

Wyoming: Where Power Transmission & Generation Meet

Wyoming Infrastructure Authority



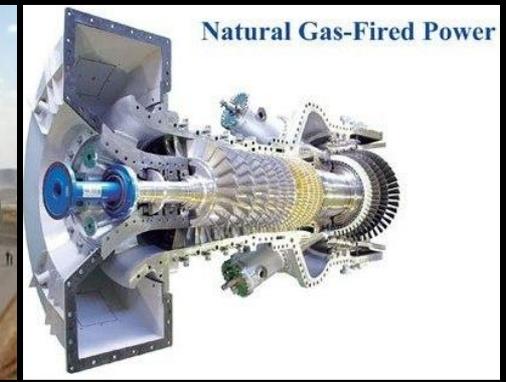
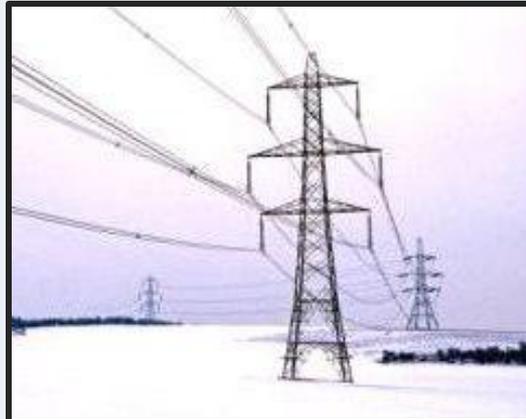
Nebraska Wind Conference

Lincoln, NE

October 22-23, 2012



INFRASructure AUTHORITY
An Instrumentality of the State of Wyoming



Today's Discussion

- *Information about the Wyoming Infrastructure Authority*
- *Update on the transmission projects under development in Wyoming*
- *Value Proposition for Wyoming Wind to California*
- *Geographic Diversity resulting from WY wind blended with NE wind*
- *Recent commissioned studies by the WIA*

Wyoming Infrastructure Authority

- *Created in 2004 by the Wyoming Legislature---*
<http://legisweb.state.wy.us/statutes/statutes.aspx?file=titles/Title37/T37CH5.htm>
- *Mission: diversify and expand the state's economy through improvements in the transmission grid*
- *Tools:*
 - *Can plan, finance, site, own, operate and otherwise promote transmission projects—model used contemplates plan & development only (i.e. no construction, ownership or operating role)*
 - *\$10 million venture account to develop projects*
 - *\$1 billion in bonding capability to help finance transmission projects*

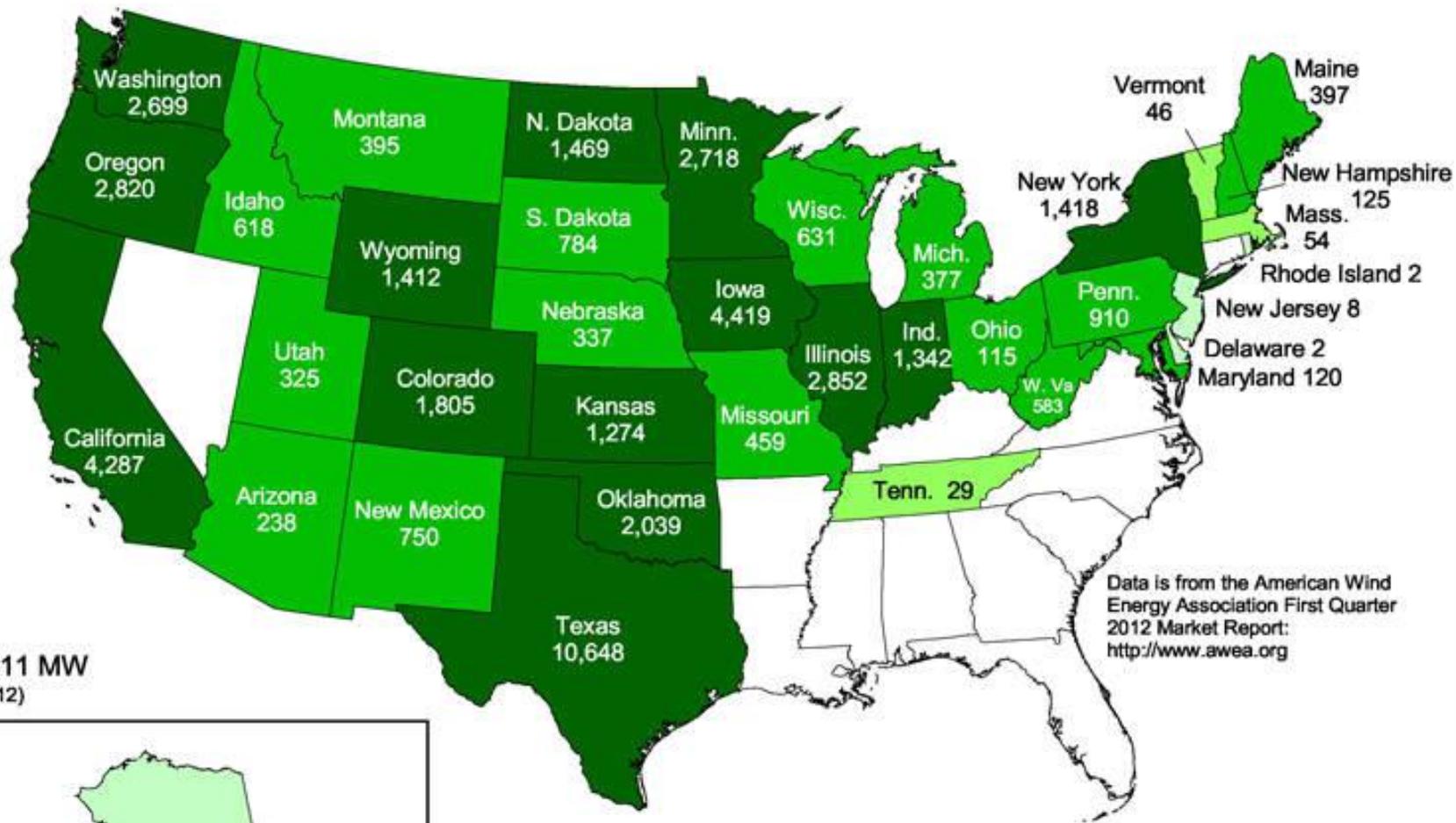


Wyoming Infrastructure Authority

Structure:

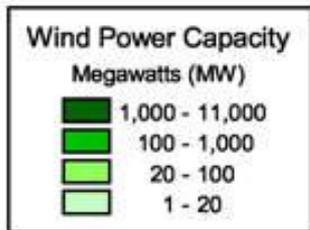
- *Five (5) member Governor-appointed Board of Directors*
 - *Mike Easley, Chairman: CEO, Powder River Corporation*
 - *Kyle White, Vice-Chairman: VP of Regulatory and Governmental Affairs, Black Hills Corporation*
 - *Bryce Freeman, Treasurer: Administrator of the Wyoming Office of Consumer Affairs*
 - *J.M. Shafer, member: Former executive with both Tri-State and Western Area Power Administration*
 - *Dave Sparks, member: Executive Vice President, TransCore*
- *Staff*
 - *Loyd Drain, Executive Director*
 - *Holly Martinez, Administrative Manager*

Current Installed Wind Power Capacity (MW)



Total: 48,611 MW
(As of 03/31/2012)

