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RETI Phase 2 Update Workgroup

Black & Veatch: Ryan Pletka, Tim Mason, Sally Maki

Special Guest: Rich Ferguson

Working Group Meeting

September 24, 2009

RETI Phase 2 Update Workgroup Issues

- Economic Model Update
 - Model review
 - Incentives Assumptions
- Extended Analysis of WECC Resources
 - Introduction
 - Approach
- CREZ and Technology Updates



TBD



 **Net Short Update**

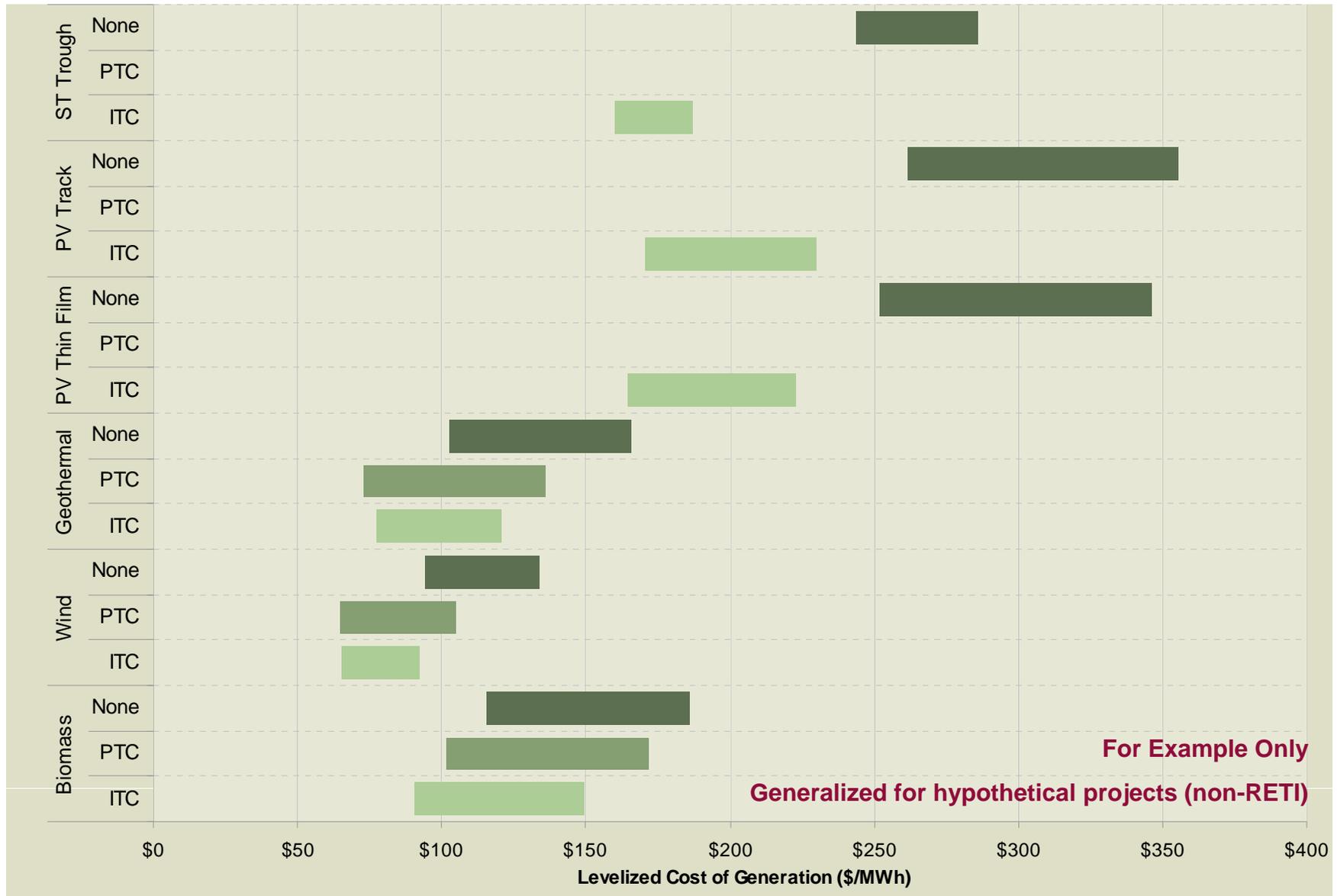
Economic Model

- Updated levelized cost of energy model
 - Couple of clarifications questions answered
 - No material comments
 - Will assume to be good working model unless substantive issues arise
- Need guidance on assumptions for “base case” incentives and timing

Current Renewable Incentive Timelines

- 30% Grant
 - 12/31/2010 – must “start construction” – All technologies
 - Same placed in service guidelines as below
- 30% Investment Tax Credit
 - 12/31/2012 – Wind
 - 12/31/2013 – Biomass, Geothermal, others
 - 12/31/2016 – Solar
- \$10-21/MWh Production Tax Credit
 - 12/31/2012 – Wind
 - 12/31/2013 – Biomass, Geothermal, others
 - Not applicable to solar

Impact of Subsidies for Renewables (ITC = Grant)



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Out-of-State Resources in RETI

RETI Phase 1 Assessment Method for Resources

		CA	OR	WA	NV	AZ	Baja	BC
Bio		Detailed	Detailed	Detailed				PG&E
PV		Detailed						
ST		Detailed			BLM, South only	BLM, West only		
Wind		Detailed	Class / regional	Class / regional	BLM, South only		Class / regional, North only	PG&E
Geo		Detailed	Detailed		Detailed			Detailed, South

RETI	MW
	GWh/yr

		CA	OR	WA	NV	AZ	Baja	BC
Bio		1,725	454	449				1,520
		12,087	3,182	3,147				10,652
PV*		27,460						
		58,680						
ST		65,200			7,429	7,129		
		159,214			17,761	17,722		
Wind		16,208	4,688	3,762	1,475		5,000	2,405
		46,093	10,326	11,877	3,203		14,449	18,371
Geo		1,918	520		1,283			244
		14,623	3,959		9,165			1,869

*Distributed 20 MW PV projects only. PV could also be built on solar thermal land

Proposed Changes to OOS Assessment Sources

		CA	OR	WA	NV	AZ	Baja	BC
Bio		Detailed	Detailed	Detailed				PG&E → WREZ
PV		Detailed			Not done → WREZ	Not done → WREZ		
ST		Detailed			BLM, South only → WREZ	BLM, West only → WREZ		
Wind		Detailed	Class / regional → WREZ	Class / regional → WREZ	BLM, South → Multiple options		Class / regional, North → Detailed	PG&E → WREZ
Geo		Detailed	Detailed → WREZ		Detailed → WREZ			Detailed, South → WREZ

