

Wyoming Wind Energy, Transmission and the West

Craig Cox
Interwest Energy Alliance

*to Wyoming Infrastructure Authority
Board Meeting*

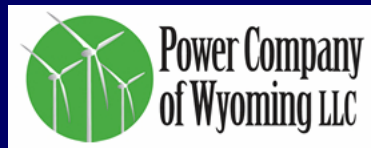
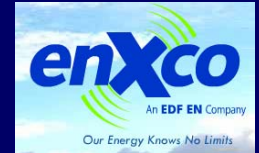
*Casper, Wyoming
10 November 2009*



ABENGOA SOLAR

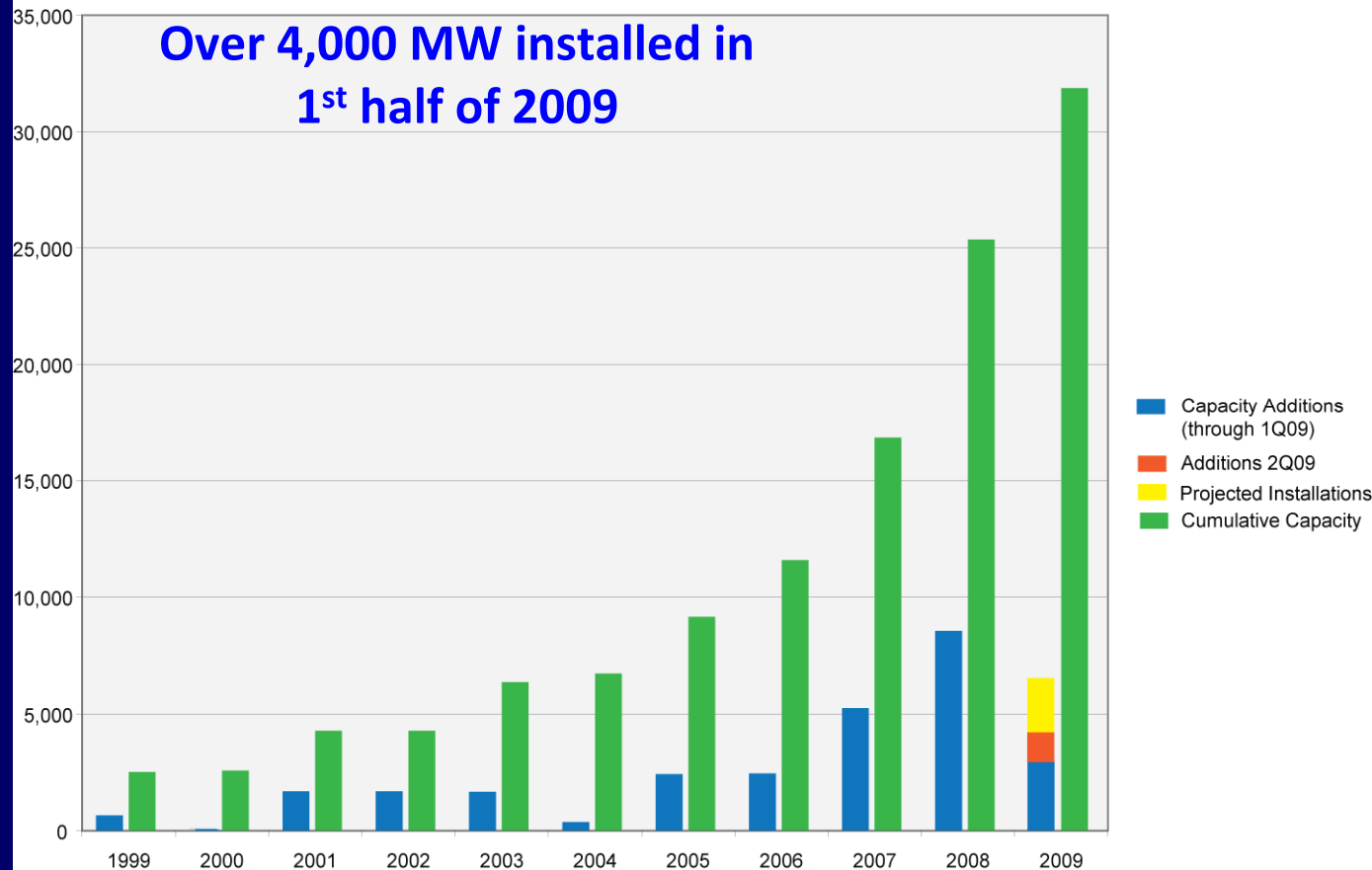


