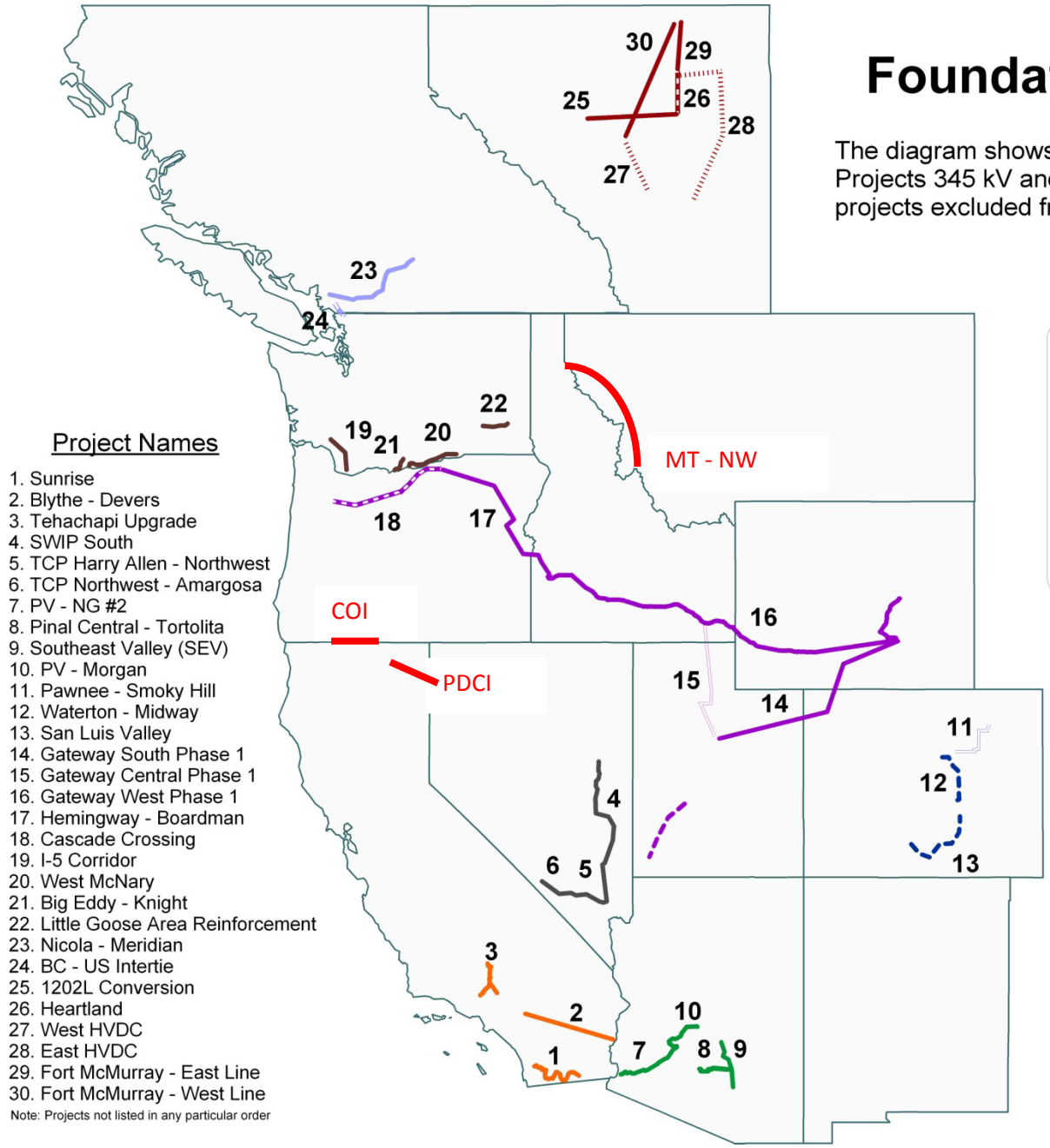


Total WECC Incremental RPS Energy 2010-2020 = 89,644 GWh

WECC

Foundational Projects - 2020

The diagram shows illustrative routings for 30 SCG Foundational Projects 345 kV and higher. There are 14 lower voltage/reinforcement projects excluded from the map for clarity.