Data is from the American Wind Energy Association First Quarter 2012 Market Report: <http://www.awea.org>



U.S. Department of Energy



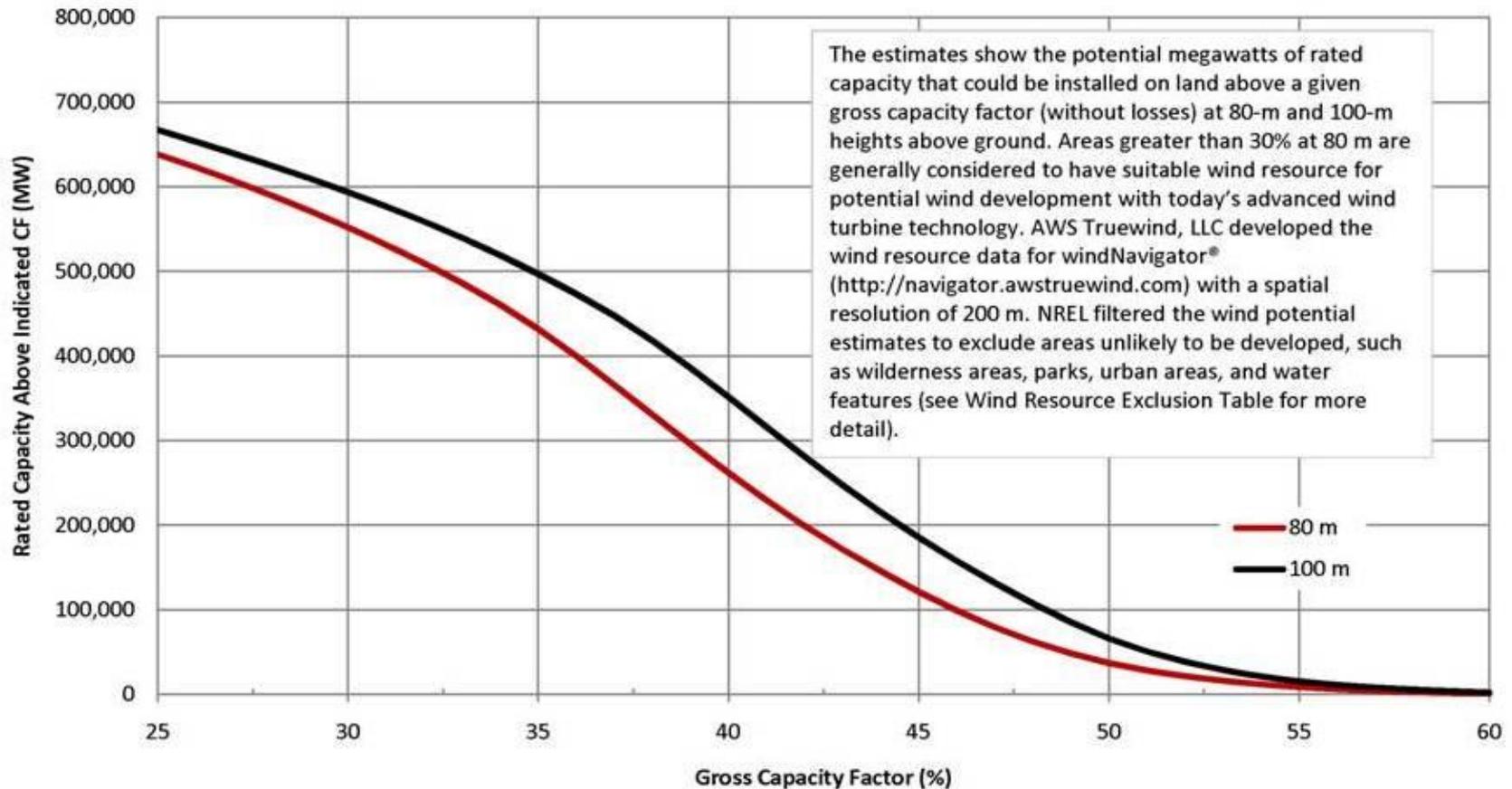
NATIONAL RENEWABLE ENERGY LABORATORY

28-JUN-2012 1.1.23

***Update on the transmission projects under
development in Wyoming***

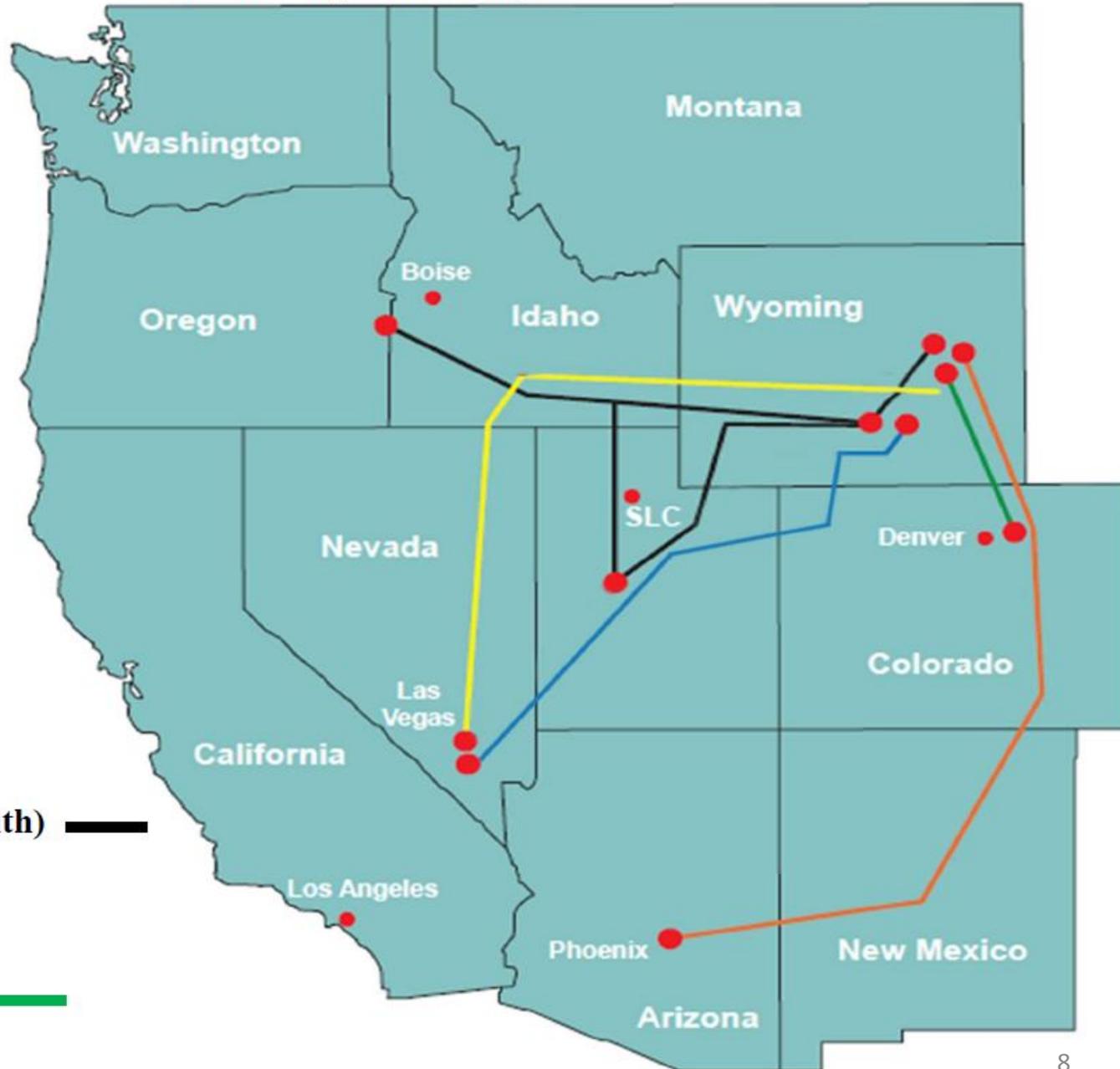
Wind Quality and Availability in Wyoming

