

Other State Processes for Identifying Wind Energy Resource Zones

State Plan Outlines

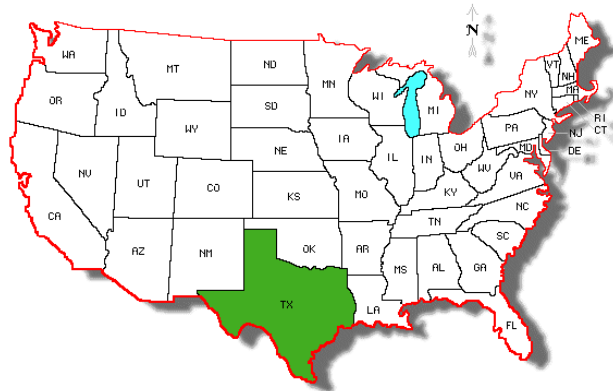


Michigan Public Service Commission

Michigan Wind Energy Resource Zone Board Meeting
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Texas



Texas- ERCOT Analysis of Transmission Alternatives for Competitive Renewable Energy Zones in Texas Outline of Plan

System Planning Report

Title Page

Executive Summary

ERCOT has performed an independent evaluation, with input from its stakeholders and the Southwest Power Pool, of the potential for wind generation development in Texas and of the transmission necessary to deliver a portion of this new wind generation capacity to electric customers in ERCOT. This study was conducted to support the Public Utility Commission of Texas (PUCT) in meeting its requirements under the Public Utility Regulatory Act of 2005, Section 39.904 (g), to designate competitive renewable energy resource zones (CREZs)

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- Description of Proposed System Improvements
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 - Combination Scenarios
- Modeling Results for Proposed System Improvements

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Summary and Conclusions

This study of transmission improvements to support additional wind capacity developed in Competitive Renewable Energy Zones has been conducted to support the Public Utility Commission of Texas in meeting the requirements of recently passed legislation. This study is based on input assumptions from the Five-Year Transmission Plan, and from a study of wind generation potential from areas throughout the State of Texas conducted by AWS Truewind. Detailed steady-state transmission models and security constrained unit-commitment and unit dispatch models have been used to analyze the costs and benefits of a large number of potential transmission improvements.

The study indicates that there is significant potential for development of wind resources in Texas. There are currently 2,508 MW of wind generation in-service in ERCOT and at least 4,850 MW of wind resources are likely to be in-service by the end of 2007. Approximately 17,000 MW of wind generation has requested interconnection analysis. Much of that current wind generation development is in West Texas. Studies indicate that the existing transmission network is fully utilized with respect to wind transfers from West Texas to the remainder of ERCOT. Thus, new bulk transmission lines are needed to support significant transfers of additional wind generation in the West Texas area.

From a transmission planning perspective, there are four general areas of wind capacity expansion: the Gulf Coast; the McCamey area, central-western Texas, and the Texas Panhandle. Transmission solutions for each of these areas are described in this report. These solutions represent incremental plans for each area and form the basis of transmission solutions to support combinations of wind development between two or more areas. Some common projects will be needed to mitigate the impact of the new CREZ-related generation on existing wind generation. Even with these projects, existing wind generation will be more susceptible to curtailment due to remaining system constraints because of its generally higher shift factors on those constraints.

This study does not attempt to capture all of the benefits and costs associated with the designation of CREZs, but focuses primarily on the direct costs and benefits related to the electric power system. In general, the production cost savings per kW of new wind generation varies little between the different areas. The Coastal area has lower capacity factor sites than the other areas but the wind output is somewhat more coincident with the ERCOT electrical load. The Coastal area also requires the least transmission investment per MW of installed new wind capacity. The Panhandle area has more, high capacity factor resources. The transmission cost per MW is also higher for the Panhandle area; the higher capacity factor of the resources in this area does not offset this higher cost.

The first level solution for the Central and McCamey areas use the same bulk transmission addition, so the designation of CREZs and addition of resources in these areas must be generally considered in conjunction.

While transmission solutions were generally developed that provided 1,000 MW incremental steps for each area, the second step for the McCamey level is larger, in terms of both cost and MW of wind generation supported; although the cost per MW of supported wind is similar to the other levels for McCamey and Central areas.

ERCOT will be performing an analysis of the impact of significant additional wind generation on the level of the different ancillary services that it procures to maintain system reliability. In addition, further ERCOT analysis of several issues is needed once a specific set of CREZs is designated by the PUCT and wind generation developers have indicated specific locations. These additional analyses include reactive support needs, dynamic stability analyses, optimization of the "on-ramps" within the CREZs and analysis of the specific projects or operational procedures needed to mitigate curtailments of existing wind generation.