MW: RETI vs. WREZ

		CA	OR	WA	NV	AZ	Baja	BC
Bio		1,725	454	449				1,520
		145	652	101	299	329		939
PV		27,460			18,960	20,178		
ST		65,200			7,429	7,129		
		16,931			18,960	20,178	5092	
Wind		16,208	4,688	3,762	1,475		5,000	2,405
		6,042	2,913	3,262	432	3,714	2,963	13,942
Geo		1,918	520		1,283			244
		1,434	832		1,408			340

Notes: PV and ST not differentiated in WREZ, assumed all ST

GWh/yr: RETI vs. WREZ

		CA	OR	WA	NV	AZ	Baja	BC
Bio		12,087	3,182	3,147				10,652
		1,080	4,855	752	2,226	2,450		6,992
PV		58,680						
ST		159,214			17,761	17,722		
		44,015			46,262	54,180	14,069	
Wind		46,093	10,326	11,877	3,203		14,449	18,371
		16,122	7,479	8,230	1,085	9,191	8,897	34,103
Geo		14,623	3,959		9,165			1,869
		11,074	6,146		10,041			2,540

Notes: PV and ST not differentiated in WREZ, assumed all ST

Proposed Changes to OOS Analysis

- Change to WREZ
 - Biomass - BC
 - Wind - OR, WA, BC
 - Solar PV - Add NV and AZ (previously not included)
 - Solar Thermal – NV, AZ
 - Geothermal – All areas except California (WREZ more recent)
- Special Cases
 - Baja Wind → Detailed assessment
 - Nevada Geothermal and Wind → Many options

Nevada Geothermal and Wind

Options

- No Change (detailed assessment for geothermal, BLM data for wind)
- WREZ
- RETAAC
- New detailed assessments, including environmental (may also add solar, in this case)

Nevada RETAAC

- Goal: to develop NV transmission recommendations
- Identifies zones for Wind, Solar, Geothermal and Biomass
 - Only identifies *concentrations*, **not** projects or MW numbers
- Resource information sources:

TABLE 3: SOURCES OF DATA INDICATING LOCATION/CONCENTRATION OF NEVADA’S RENEWABLE ENERGY RESOURCES

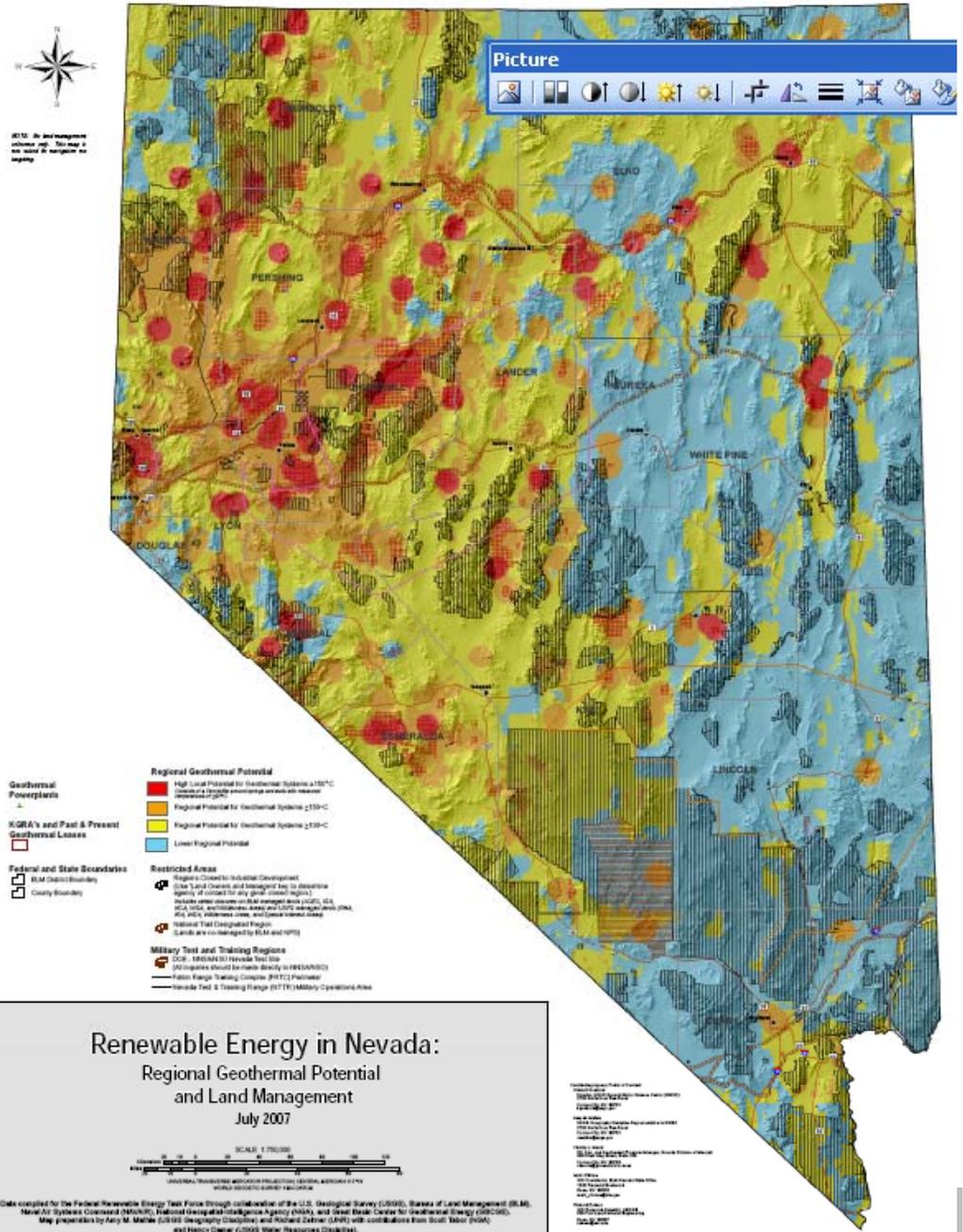
Type of Resource	USGA Geo Resource Map	RETI Geo EX Map	RETI B&V Site ID & Screening	Utility OASIS Interconnect Studies	BLM Site R/W & Lease	NVE 2007-08 RFP Responses (1)	NREL Resource Maps
Geothermal	X	X		X	X	X	X
Solar			X	X	X	X	X
Wind			X	X	X	X	X

Notes:

(1) Confidential bid information. All other sources are publicly available.