Wyoming - Wind Resource Potential Cumulative Rated Capacity vs. Gross Capacity Factor (CF)



Transmission Projects Under Development in Wyoming

Routes are subject to change



Projects:

Energy Gateway (West & South) 

TransWest Express 

Zephyr 

Wyoming-Colorado Intertie 

High Plains Express 

2011-2012 Significant Developments

- 1) July 14---3rd party applies for 100 % of the capacity on the **Wyoming Colorado Intertie Project**
- 2) July 22---BLM publishes the draft EIS for **Power Company of Wyoming's 1,000 turbine wind project**
- 3) July 29---BLM publishes the draft EIS for the **Gateway West Trans. Project (GWW)**
- 4) September 9---**Transwest Express LLC (TWE)** announces development agreement with WAPA
- 5) September 22---**WECC releases its 10yr Regional Transmission Plan**
- 6) October 5---Two Wyoming Transmission Projects are selected by **Federal Rapid Response Team for Transmission---TWE & GWW**
- 7) December 8---**The BLM issues its 2012 priority generation projects---three (3) Wyoming wind projects are named**
- 8) December 19--- Duke-American Transmission Co (DATC) announces it has acquired the **Zephyr Power Transmission Project**
- 9) Feb. 27, 2012: The International Brotherhood of Electrical Workers (IBEW) and TransWest Express LLC signed a partnering agreement relative to the **TransWest Express Transmission Project**
- 10) May, 2012: A BLM national manager was named to the **Zephyr Transmission Project**—a precursor to the entry into the NEPA process
- 11) July 2, 2012: The BLM has published its Final Environmental Impact Statement for the **Chokecherry and Sierra Madre Wind Energy Project**, a 2,000-3,000 megawatt wind farm proposed by Power Company of Wyoming LLC in Carbon County, Wyoming
- 12) October 9, 2012: Ken Salazar, Secretary of Interior, signs the Record of Decision (ROD) for the 1000 turbine **Chokecherry and Sierra Madre Wind Energy Project**—this will be the world's largest wind farm

Permitting & Siting Status of Transmission Projects in Wyoming

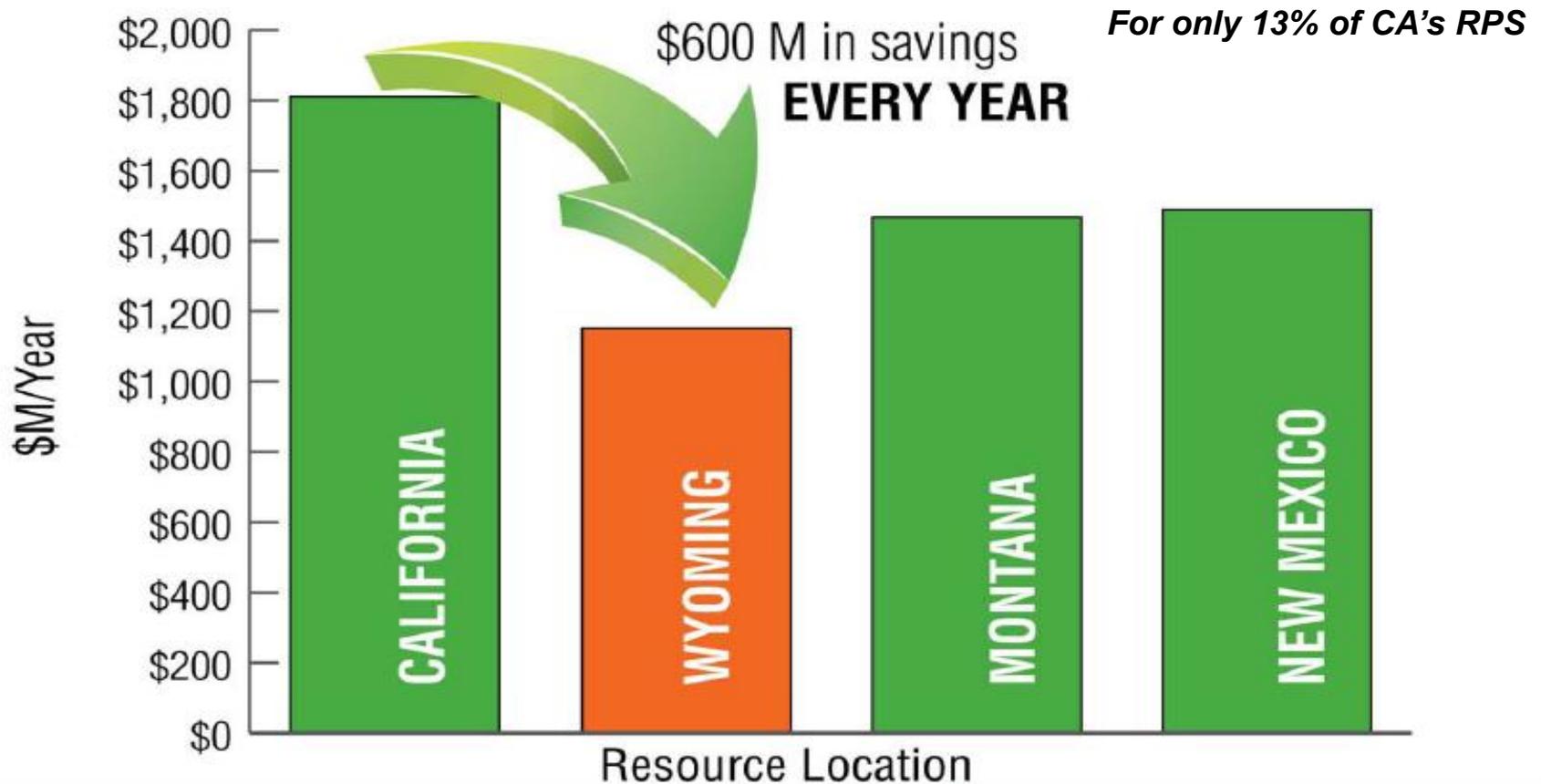
Project	Size of Project (MW)	Developer	Initiated NEPA Process?	NEPA Progress	Est. In-Service Date (per Developer)
Gateway West <i>A Rapid Response Team Project</i>	1,500	PacifiCorp	YES	Draft EIS obtained--July, 2011-- Record of Decision expected in 2013	2016-2018 (different dates--different segments)
Gateway South	1,500	PacifiCorp	YES	Draft EIS expected 2013	2017-2019 (different dates--different segments)
TransWest Express <i>A Rapid Response Team Project</i>	3,000	TransWest Express LLC	YES	Draft EIS expected in early 2013 with a Record of Decision in early 2014	2016
Zephyr	3,000	Duke Energy/American Transmission Company (DATC)	NO	BLM filing was made in March, 2012--National Manager named in May, 2012	Early 2020
Wyoming-Colorado Intertie	850-900	LS Power/WIA	N/A	N/A---no public lands and no federal nexus--3rd party application for 100% of capacity--FERC filing was completed on May 9, 2012	2015-2016
High Plains Express	3,500	10 Developers	NO	None to date	TBD