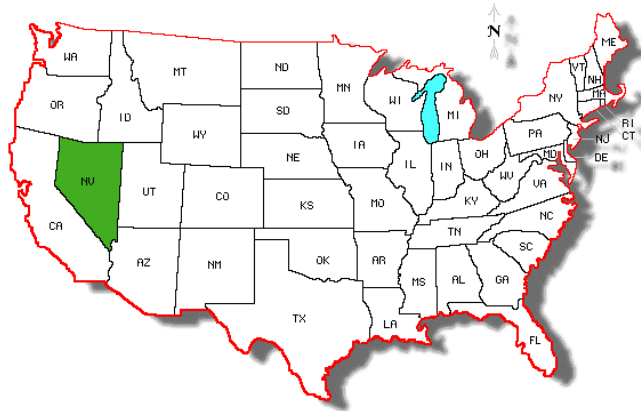
Problems & Difficulties Identified

The key challenges identified in the Texas ERCOT report are the time constraints in analyzing transmission system capabilities. There were numerous scenarios given without the ability to successfully conclude transmission within the state is able to support the scenarios.

Texas Report Findings

- There is significant potential for development of wind resources in Texas.
- There are currently 2,508 Megawatts (MW) of wind generation in-service. At least 4,850 MW of wind resources are likely to be in-service by the end of 2007, and around 17,000 MW of wind generation has requested interconnection analysis. Much of that current wind generation development is in West Texas.
- Studies indicate that the existing transmission network is fully utilized with respect to wind transfers from West Texas to the remainder of ERCOT. New bulk transmission lines are needed to support transfers of additional wind generation from the West Texas area.
- There are four general areas of wind capacity expansion: the Gulf Coast; the McCamey area, central-western Texas, and the Texas Panhandle. Transmission solutions for each of these areas are described in this report which provide an incremental plan for each area and form the basis of transmission solutions to support combinations of wind development between two or more areas. Some common projects will be needed to mitigate the impact of the new CREZ related generation on existing wind generation. Even with these projects, existing wind generation facilities will be more susceptible to curtailment due their generally higher shift factors on the remaining system constraints.
- This study does not attempt to capture all of the benefits and costs associated with the designation of CREZs, but focuses primarily on the direct costs and benefits related to the electric power system.
- The production cost savings per kW of new wind generation varies little between the different areas.
- The Coastal area has lower annual capacity factor sites than the other areas but the wind output is somewhat more coincident with the ERCOT electrical load.
- The Panhandle area has more resources with high annual capacity factors.
- The Coastal area requires the least transmission investment per MW of installed new wind capacity. The transmission cost per MW is higher for the Panhandle area; the higher annual capacity factor of the resources in this area does not offset this higher cost.
- The first level solution for the Central and McCamey areas use the same bulk transmission addition, so the designation of CREZs and addition of resources in these areas must be generally considered in conjunction.
- While transmission solutions were generally developed that provided 1,000 MW incremental steps for each area, the second step for the McCamey level is larger, in terms of both cost and MW of wind generation supported; although the cost per MW of supported wind is similar to the other levels for McCamey and Central areas.
- ERCOT will be performing an analysis of the impact of significant additional wind generation on the level of the different ancillary services that it procures to maintain system reliability. In addition, further ERCOT analysis of several issues is needed once a specific set of CREZs is designated by the PUCT and wind generation developers have indicated specific locations. These additional analyses include reactive support needs, dynamic stability analyses, optimization of the "on-ramps" within the CREZs and analysis of the specific projects or operational procedures needed to mitigate curtailments of existing wind generation.

Nevada



Nevada- Renewable Energy Transmission Access Advisory Committee Outline of Plan

Phase I Report

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Introduction

Chairman's Comments

- Appointed Committee Members
- Non-Committee Sub-Group Participants
- Map Contributors
- Administrative Assistants
- Video Conferencing Coordinators

Executive Order by Governor

Executive Summary

Nevada was one of the first states to adopt a Renewable Portfolio Standard. The Portfolio Energy Standard is commonly referred to as the "RPS," or simply the "Portfolio Standard." Since its inception in 1997 the RPS has been modified by the Legislature several times. Currently Nevada's RPS encompasses both renewable energy and energy efficiency. The RPS requires the state's investor owned electric utilities (Sierra Pacific Power and Nevada Power Companies) to generate, acquire, or save electricity from renewable energy systems or energy efficiency measures of not less than 20 percent (20%) by 2015.

Renewable energy development has accelerated with the implementation of the RPS. To facilitate delivering this new energy to users it is recognized that transmission adequacy must be assessed, limitations identified and new electrical interconnects proposed. The Renewable Energy Transmission Access Advisory Committee ("RETAAC" or "the Committee") initiated this process of review. Wind, solar, geothermal and biomass potential was examined using the best available databases and models. Available transmission access was compared to these renewable energy zones and areas of constraint were overlaid on the resulting maps. Three recommendations were made by the committee:

1. The Governor's Office support the construction of transmission lines and collector systems to enable access for renewable energy development in each of the identified Renewable Energy Zones.
2. The Governor's Office support the construction of a transmission line to connect the state's northern and southern electric grids of sufficient capacity to provide Nevada Power with their non solar renewable energy requirements from the abundant geothermal and wind resources in northern Nevada and provide Sierra Pacific Power access to the abundant solar resources in southern Nevada.
3. Initiate Phase II of the RETAAC to define the environmental and physical feasibility issues, costs and potential financing mechanisms associated with the recommended transmission routes beginning in first quarter 2008 with a completion date of December 31, 2008.