WESTERN RESOURCE ADVOCATES



U.S. wind industry today

U.S. Wind Installation Growth

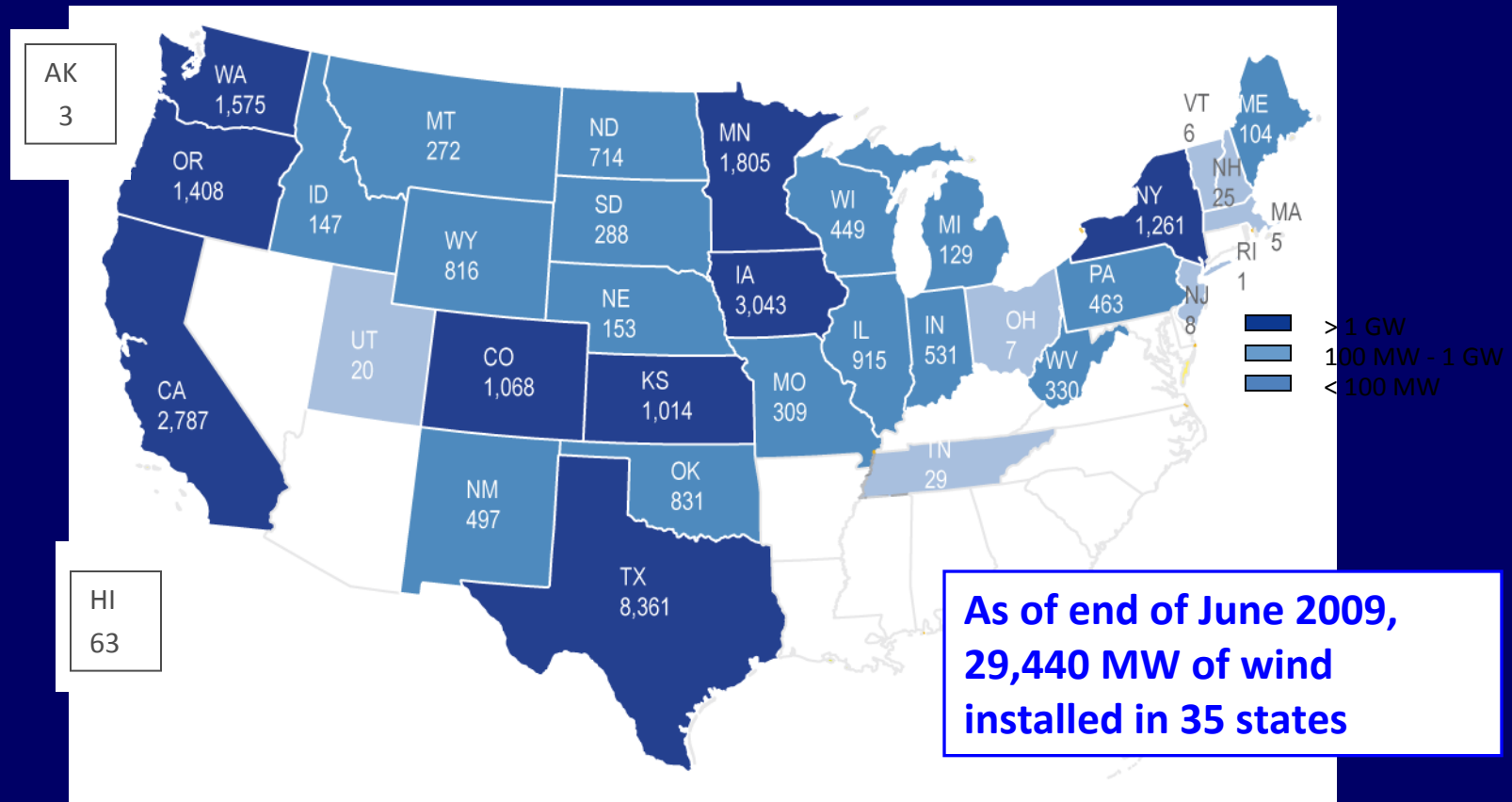


2,860 MW
commissioned in
Q1 2009

1,210 MW
commissioned in
Q2 2009

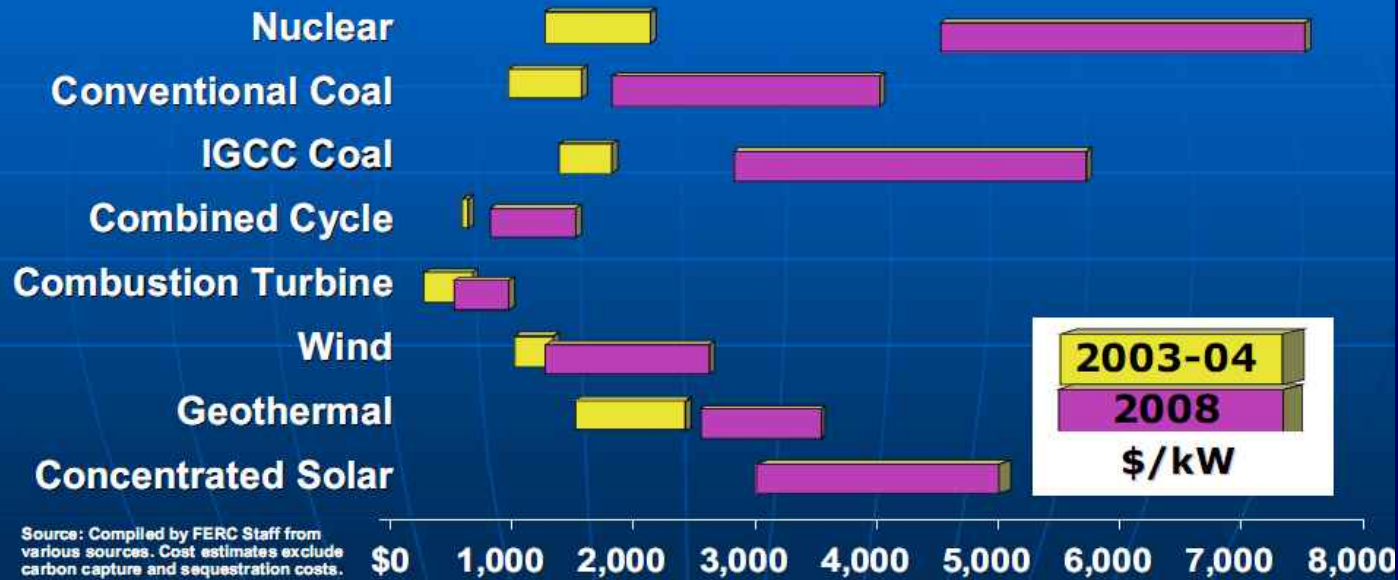
>5,500 MW under
construction (for
completion in second
half of 2009 and/or
first half of 2010)

Installations Growing Throughout U.S.



Wind is cost-effective

Estimated Cost of New Generation



Wind energy is wildlife-friendly

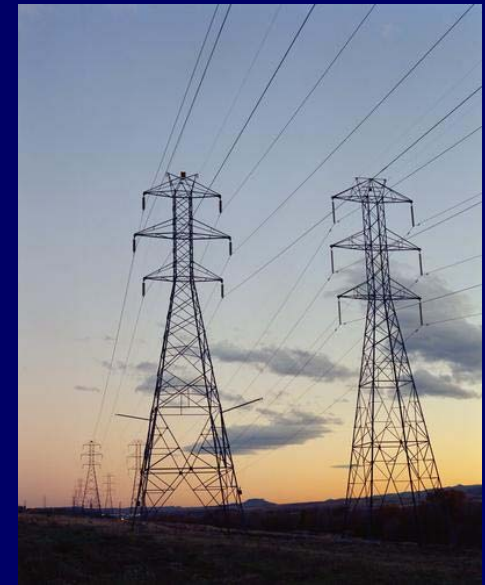
Table ES-2: Highest Levels of Relative Wildlife Risks for each Life Cycle Stage of Each Electricity Generation Source