***Value Proposition for Wyoming Wind
to California***

Data from WECC 10 year plan

Annual Cost Estimates for Delivering Approximately 3,000 MW of Renewable Energy to California by 2019

Source: WECC DRAFT 10-Year Regional Transmission Plan Summary, August 2011



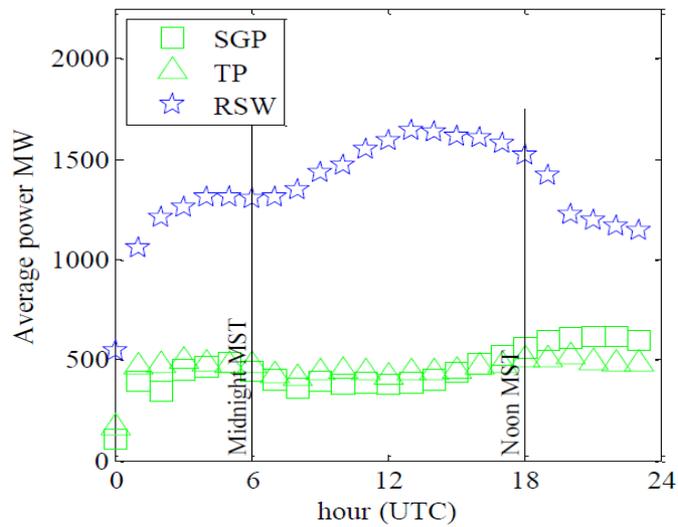
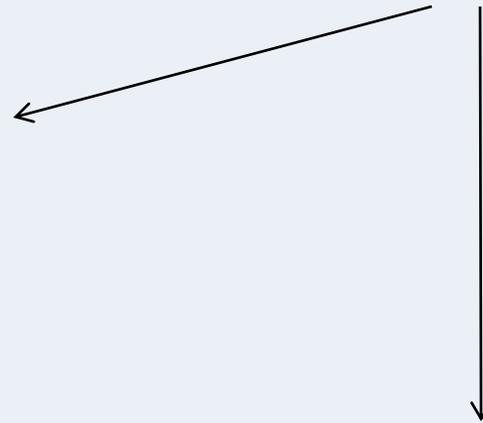


Figure 12 – Average diurnal variation of power production from three sites with different levels of installed capacity given by scenario 3: (a) 1500 MW at SGP, 1500 MW at TP, and 3000MW at WC, and (b). 1500 MW at SGP, 1500 MW at TP, and 3000MW at RSW. Diversity is indicated in diurnal output when the period of maximum output power is shifted for the different sites.

Wind profiles for WY & CA



Graphs are from a draft of the Univ of WY's Reports on Geographic Diversity Studies

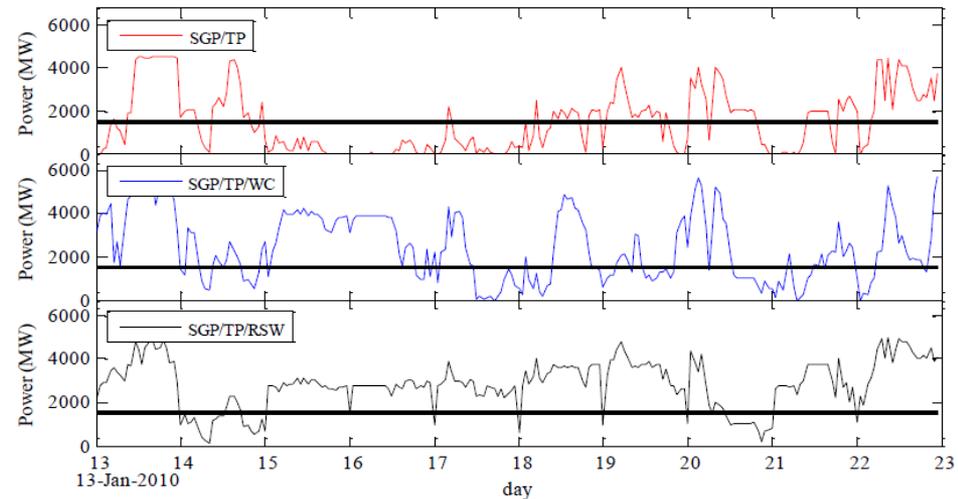


Figure 13 – Hourly aggregate output from combinations of wind farms for the three scenarios discussed above over a 10 day period. The dark line shown in each plot represents 25% of the total installed capacity.

