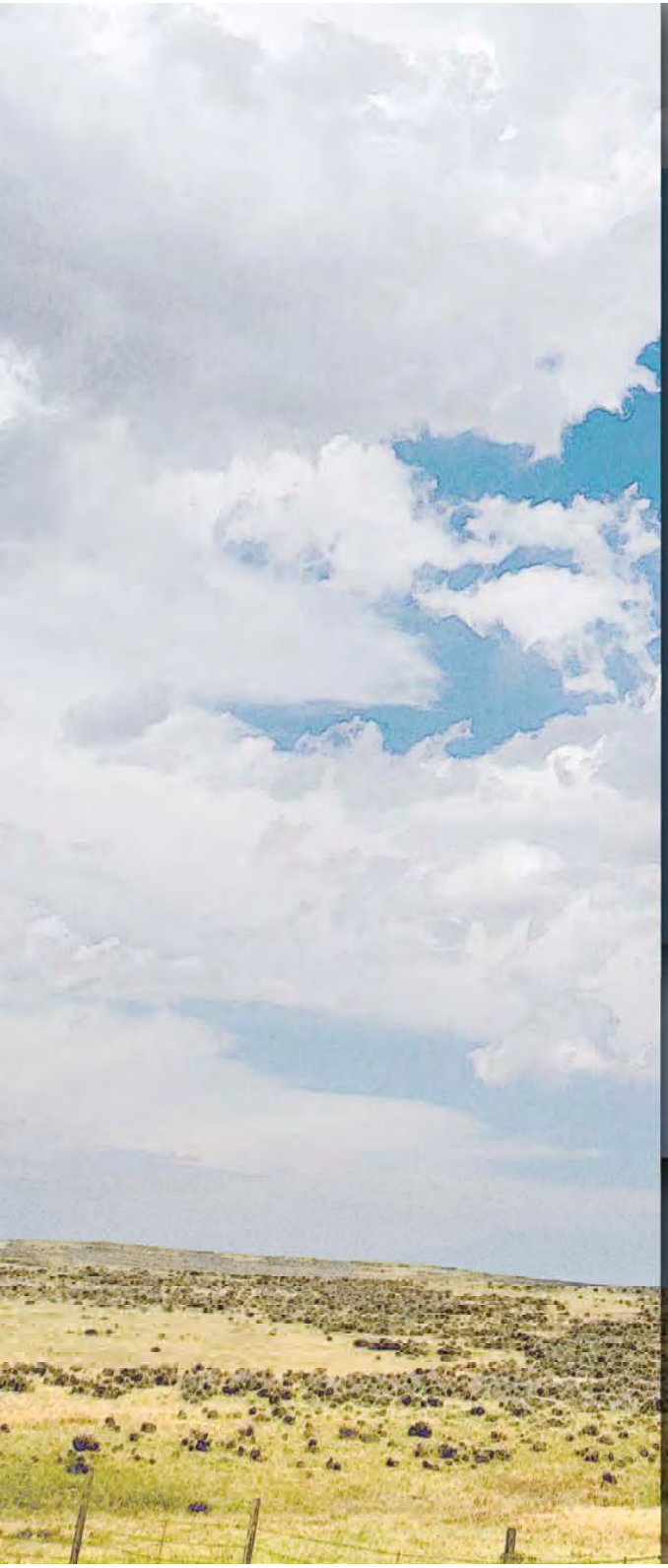

Transmission and Renewable Integration in Resource Planning