Source	Relative Wildlife Risk Level for Potential Harm					
	Resource Extraction	Fuel Transportation	Construction of Facility	Power Generation	Transmission and Delivery	Decommissioning of Facility
Coal	Highest Potential	Lower Potential	Lower Potential	Highest Potential	Moderate Potential	Lower Potential
Oil	Higher Potential	Highest Potential	Lower Potential	Higher Potential	Moderate Potential	Lower Potential
Natural Gas	Higher Potential	Moderate Potential	Lowest Potential	Moderate Potential	Moderate Potential	Lowest Potential
Nuclear	Highest Potential	Lowest Potential	Lowest Potential	Moderate Potential	Moderate Potential	Lowest Potential
Hydro	None	None	Highest Potential	Moderate Potential	Moderate Potential	Higher Potential
Wind	None	None	Lowest Potential	Moderate Potential	Moderate Potential	Lowest Potential

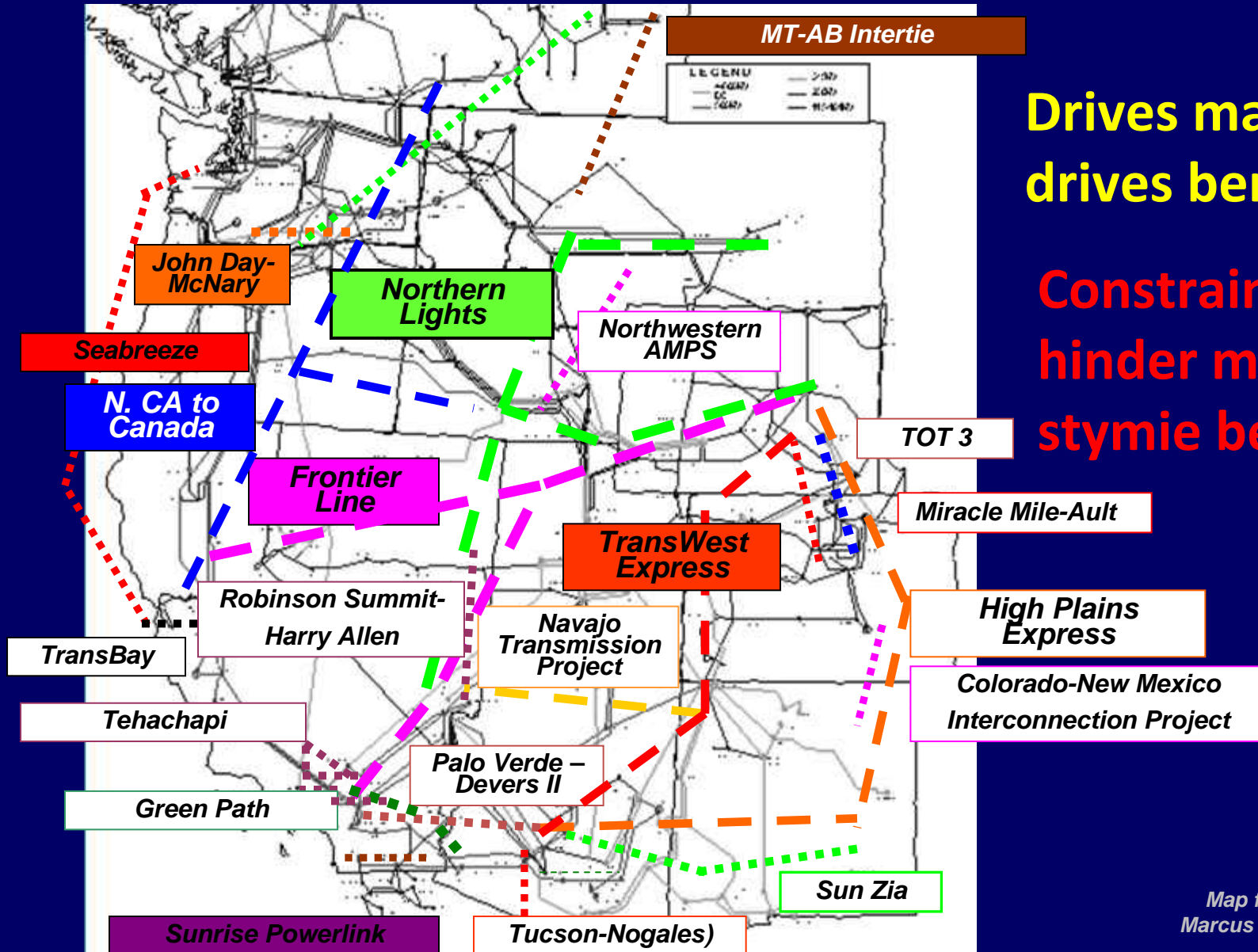
From "Comparison of Reported Effects and Risks to Vertebrate Wildlife from Six Electricity Generation Types in the New York/New England Region," NYSERDA Report 09-02 [http://www.nyserda.org/publications/Executive Summary Report.pdf](http://www.nyserda.org/publications/Executive%20Summary%20Report.pdf)