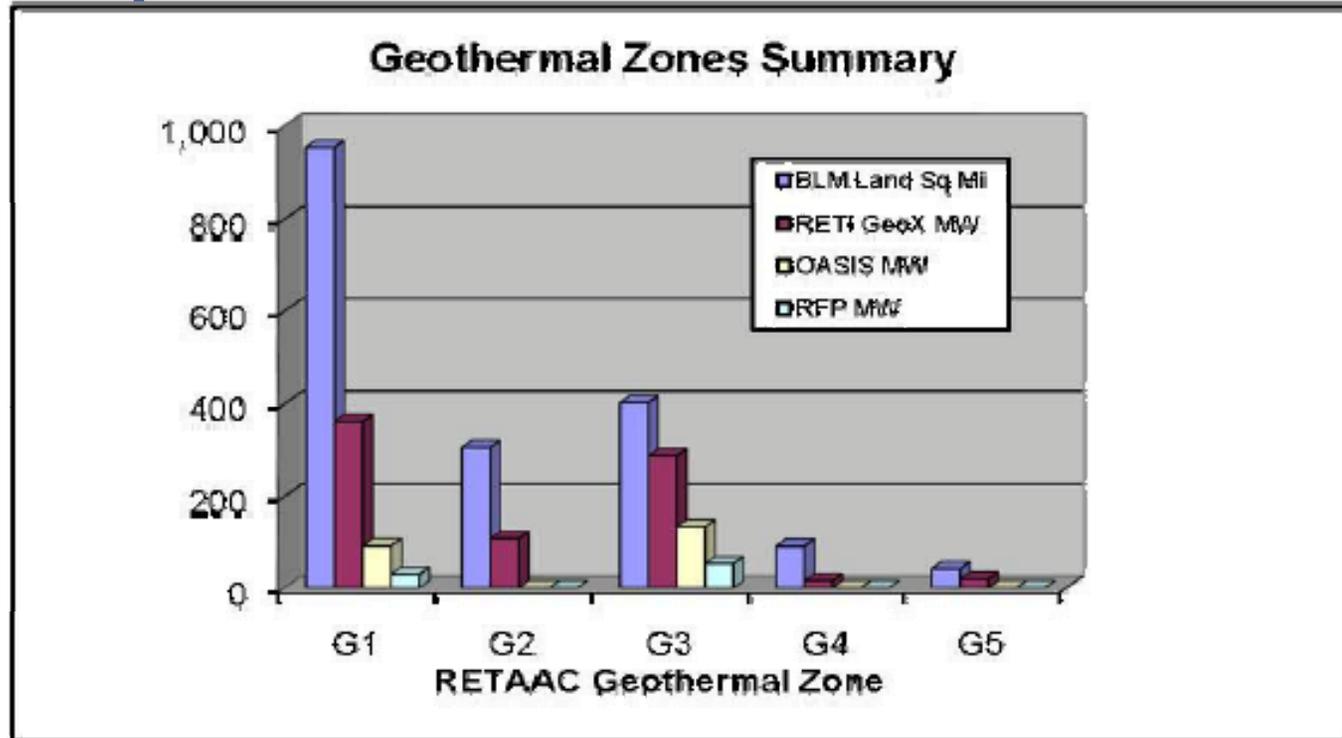
Source: RETAAC Phase II Report

Example RETAAC Data



Source: RETAAC Phase II Report and RETAAC Renewable Maps

Example RETAAC Data



Geothermal Zones	G1	G2	G3	G4	G5
Land (Est'd Sq Mi)	953	306	402	91	42
RETI GeoX MW	362	108	288	16	20
OASIS MW	92	0	133	0	0
RFP MW	30	0	53	0	0
Est. MW Range:	350-400	100-150	250-300	50-100	50-100

Resource potential within zones G1 - G5 is estimated at 800 to 1,100 MW.

Resource potential is only one of multiple factors that determine project viability. Therefore it is likely that a substantial portion of these potential resources is undevelopable.

Source: RETAAC Phase II Report and RETAAC Renewable Maps

Summary of Recommended Resource Assessments Use (RETI vs. WREZ) MW Estimates

Re-visit BC conversation in light of other potential OOS sources like Wyoming wind

		CA	OR	WA	NV	AZ	Baja	BC
Bio 		1,725	454	449				1,520
		145	652	101	299	329		939
PV 		27,460						
					18,960	20,178		
ST 		65,200			7,429	7,129		
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Geo 		1,918	520		1,283			244
		1,434	832		1,408			340

Economic when combined with wind? To be evaluated

Review estimates based on new lease sales

???

Perform new detailed analysis, coordinate with EWG

Notes: PV and ST not differentiated in WREZ, assumed all ST

Agenda for Next Time

- Information on Incentives for Canada and Mexico
- Update on unresolved OOS resource issues
- Consideration of other OOS resource areas in WECC
- Transmission cost assumptions for OOS Resources
 - *Lump adjacent resources into California?*

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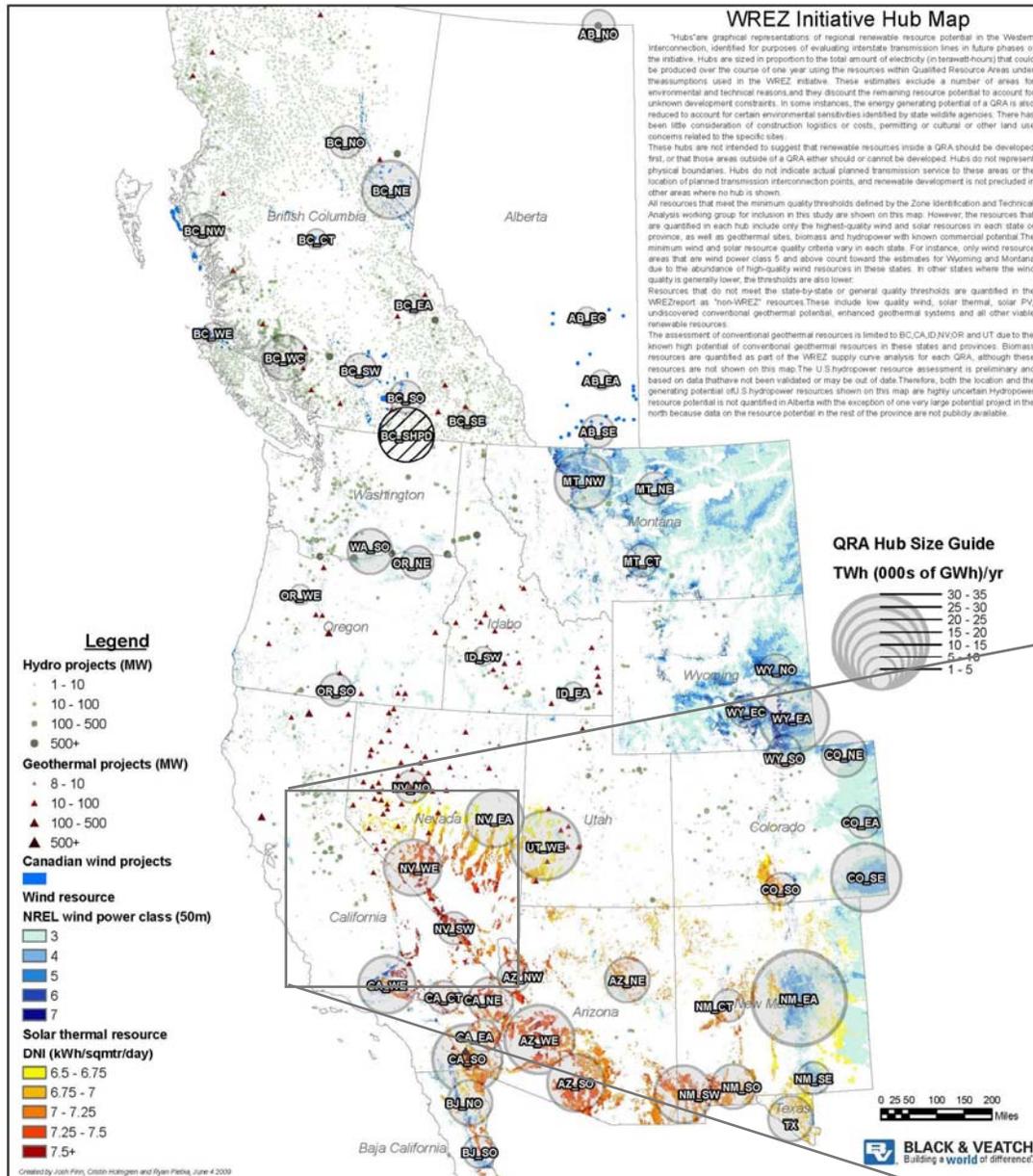
Back-up Material