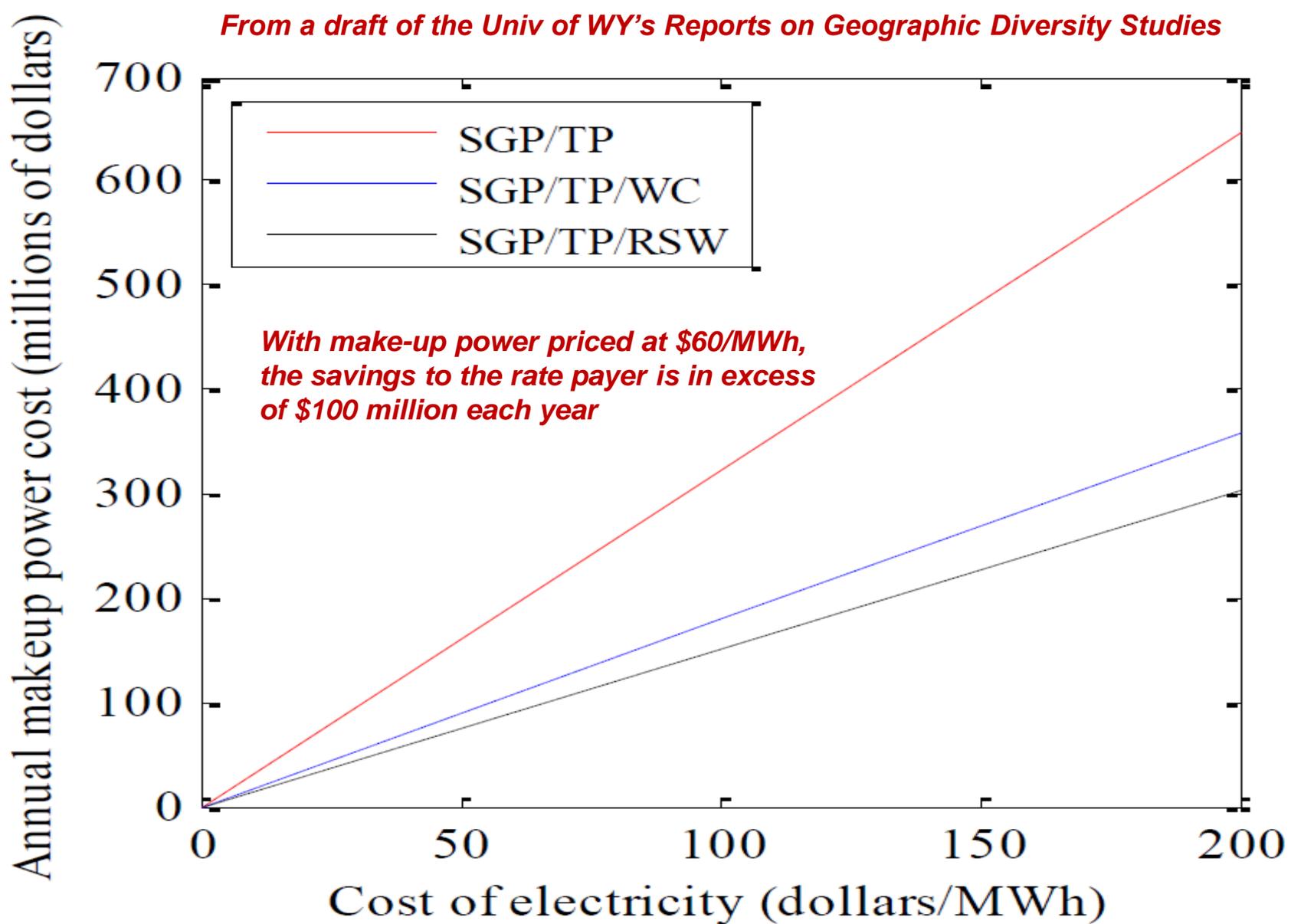
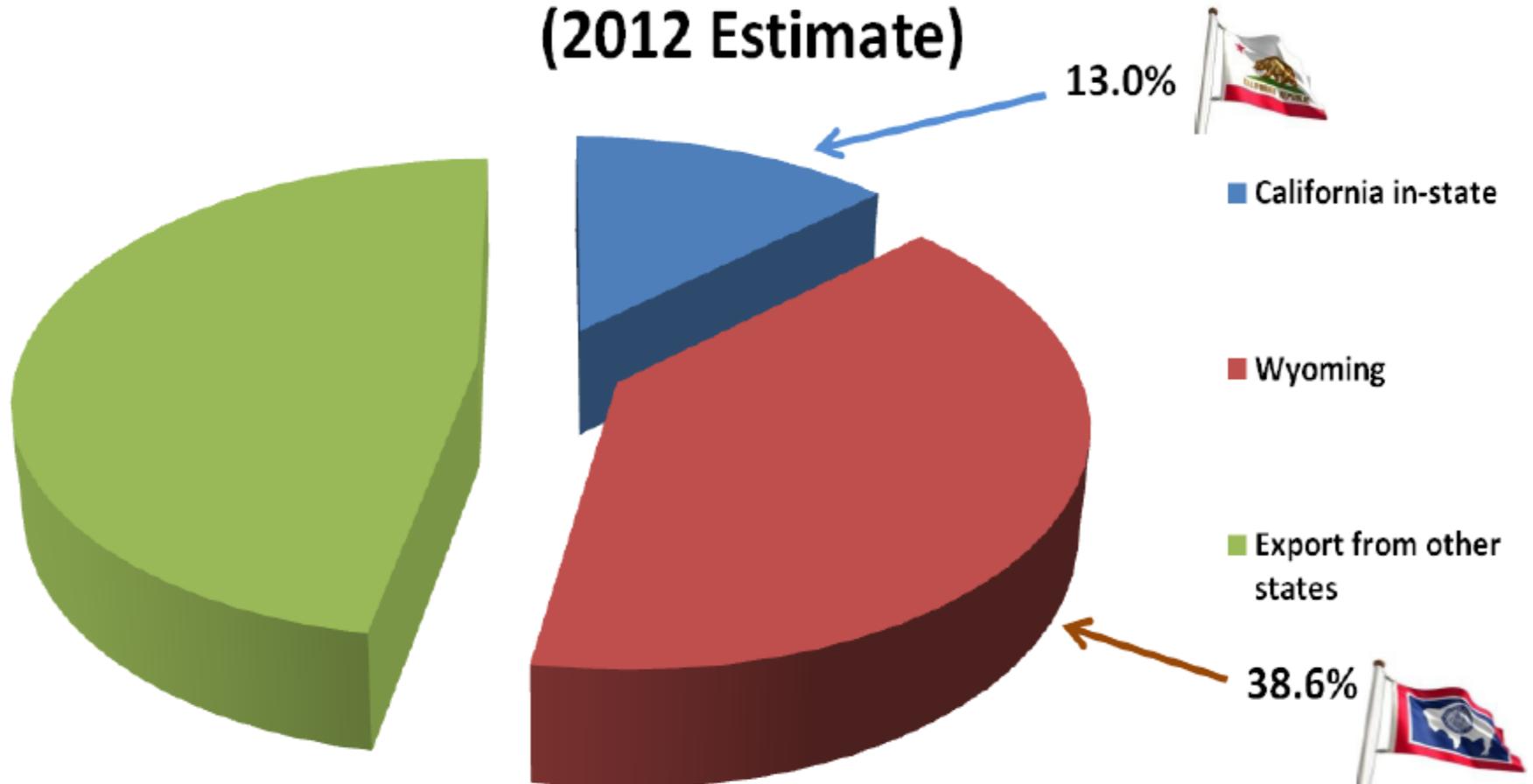


Figure 14 – Annual cost to purchase makeup power for different wind sites in California and Wyoming All three cases represent 6000MW of installed capacity, and power is purchased whenever the aggregate output of the three plants drops below 1500 MW or 25% of the installed capacity.

A great example of how Wyoming is already complementing California's indigenous resources

Where Does California Get its Natural Gas? (2012 Estimate)