Hindrances to wind energy growth

- Inconsistent federal and state policies
- Duplicative/overlapping layers of permitting (e.g., county and state)
- **Transmission constraints**



Transmission



**Drives markets,
drives benefits**

**Constraints
hinder markets,
stymie benefits**

*Map from presentation by
Marcus Wood of Stael Rives*

Critical transmission issues

How do we PLAN for transmission?

- “single utility” planning, eg 1991 Colorado Ute agreement
- Long term—10, 20 years, life of equipment
- Systematic and comprehensive
 - System benefits, least total G&T costs
- How do we PAY for transmission?
- How do we PERMIT transmission?

“PLAN -- PAY – PERMIT”

Critical transmission issues

- Planning that includes collectors
- System benefits planning collectors and backbone, interstate lines together
- Timing collectors with backbone, interstate lines
- Options for independent collector development and ownership, consortium approaches
- Joint ownership, open season
 - Cost allocations, cost recovery, financing
- Local permitting advantages

Transmission, Operations, Markets

Build transmission, net of: EE/DSM/CHP/Electric Vehicles/coal retirements

ALSO, reform operations:

regional weather forecasting, real time scheduling, consolidate or virtual balancing areas, share ACE

ALSO, need regional market functions:

eliminate pancaked transmission rates
access regional regulation capabilities

WW&SIS: 20-30% penetration changes:
“dramatic”

Colorado's "box canyon": Wyoming's opportunity?



Routing of interstate transmission line strictly conceptual

Exploration of Resource and Transmission Expansion Decisions in the Western Renewable Energy Zone Initiative

Andrew Mills, Amol Phadke, Ryan Wiser
Lawrence Berkeley National Laboratory

November 5, 2009

Electricity Markets and Policy Group • Energy Analysis Department



LBNL WREZ Conclusions

- Wind is the largest contributor to meeting RPS targets WECC-wide
- Transmission investment costs are substantial, but only a fraction of the costs required to meet a 33% RPS
- Long transmission lines (> 400 miles) can be economically justified in particular cases, but most transmission lines will be relatively short (< 250 miles)
- Transmission expansion can be reduced through Renewable Energy Credits
- Hydro, biomass, and geothermal contributions to the portfolio do not change significantly with increasing renewable demand or sensitivity cases
- Key uncertainties can shift the balance between wind and solar in the renewable resource portfolio

Exploration of Resource and
Transmission Expansion Decisions in
the Western Renewable Energy Zone
Initiative

Andrew Mills, Amol Phadke, Ryan Wisler
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Energy-First Planning