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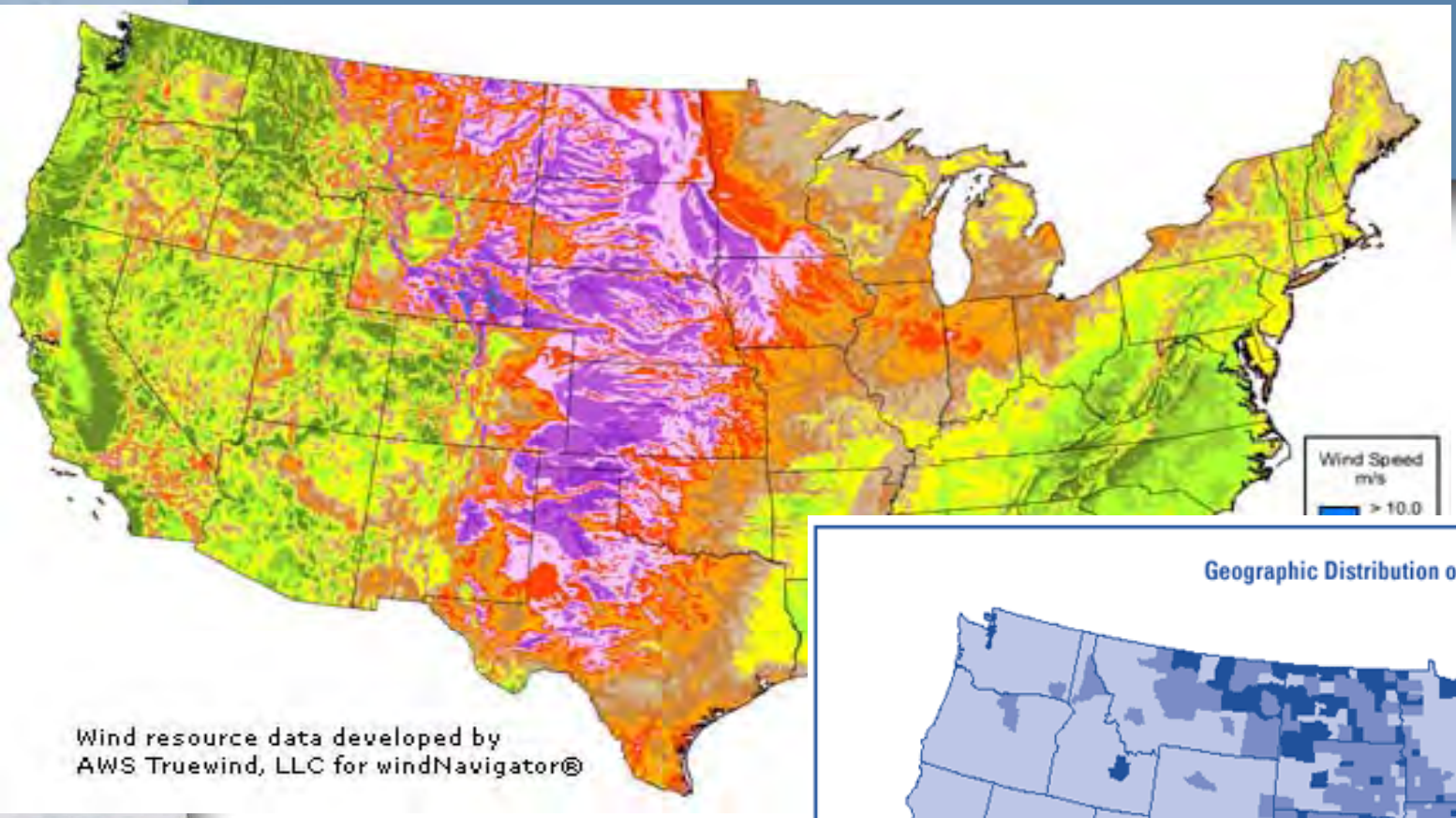