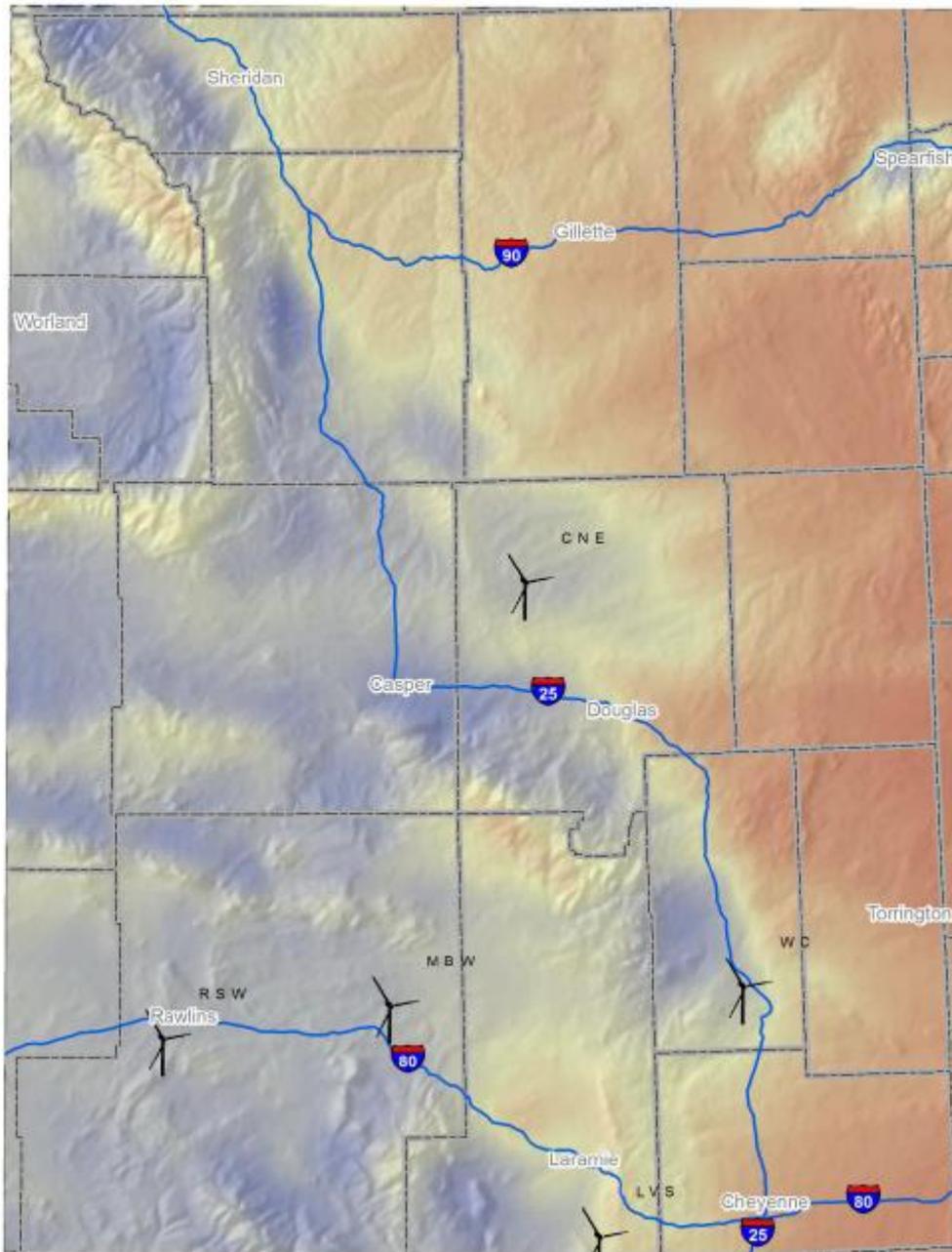


Estimate is based on the addition of natural gas from Wyoming via the El Paso Ruby Pipeline completed in 2011

***Geographic Diversity resulting from WY wind
blended with NE wind***

Hooker County Correlation with Wyoming Sites

Wind Power Density Correlation Coefficient



Legend



Wind Farms Sites

Interstates

County Boundaries

Wind Power Density Cor. Coef.

High : 1
Low : 0

High is bad
Low is good



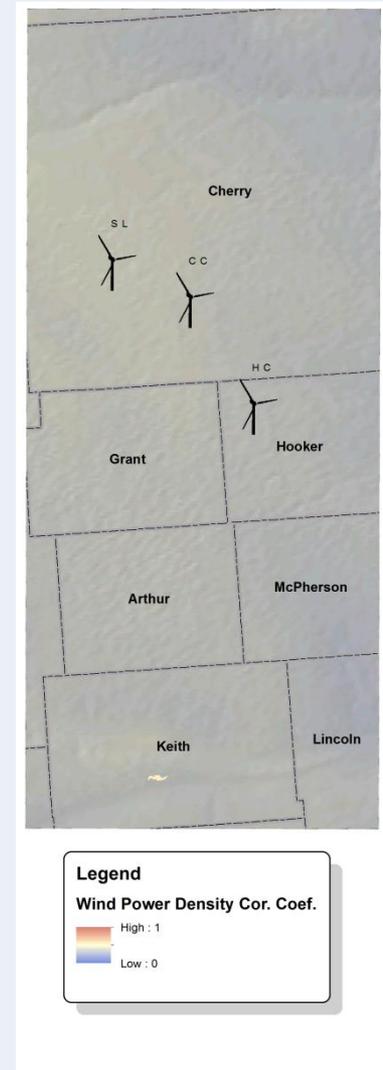
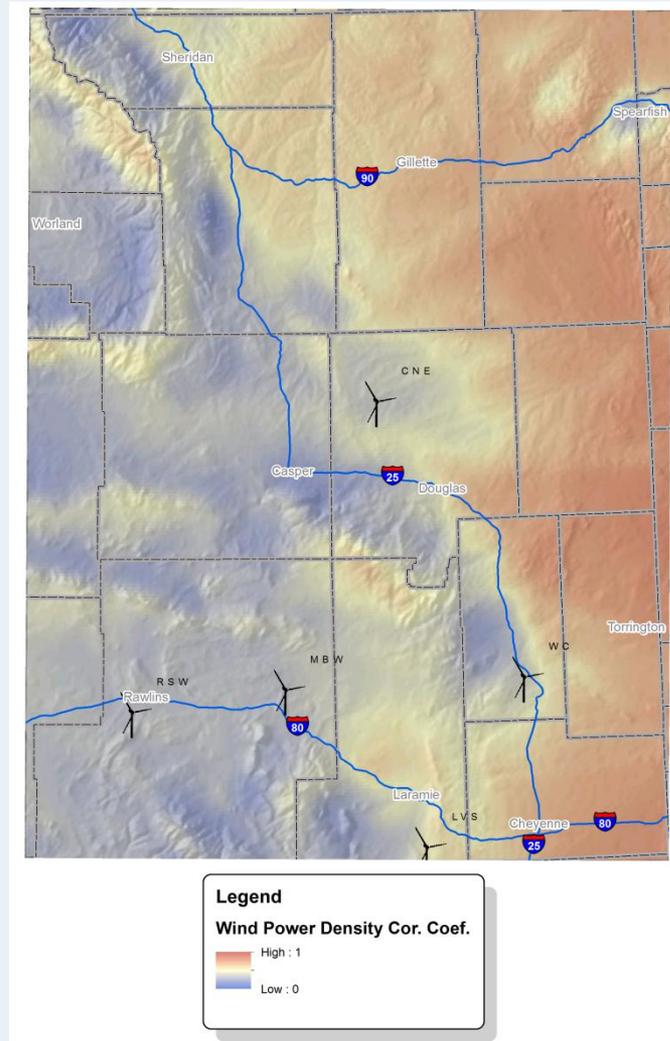
Graph is from a draft of the Univ of WY's Reports on Geographic Diversity Studies



Map Created for University of Wyoming Wind Energy Research Center
Cartography: Wyoming Geographic Information Science Center
Projection: Wyoming Lambert Conformal Conic (WyLAM)
Source: Wind power density determined from output of the Weather Research Forecast Model (WRF) high resolution window with 4 km horizontal spacing during the period July 2009 to June 2010.
Date: July 16, 2012