Today: planning focuses on capacity

- Capacity resources supply most energy

Carbon constraints focus on energy

- Emissions a function of energy, not capacity

Huge amounts of low marginal cost, no-carbon energy resources available

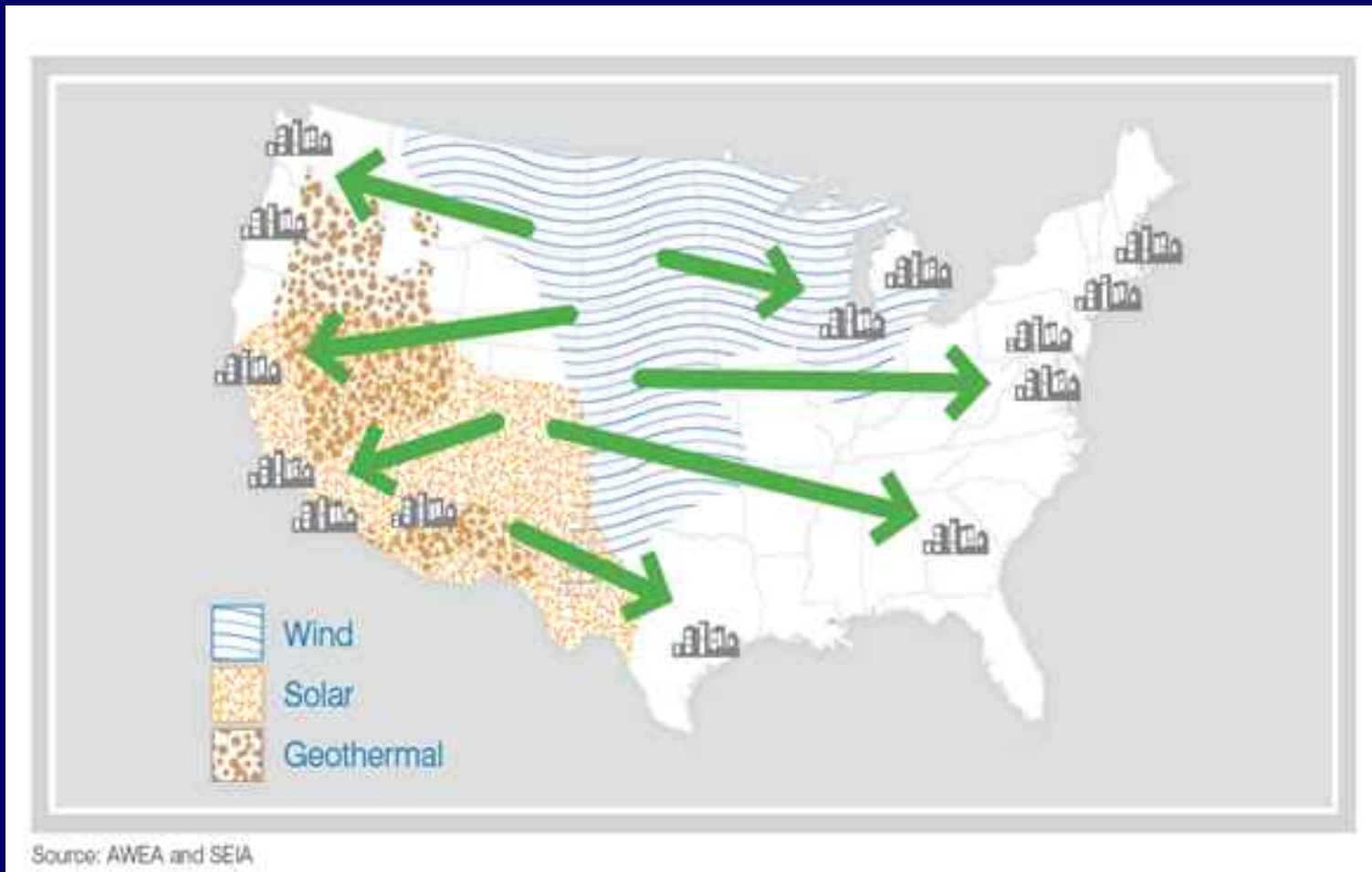
- Plan electric system to maximize their use

Need to build capacity strategically, to keep system balanced, fill in around energy resources

Transmission decisions: Gaining public support

- **Public understanding and support**
 - Saving money on generation costs justifies transmission
 - Even though transmission dollars are large, they are tiny compared with generation costs and potential savings
 - Economic development opportunities are quantifiable, and significant