OOS Resources in RETI

Presented September 9

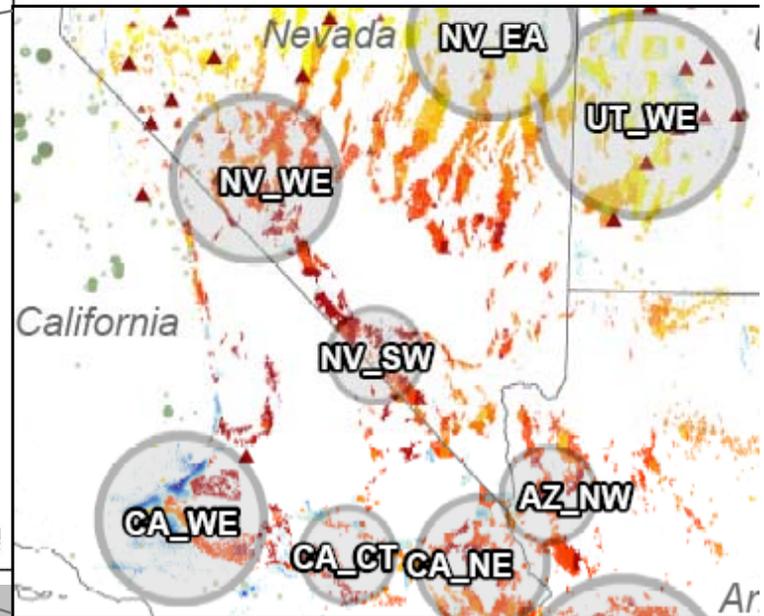
Western Renewable Energy Zones (WREZ)

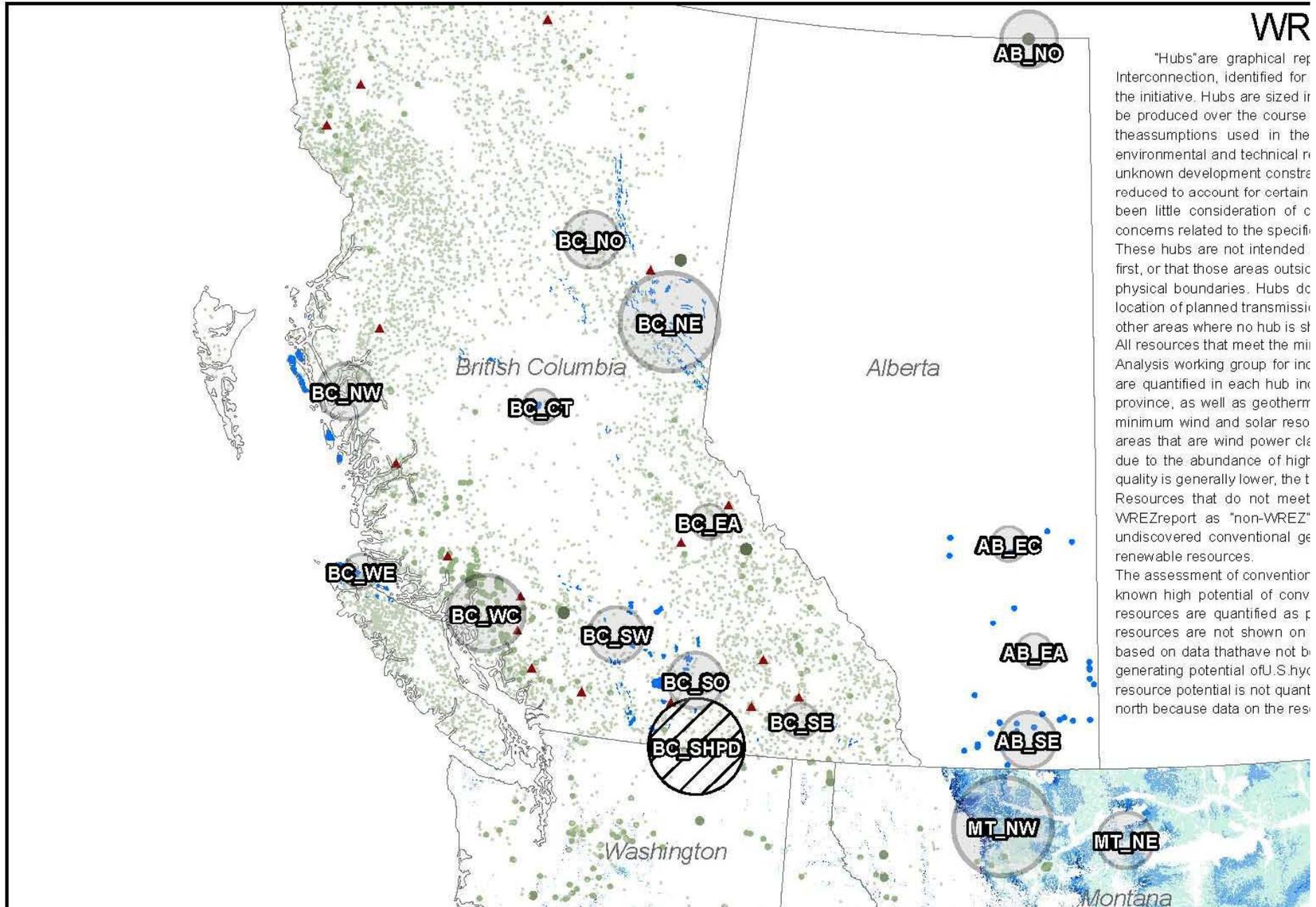
- High-level WECC-wide analysis of renewable energy zones
- Analyzes cost of transmitting renewables from zones to load centers
- Could augment or substitute RETI out of state resource analysis