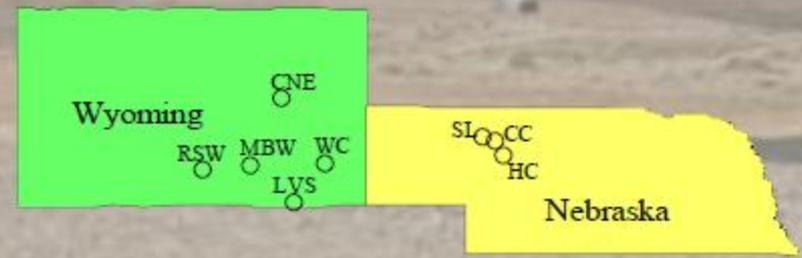
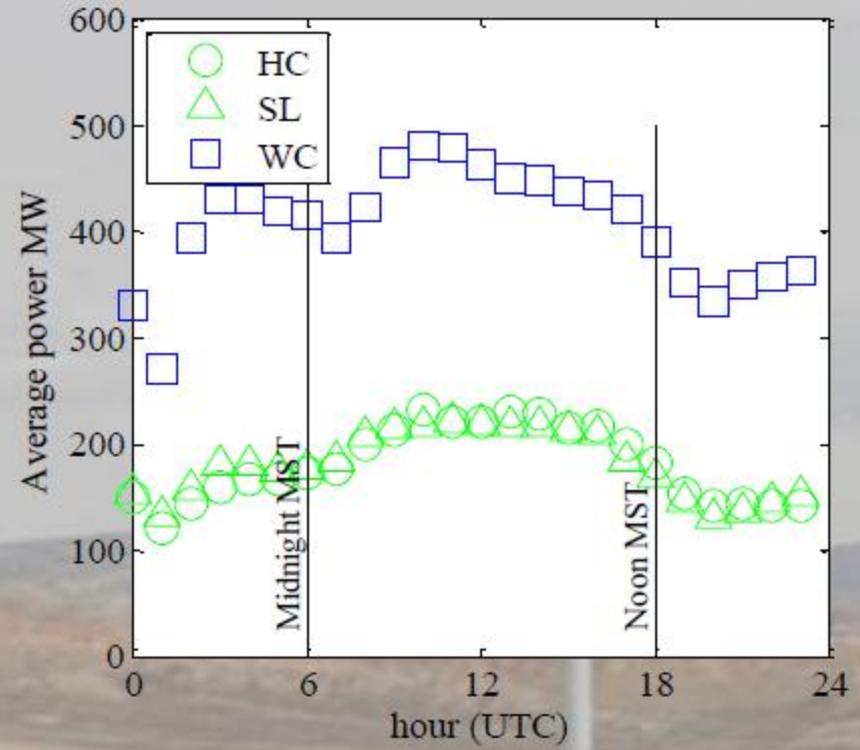
Wyoming/Nebraska Correlations

- Correlation between WC and Nebraska (right) and HC and Wyoming (left)
- The result for WC is relatively uncorrelated with Nebraska wind sites (good for diversity)
- The result for HC is richer as it appears to be well correlated with the WY plains, but not the mountains



Graph is from a draft of the Univ of WY's Reports on Geographic Diversity Studies

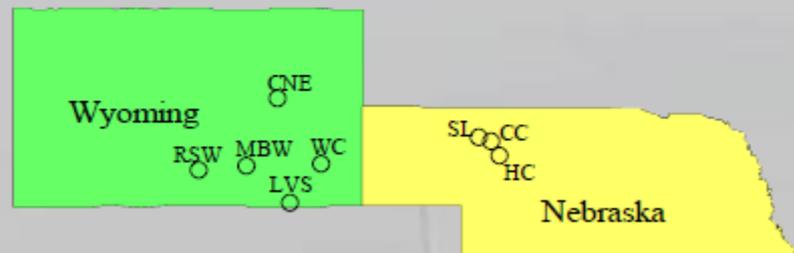
- **HC is a wind farm in Hooker County, NE**
- **SL is a wind farm near Stevenson Lake in NE**
- **900 MW in Wyoming**
- **900 MW in Ne**
 - 450 HC
 - 450 SL
- **Wyoming Capacity Factor 0.45**
- **Nebraska Capacity Factor 0.40**



*Graph is from a draft of the Univ of WY's
Reports on Geographic Diversity Studies*

• **3 Cases**

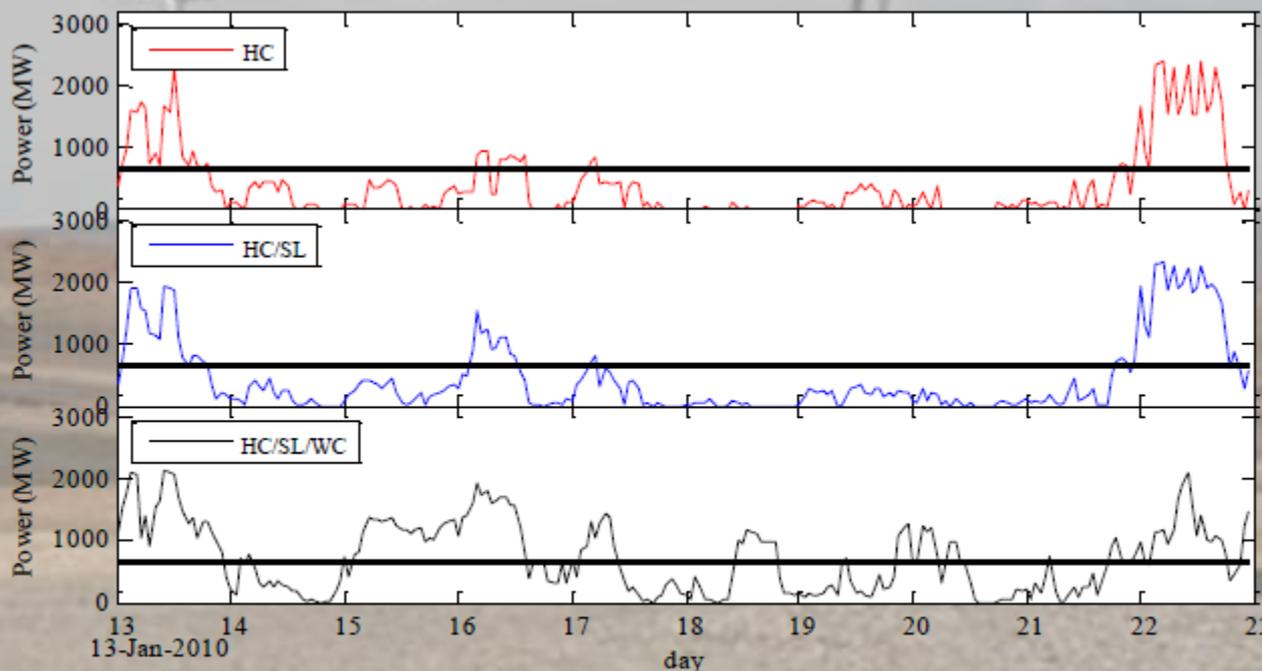
- 1800 MW at HC
- 900 MW at HC and 900 MW at SL
- 450 MW at HC and 450 MW at SL and 900 MW at WC