Project Names

1. Sunrise
2. Blythe - Devers
3. Tehachapi Upgrade
4. SWIP South
5. TCP Harry Allen - Northwest
6. TCP Northwest - Amargosa
7. PV - NG #2
8. Pinal Central - Tortolita
9. Southeast Valley (SEV)
10. PV - Morgan
11. Pawnee - Smoky Hill
12. Waterton - Midway
13. San Luis Valley
14. Gateway South Phase 1
15. Gateway Central Phase 1
16. Gateway West Phase 1
17. Hemingway - Boardman
18. Cascade Crossing
19. I-5 Corridor
20. West McNary
21. Big Eddy - Knight
22. Little Goose Area Reinforcement
23. Nicola - Meridian
24. BC - US Intertie
25. 1202L Conversion
26. Heartland
27. West HVDC
28. East HVDC
29. Fort McMurray - East Line
30. Fort McMurray - West Line

Note: Projects not listed in any particular order

Transmission Key

- 500 kV Single Circuit Line
- 345 kV Single Circuit Line
- 500 kV Double Circuit Line
- 345 kV Double Circuit Line
- DC Circuit (various voltages)

Sub-Region Key

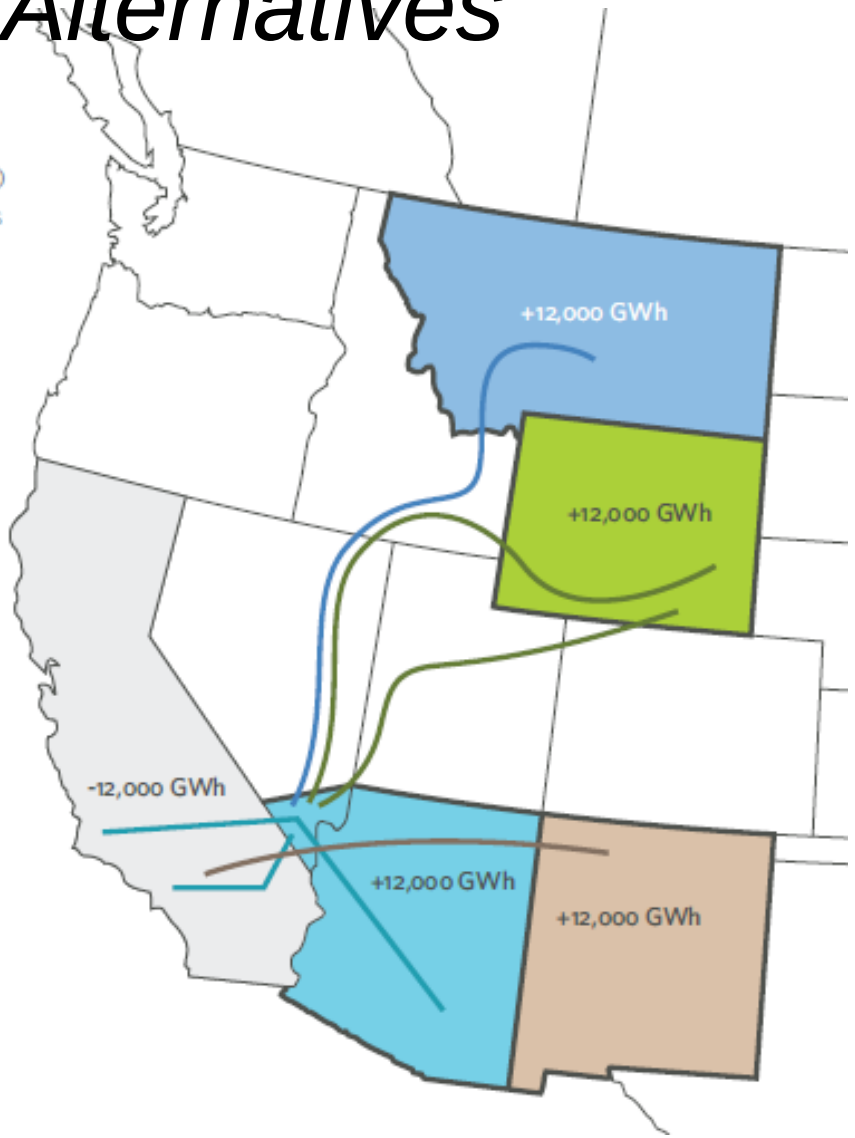
CAISO	NTTG
SSPG	CG
SWAT	BCCPG
CCPG	AESO

WECC

Resource Relocation Alternatives

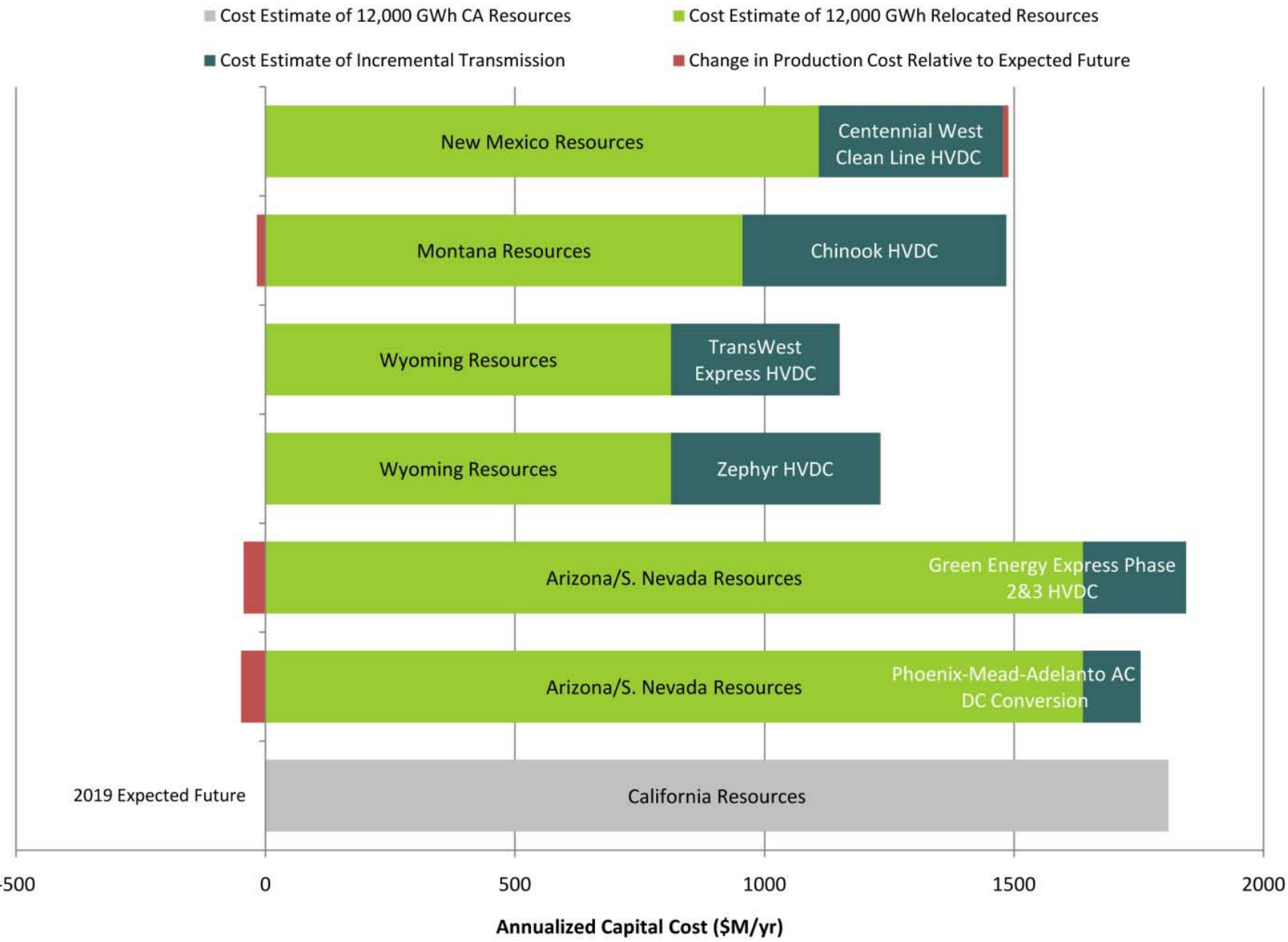
Transmission Expansion

- Relocate 12,000 GWh of renewable generation from California to eight different locations
- Observe the impact on costs and transmission needs



WECC

Capital Cost Comparison of Potentially Cost-Effective Resource Relocation Alternatives with Large-Scale Transmission Expansion



10-Year Regional Transmission Plan
Observations & Recommendations

1. Cost-effective remote renewable resources
2. Montana to Northwest (Path 8)
3. Pacific Tie Paths (Paths 65, 66)
4. Operational impacts of variable generation
5. Planning cooperation
6. Environmental and cultural considerations in future transmission planning processes
7. Water resource impacts on the future generation mix
8. Gaps in regional transmission planning processes

Looking Forward

- Process Improvements
  - o Long-term capital planning tools
  - o Scenario-driven planning
  - o Inclusion of water & environmental factors
  - o Operational and reliability impacts
- Things we won't realize by this process
  - o Quantification of impacts on specific ratepayers
  - o Cost allocation
  - o Permitting or siting

Questions

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All information on the WECC 10-Year Regional Transmission Plan may be found at http://www.wecc.biz/10yrPlan.