WREZ Resource Assessment

- Estimates resource potential at a particular price point in each "hub"

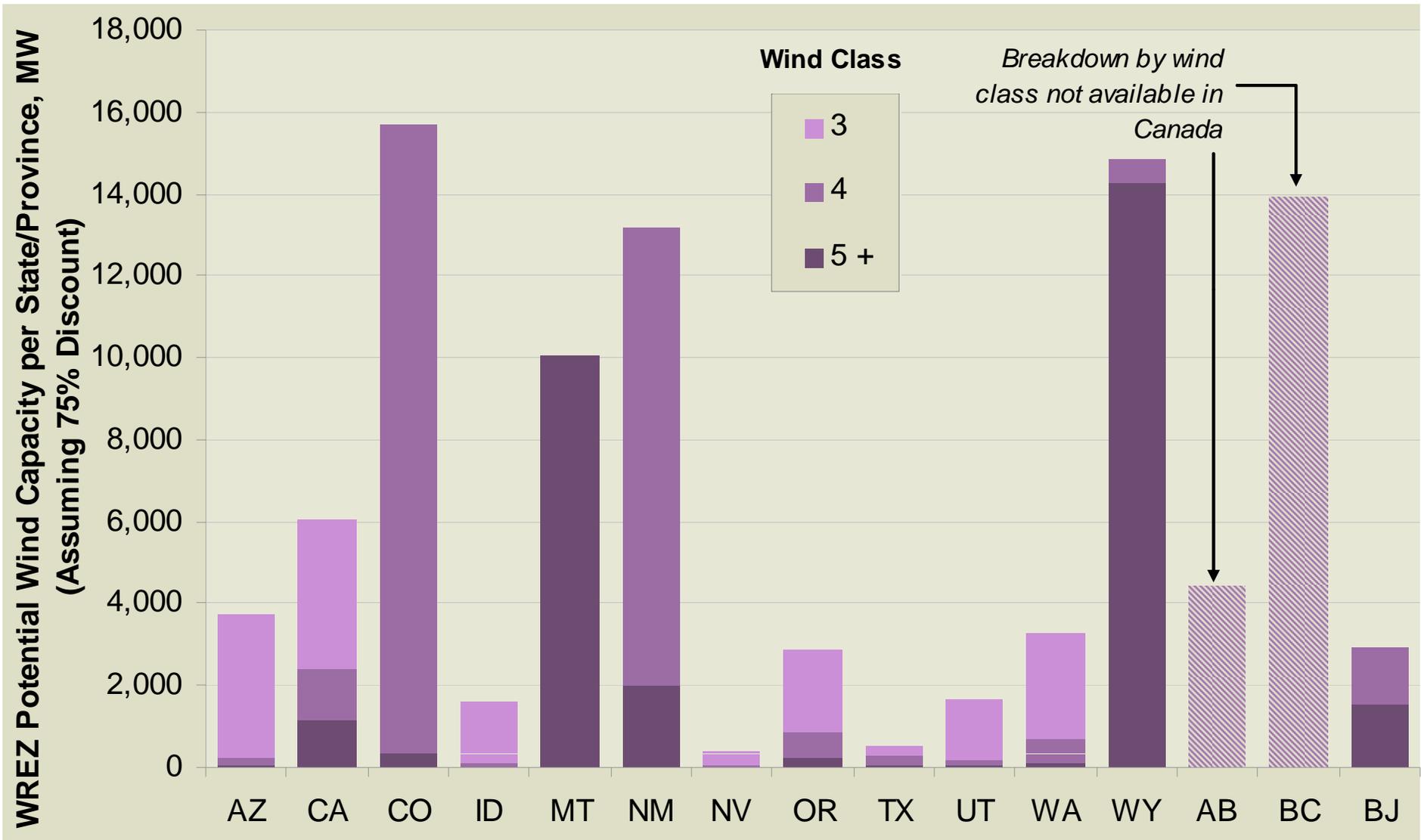




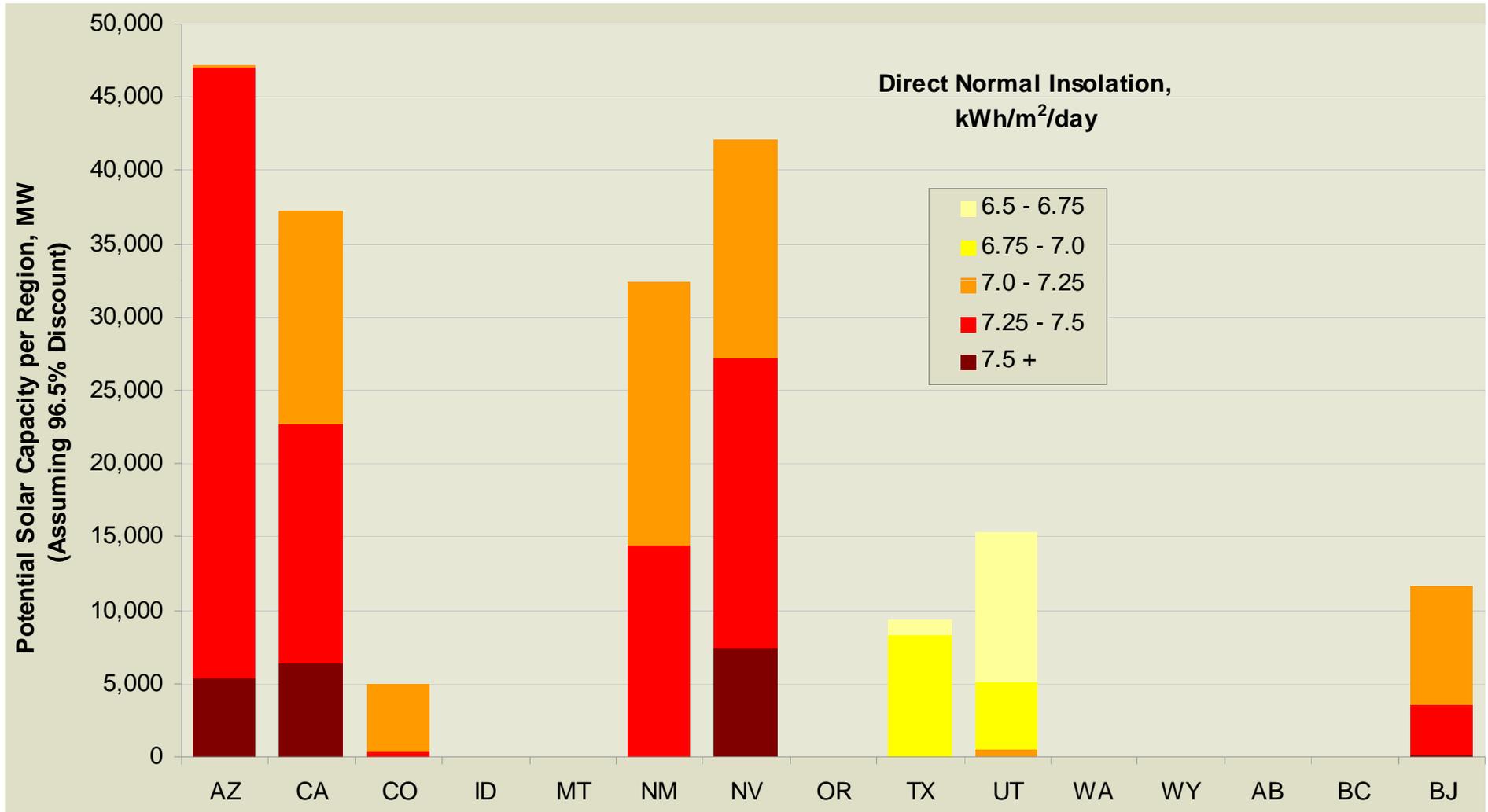
WR

"Hubs" are graphical representations of renewable energy resources, identified for the initiative. Hubs are sized in proportion to the amount of resources that can be produced over the course of the project, based on the assumptions used in the environmental and technical resource assessment. Hubs are not intended to represent physical boundaries. Hubs do not represent the location of planned transmission lines or other areas where no hub is shown. All resources