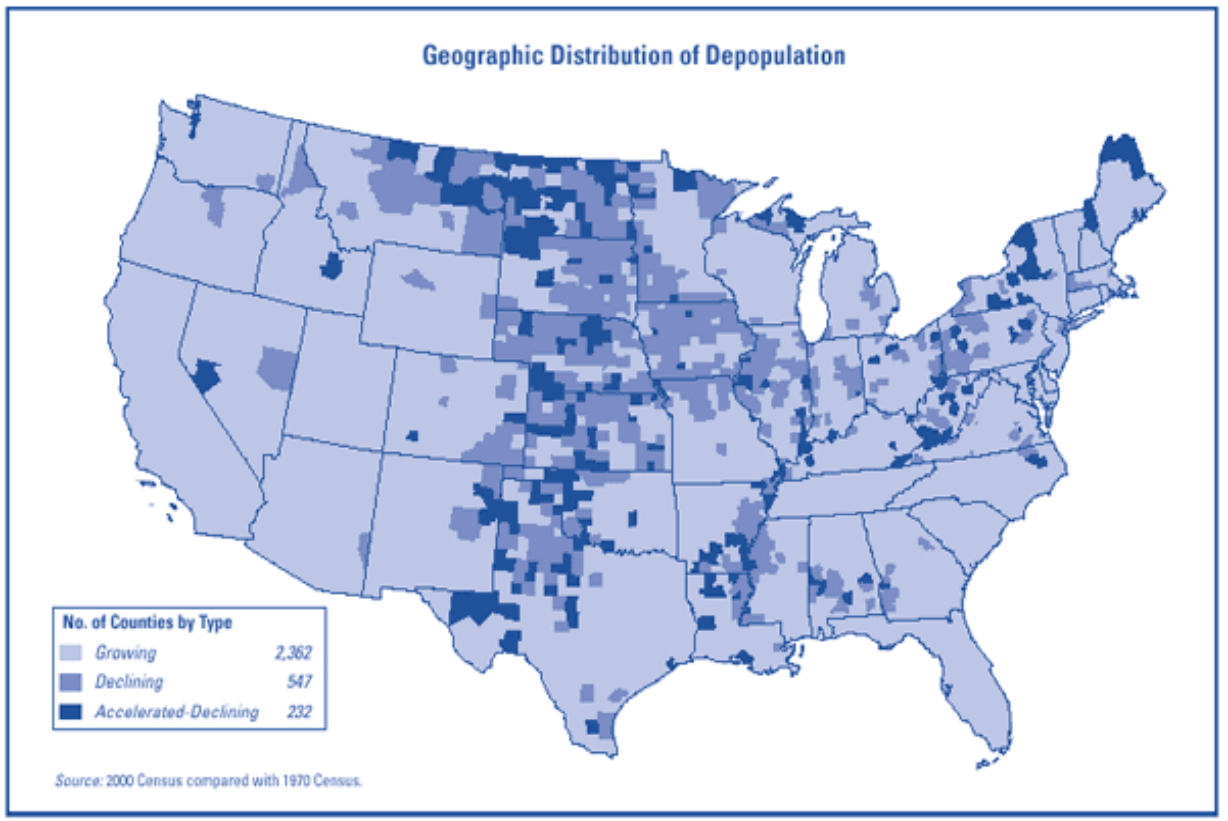
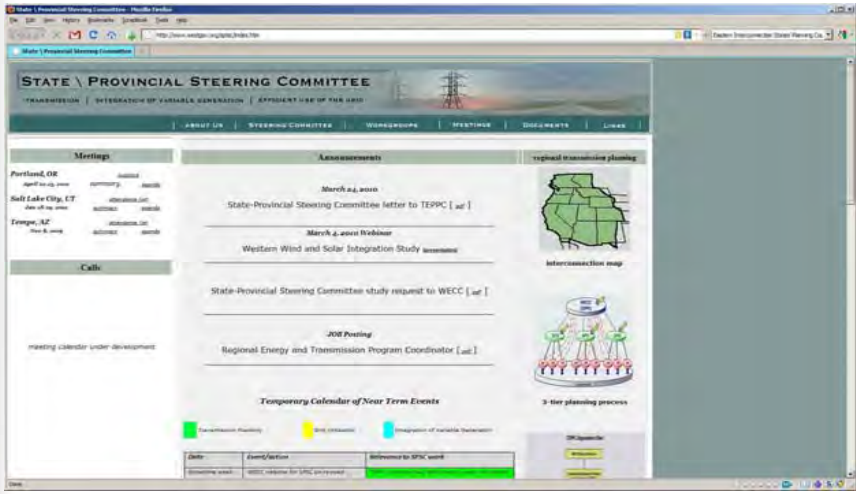
Resources: The windy rural areas