Regionally or nationally: green-power superhighways



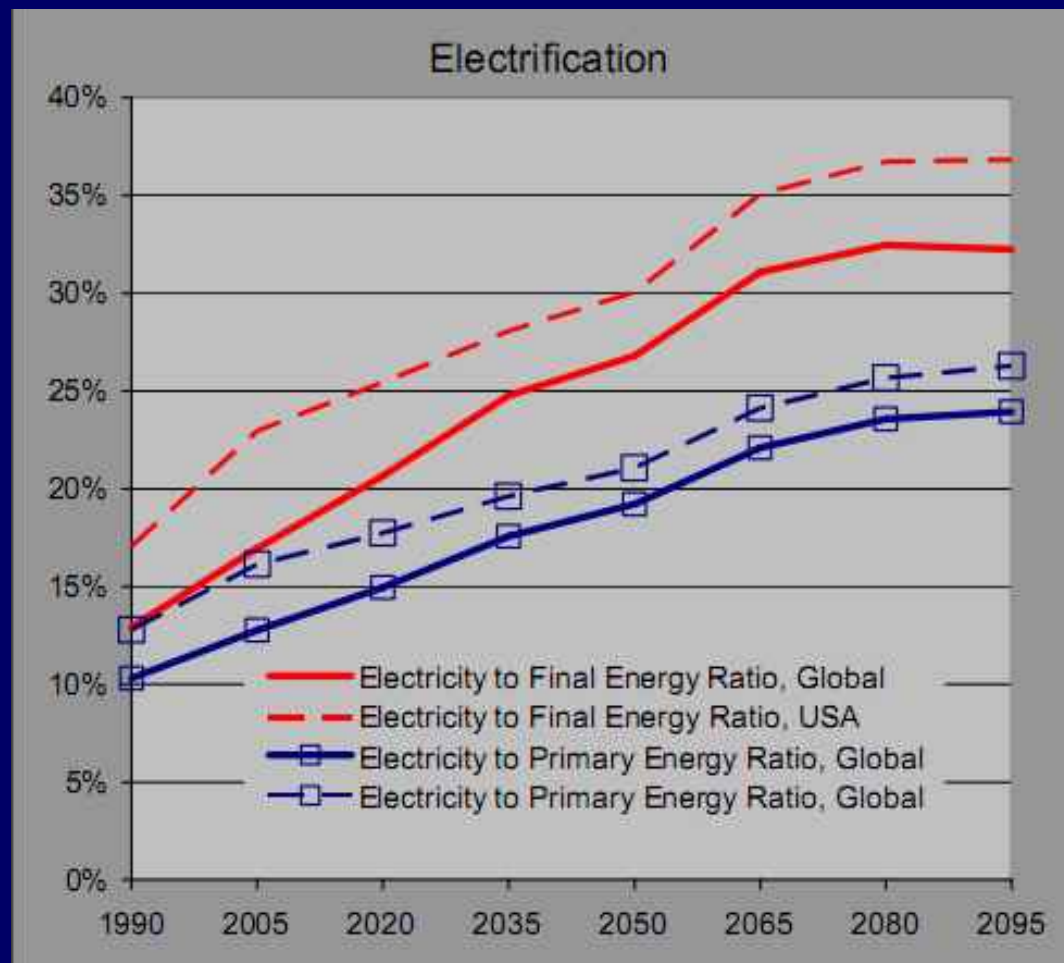


We have been talking planning...



...but only steel in the ground (and wires) can transmit electrons!

Electrification of the economy



From "Electrification of the economy and CO2 emissions mitigation,"
by Edmonds, Wilson, Wise and Weyant, 2006,
available at <http://www.pnl.gov/gtsp/docs/electrification.pdf>

So, What's in it for Wyoming?

Hundreds of new permanent jobs

Average of one job per installed 10 MW, plus significant potential number of supply-chain jobs

Thousands of construction jobs

Number varies depending on project and location

Millions of dollars in local economic benefits

Increased local tax base, new infrastructure, landowner payments, economic multipliers

End of boom-bust cycle

Wind is inexhaustible and less vulnerable to booms and bust

Opportunity to lead in a 21st-century energy industry

Worldwide demand is booming for clean energy technologies

Strengthening U.S. energy security – and national security

Clean energy will be a cornerstone of America's national security in the 21st century

Thank you



Craig Cox
Interwest Energy Alliance
cox@interwest.org
www.interwest.org
303-679-9331