that meet the minimum criteria for inclusion in the WREZ report are quantified in each hub in the province, as well as geothermal resources with a minimum wind and solar resource potential. Areas that are wind power class 1 or 2, but do not meet the criteria for inclusion in the WREZ report as "non-WREZ" resources are not shown on the map. Resources that do not meet the criteria for inclusion in the WREZ report as "non-WREZ" resources are not shown on the map. Resources that do not meet the criteria for inclusion in the WREZ report as "non-WREZ" resources are not shown on the map.

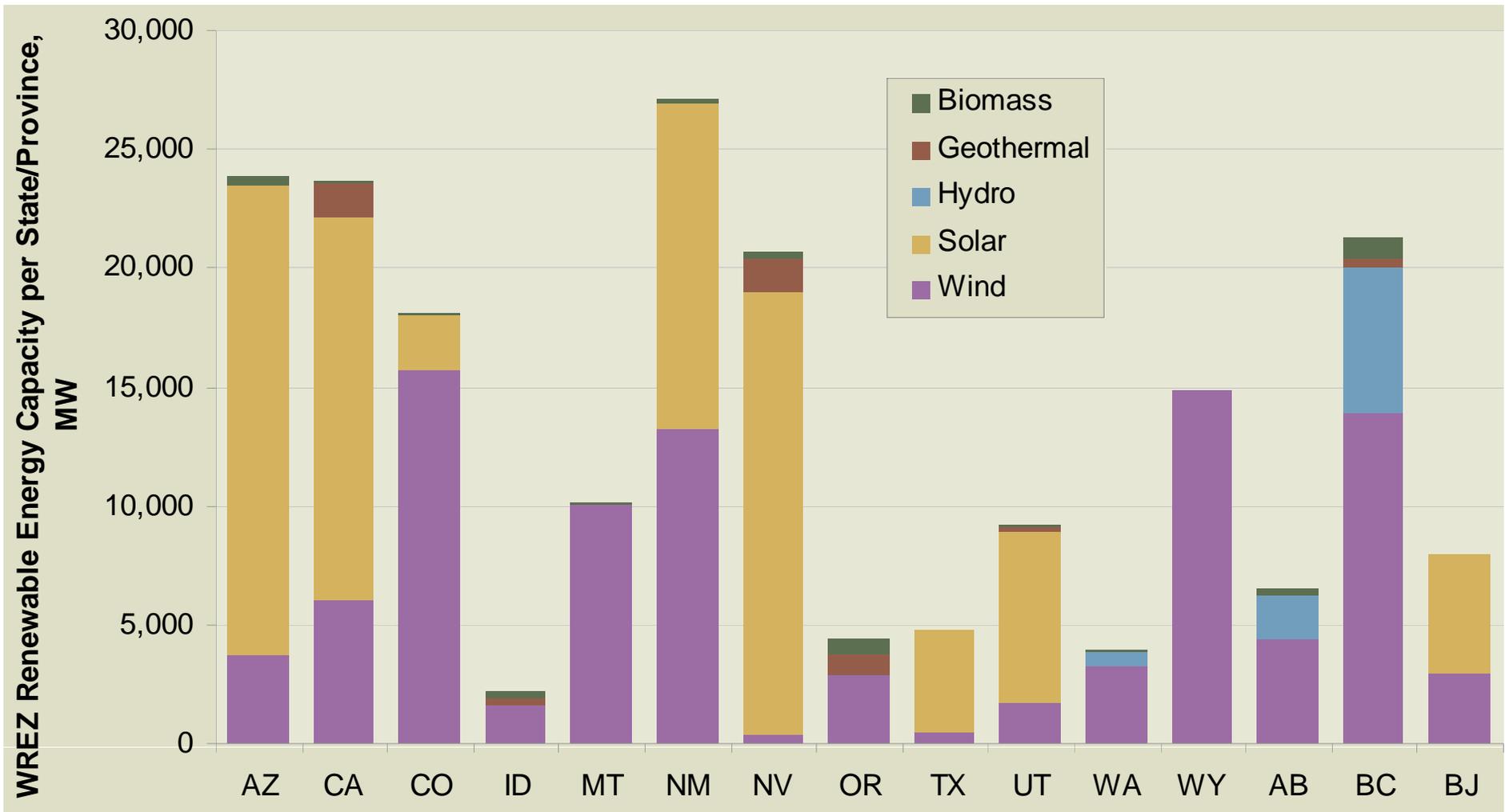
Wind Resources in Hubs (MW)