Wind resource data developed by
AWS Truewind, LLC for windNavigator®



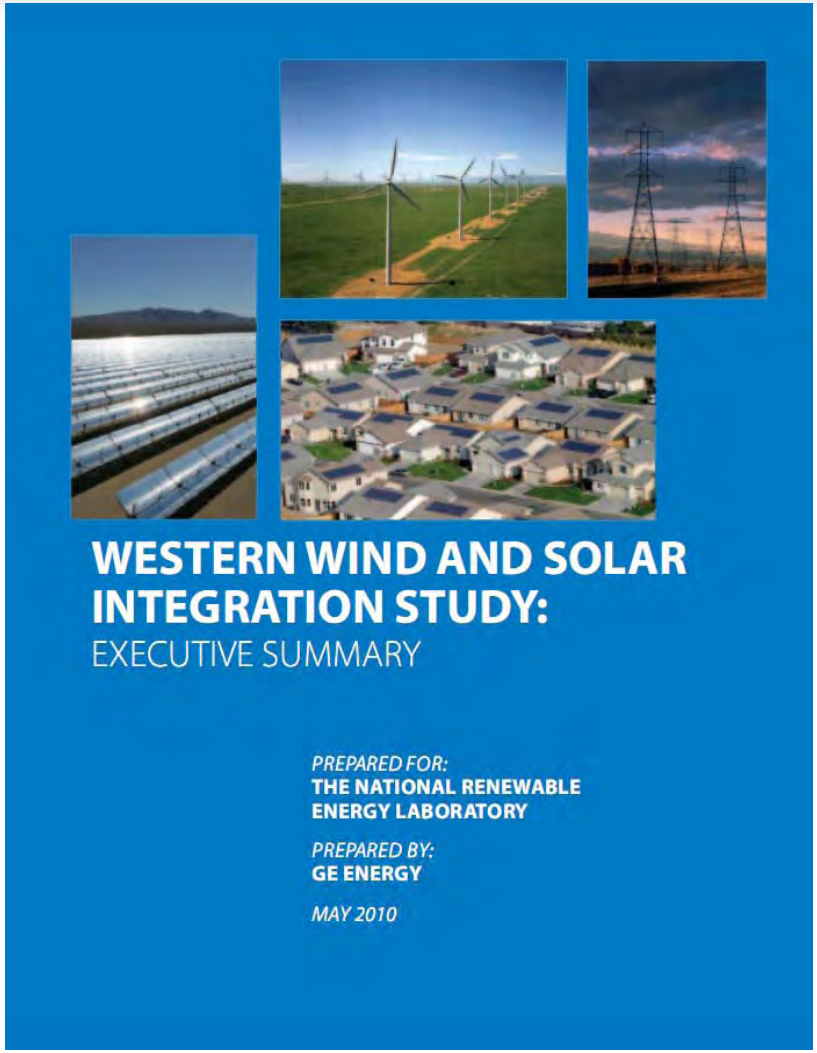
Expanding transmission planning: Grid-wide



Expanding transmission planning: Statewide

- Colorado PUC Dockets:
- 09R-904E (Noise, EMF, etc.)
- 09M-616E (rulemaking)
- Southern Colorado Transmission Project (aka San Luis Valley-Calumet-Comanche Transmission Project, Dockets 09A-324/5E).
  - The difficulties in this docket are illustrating how the lack of comprehensive, coordinated planning has helped enable NIMBY

Western Wind and Solar Integration Study: Feasibility



"WWSIS finds that 35% renewable energy penetration is operationally feasible provided significant changes to current operating practice are made, including balancing area cooperation and sub-hourly economic dispatch."