• **Black line is at 35%
of installed capacity**

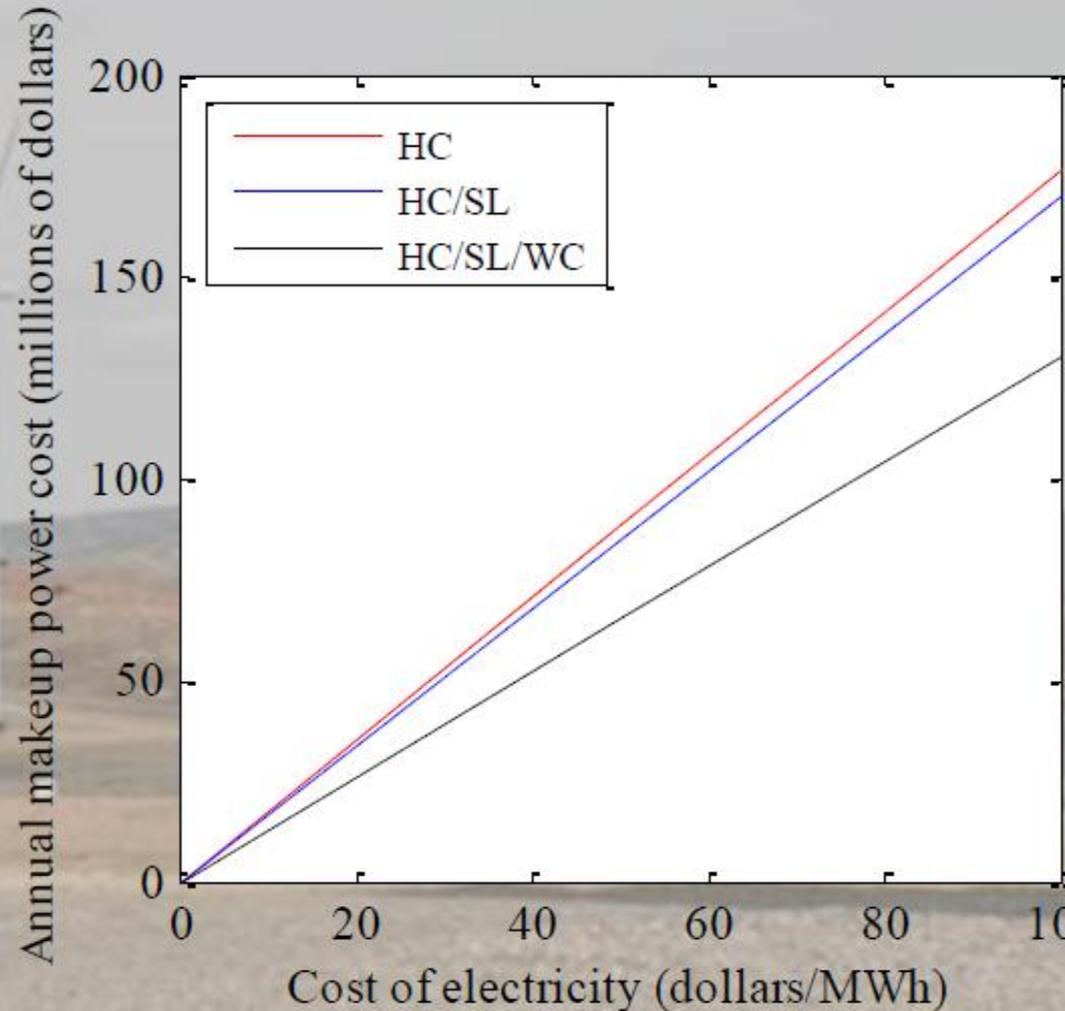
- 630 MW

• **Addition of
Wyoming wind
reduces time that
power falls below
“minimum”**



- Reduction in purchase of make-up power in the 10's of millions of dollars
- Effect of diversity is clear
 - Little benefit from two closely located wind farms in NE
 - Large benefit in adding WY resources when it comes to diversity

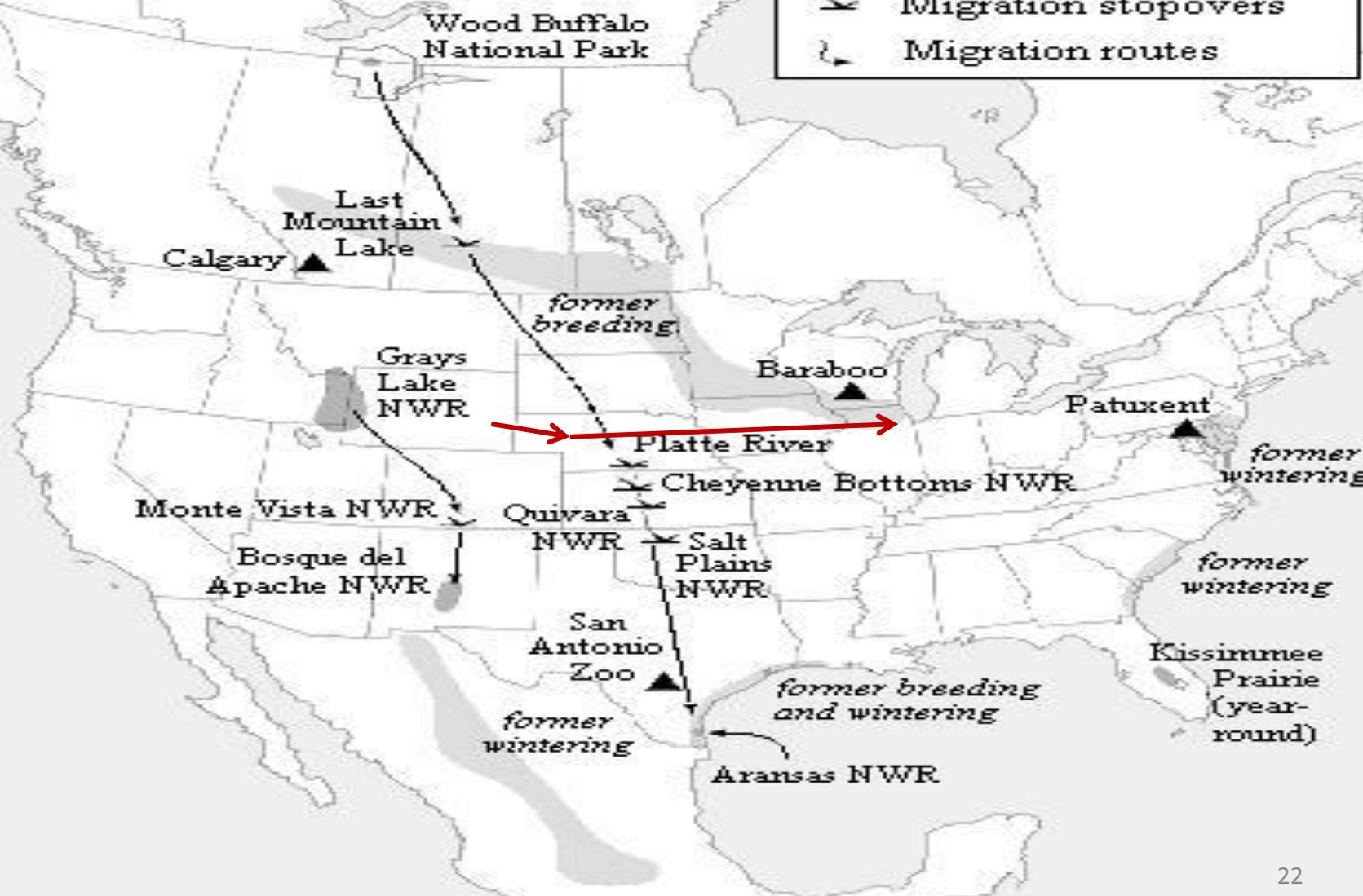
With make-up power priced at \$60/MWh, the savings to the ultimate rate payer is in excess of \$25 million each year which more than offsets the cost of the transmission



Graph is from a draft of the Univ of WY's Reports on Geographic Diversity Studies

Whooping Crane Fly Route

	Former breeding & wintering areas
	Current summering & wintering areas
	Captive population
	Migration stopovers
	Migration routes



Recent commissioned studies by the Wyoming Infrastructure Authority

- ***Guide to Permitting Transmission in Wyoming***
- ***Guide to Permitting Wind Development in Wyoming***
- ***University of Wyoming Geographic Diversity Studies for WY/CA; WY/CO; WY/NE; and Intra-state Wyoming***
- ***NREL Economic Benefits and Job Creation Study for WY/CO***

These studies are or will be posted on the WIA website at www.wyia.org

Questions?

For more information, please visit our website at www.wyia.org

200 East 17th Street

Cheyenne, WY

307-635-3573

loyd.drain@wyo.gov