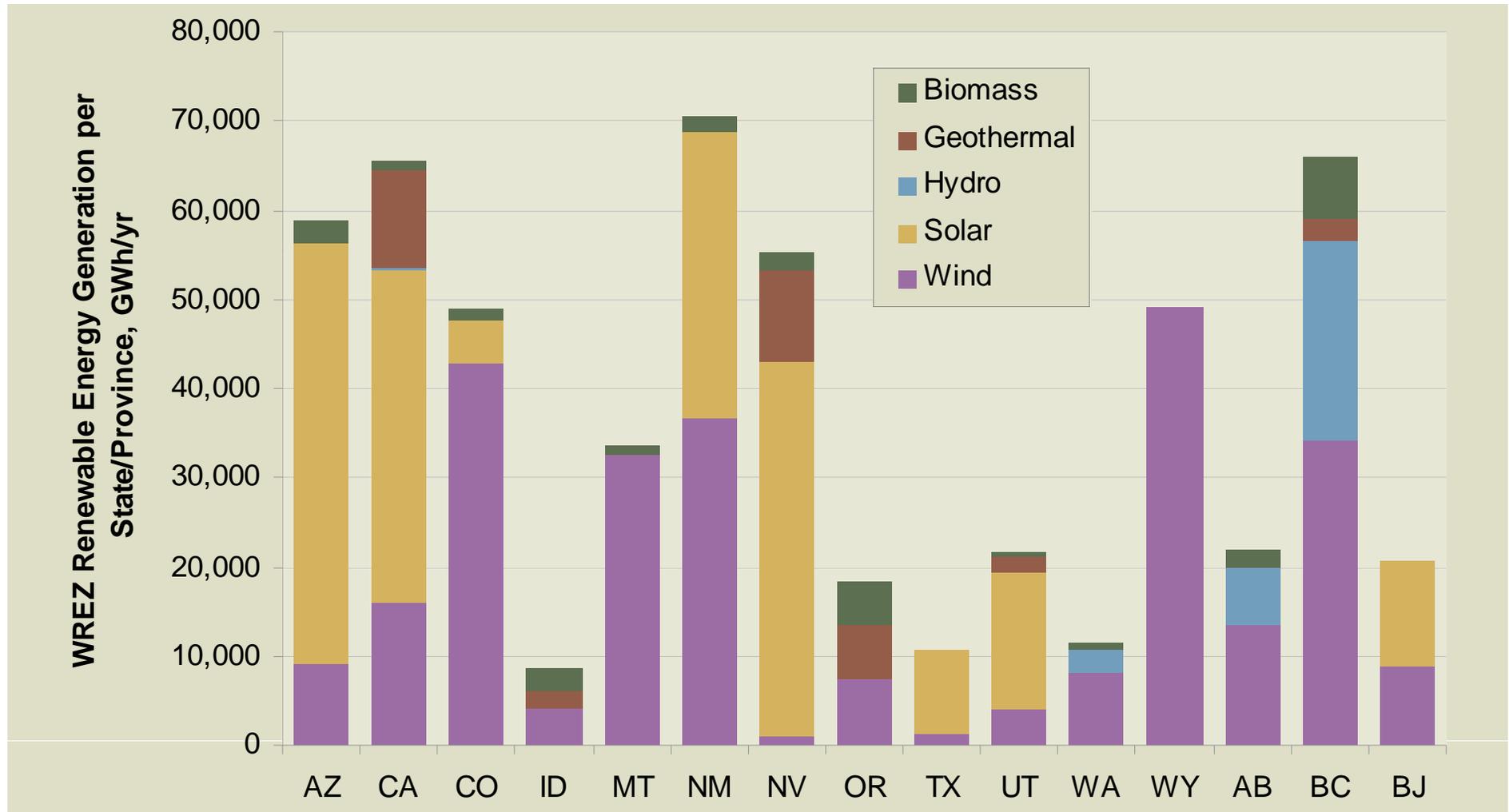
Solar Resources in Hubs (MW)



MW – All Resources (within hubs)



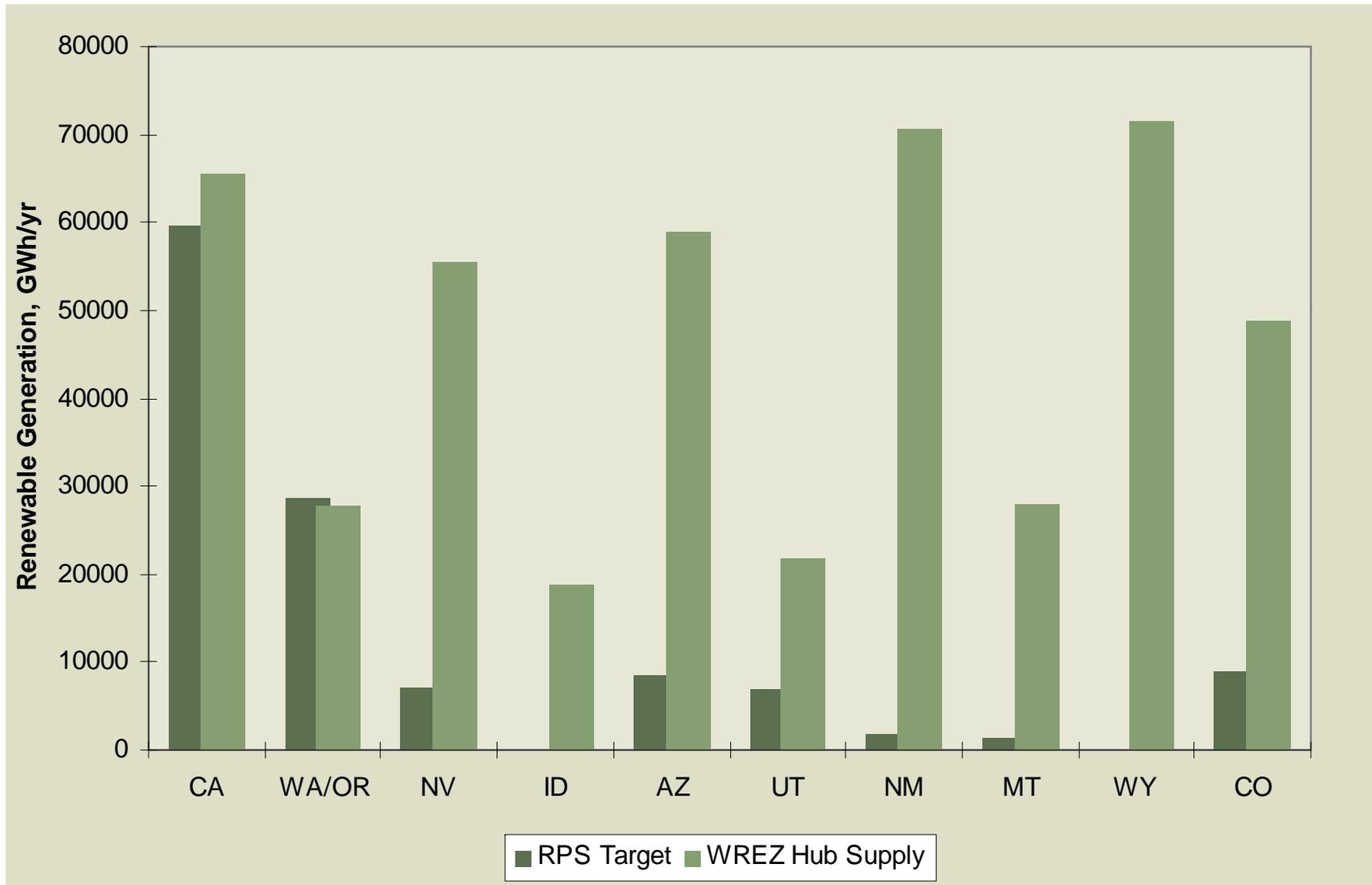
GWh/yr – All Resources (within hubs)