Western Wind and Solar Integration Study: Cost Benefits

- "The 30% case reduced annual operating costs by 40% or $20 billion ($17 billion in 2009$) and CO_2 emissions by 25% across WECC, assuming $9.50/MBTU gas. At a $3.50/MBTU gas price, operating costs were reduced by 25% and CO_2 by 45%."

Western Wind and Solar Integration Study: Demand Response and Storage

- "It is more cost-effective to have demand response address the 89 hours of contingency reserve shortfalls rather than increase spin for 8760 hours of the year. Demand response can save up to $600M/yr ($510M/yr in 2009$) in operating costs versus committing additional spinning reserves."
- "Increased renewable energy penetration slightly increases use of existing storage, but additional storage was not found to be needed."

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
  - Transmission is still controversial, so earning stakeholder consent helps minimize controversies and overcome opposition

Policy issues for consideration

- What does all this mean?
  - There is a great appetite for large-scale renewable energy development
  - This means changes across planning, investment and operations
  - There will be new market structures that will present challenges and opportunities
  - Member-owners' and stakeholders' consent must be earned by Tri-States
  - Tri-State member-owners can benefit from the transition to renewables

Transmission and Resource Planning

- FERC requires the Transmission and Resource Acquisition utility functions be separated within a utility with regard to specific resource acquisitions, but that separation is not applicable to integrated load and resource planning.
  - No barrier to consideration of transmission planning and inputs process.
- Transmission planning is resource planning

Colorado Independent Energy Association

- IPP's make up CIEA
  - IPP's need certainty in business planning
  - IPP's have proven track-record of providing cost-effective (least cost) resources when competitive bidding is enabled
- CIEA supports Tri-State's effort to improve the competitive acquisition of independent power production

Important Modeling Assumptions

- Neutrality as between self-build and IPP resource selection
- Transmission assumptions - Integration issues were once focused on hydropower, but now focus on wind, solar and geothermal power production – the Generation Development Areas
  - Build-out costs not attributable to selected resources
  - Inputs – allow opportunity for review/response
    - Voltage levels
    - Capacity levels
    - Cost per mile
    - Constraints and network upgrades
    - Costs of operation
    - Treat all lines as in-service by the end of the RAP

Tri-State Renewable Integration

- Wind and solar are relatively new to the Tri-State system:
  - Tri-State's resource planning process should model different levels of renewable penetration and at least one case that involves wind off-system sales.
- Renewable resource integration studies at different penetration levels.
  - This process should be of assistance.
  - Information gathering for 2012 process.

Cooperation and Integration

- Coordination with WAPA
  - Participation in the TIP program
- Coordination with PSCo and Black Hills
  - Missile Site Project
  - Lamar-Front Range Project
- Concerns applicable to Tri-State's modeling:
  - Looking at the system as an "island" without modeling neighboring transmission systems may skew results
  - Assigning costs of transmission to particular resources or resource areas may skew results because those costs may not represent delivered price of power

Requested Scenarios

- Tri-State reference case should include build-out of the transmission system
  - Lamar – Front Range Project
  - SLV Project
  - NE Colorado Projects mentioned in FERC 890 Presentation
- Export scenario – keep rates low
  - Basin Electric purchases reversed through advantageous use of Tri-State's service area
  - High Plains Express participation

Resource Acquisition

- Allow model assumptions and results relating to transmission and integration to be made known to bidders to ensure transparency
- Allow flexibility in bid formula – especially if projects are not needed until the far end of the study period
- Create a review where transmission costs are not assigned to bid after submission – allow the LGIP process to assign system upgrade costs
- Resolve RFP questions early and provide a mechanism for dispute resolution

Summary of Recommendations for Tri-State resource models

- All scenarios - should assume transmission build out to generation development areas
- One scenario should investigate export opportunities to the east (Basin) and south (HPX)
- Provide detail to IPP's on transmission inputs to be evaluated in resource acquisition – allow CIEA to respond to initial model runs with revised transmission inputs including ATC and cost per mile
- Allow process to be divorced from transmission system upgrades so as to maximize efficient wind and solar resources