WREZ Resource Assessment Conclusions for RETI

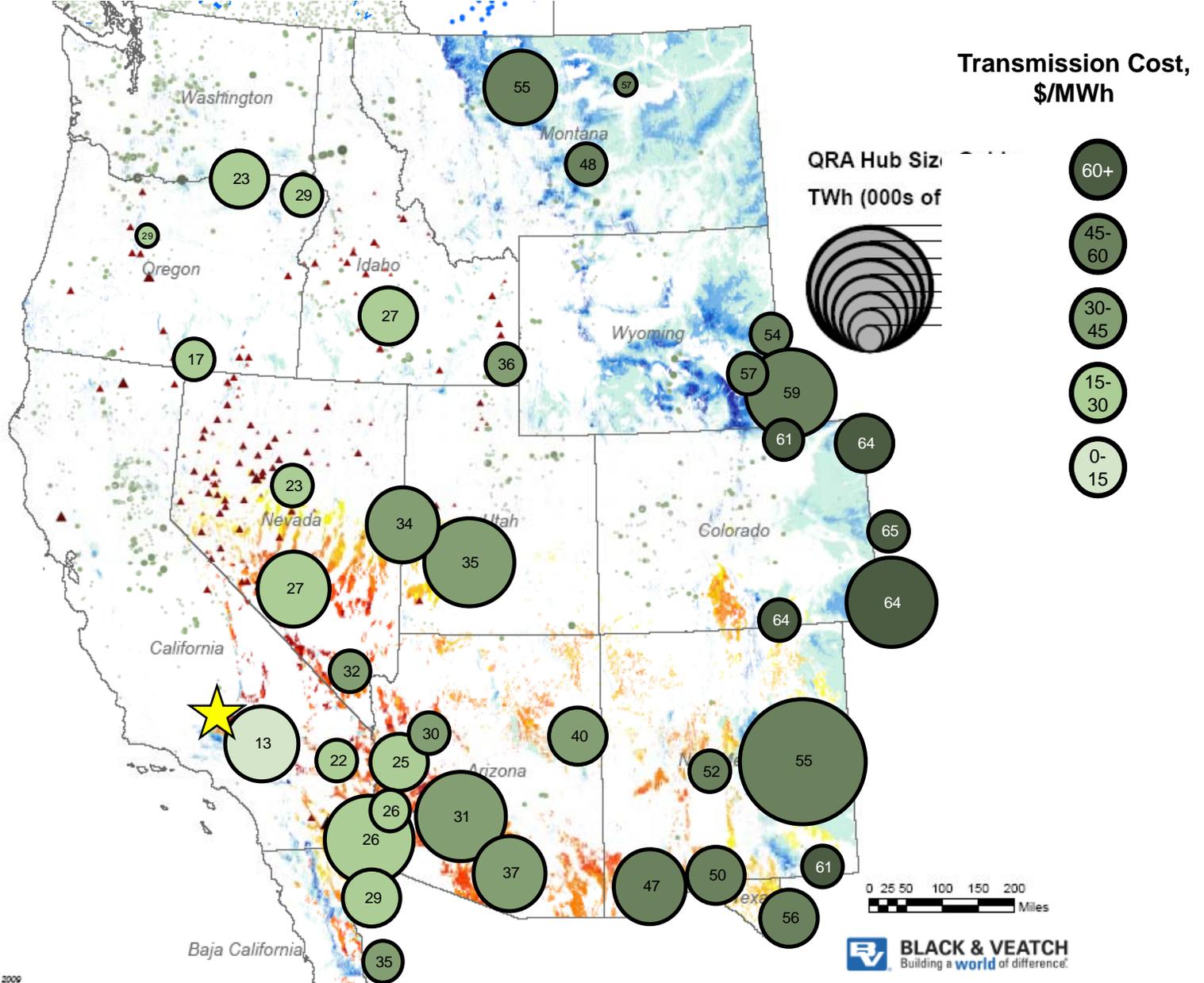
- There is significantly more developable renewable energy across the WECC than there is RPS demand
- Throughout the WECC there is a large amount of high quality developable renewable energy resources
- WREZ has quantified and estimated the cost of these resources

Comparison of WREZ resources and RPS Targets



WREZ Trans- mission Costs (\$/MWh) from QRAs to California

- Legend**
- Hydro projects (MW)**
 - 1 - 10
 - 10 - 100
 - 100 - 500
 - 500+
 - Geothermal projects (MW)**
 - 8 - 10
 - 10 - 100
 - 100 - 500
 - 500+
 - Canadian wind projects**
 - Wind resource**
NREL wind power class (50m)
 - 3
 - 4
 - 5
 - 6
 - 7
 - Solar thermal resource**
DNI (kWh/sqmr/day)
 - 6.5 - 6.75
 - 6.75 - 7
 - 7 - 7.25
 - 7.25 - 7.5
 - 7.5+



Created by Josh Finn, Orstin Holmgren and Ryan Pietka, June 4 2009

RETI Out of State Analysis vs. WREZ

	RETI 1B Out of State Analysis	WGA WREZ Analysis
Geographic scope	OR, WA, parts of AZ, BJ, BC, NV	Entire WECC
Resource assessment	Pre-id'ed projects or high-level resource assessment (no resource locations)	Screening level assessment with general resource locations
Transmission access methodology	Piecemeal, assumes resources utilize existing OR planned infrastructure	Standardized, assumes all new lines
Transmission economics	Piecemeal, assessed by location or proposed line	Standardized, applies standard assumptions across the WECC

Putting WREZ to Work for RETI – Potential Options

- Consider substitution of WREZ OOS results for RETI in Oregon, Washington, Arizona, Nevada, and British Columbia
- Consider additional states in RETI using WREZ data set (e.g. include Wyoming and Montana)
- Evaluate possibility to merge some OOS resource areas into adjacent CA CREZs (e.g., southern NV into Mountain Pass)
- Update transmission costs for out of state resources

Baja Resource Assessment

- Conduct more detailed assessment of Baja wind to determine capacity
- Split wind resource to deliver at Imperial and ECO substations
- Develop transmission assumptions to interconnect to CA grid