Methodology

- Generation of Resource Maps
- Identification of Renewable Energy Zones
- Transmission Needs Analysis- Access the Grid
 - Table 1- Transmission Links
 - Detail

Constraints and Stakeholder Analysis

- Environmental Right of Way
- Land Stakeholders
- Military

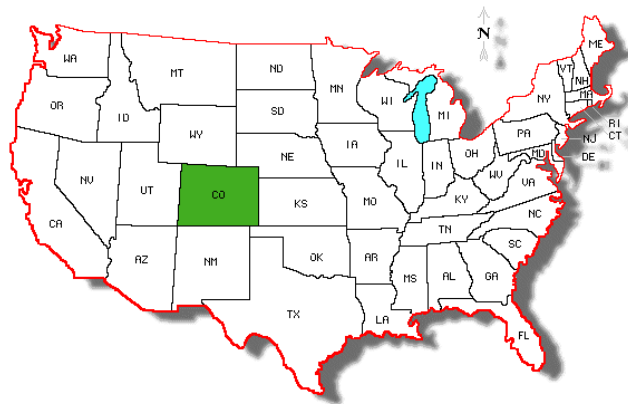
Recommendations

Summary and Conclusions

Phase II report is expected in July 2009

1. The Governor's Office support the construction of transmission lines and collector systems to enable access for renewable energy development in each of the identified Renewable Energy Zones There are renewable energy zones that have enough resource density to require transmission lines and collector systems. The collector system located, where feasible, within 25 miles of the sites within the zone so that developers can build their own radial line to the collector system.
2. The Governor's Office support the construction of a transmission line to connect the state's northern and southern electric grids of sufficient capacity to provide Nevada Power with their non solar renewable energy requirements from the abundant geothermal and wind resources in northern Nevada and provide Sierra Pacific Power access to the abundant solar resources in southern Nevada. Given that the northern and southern grids are not electrically interconnected and the location of certain resources are unique to either the north or south of the state, a connection between the two grids would allow for greater use of the renewable energy potential. Please note there is a planned transmission line that would interconnect the north and the south already in the two utilities' respective resource plans called the Eastern Nevada Transmission Interconnection (ENti). For a description of this please refer to Public Utilities Commission of Nevada (PUC) website, which can be found at <http://pucweb1.state.nv.us/PUCN/electrichomepage.aspx>.
3. Initiate Phase II of the RETAAC to define the environmental and physical feasibility issues, costs and potential financing mechanisms associated with the recommended transmission routes beginning in first quarter 2008 with a completion date of December 31, 2008. As can be seen from the section of the report on constraints, challenges are introduced when new rights-of-way are sought for new construction. Further analysis must be done to investigate the constraints and routes that can accommodate construction of transmission lines while avoiding constraint areas. Also, further study of the cost to build the proposed transmission lines and the potential of the renewable energy zones must be performed to arrive at a cost benefit that would ultimately rank the lines and perhaps identify ones that are not feasible. Finally, Phase II must address the means of financing the building of the transmission lines and collector systems contemplated here in this Phase I report.

Colorado



Colorado- Renewable Resource Generation Zones Task Force Outline of Plan

Phase I Report- Outline

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Background/Information, Creation of Task Force

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Executive Summary

Colorado has tremendous renewable resource potential. The state is number eleven in the nation for wind potential. The state ranks fourth in the nation for solar potential. According to one report, Colorado is fourth among Western states for geothermal development site potential. We have sizeable relatively untapped hydroelectric, geothermal, and biomass resources. In addition to extensive renewable resources, Colorado is also blessed with great intellectual and institutional resources. Of note, under the auspices of the Colorado General Assembly, Colorado's Research Collaboratory has partnered with National Renewable Energy Laboratory, the University of Colorado, Colorado State University, and the Colorado School of Mines. In addition, the state is fortunate to enjoy a vibrant and growing New Energy Economy of entrepreneurs and businesses. Although bringing these abundant and clean energy resources to the markets, and continuing to grow the institutions and businesses to support the markets is challenging, Colorado is well situated to respond. Integrating larger amounts of renewable resources into our electric grid will take the talent, creativity, skill, and coordination of many partners, including project developers, electric utilities, regulators, federal, state and local agencies, and many other stakeholders. We are encouraged by the focus of the Western Governors' Association's on these topics, and the General Assembly's creation of the Clean Energy Development Authority to pursue these challenges.

- Renewable Energy Attributes and Challenges
- Transmission Constraints
- Renewable Resource Generation Development Areas
- Wind Resources
- Solar Resources
- Local Development Opportunities

Connecting Colorado's Renewable Resource to the Markets

- Introduction and Background on SB07-091
- Legislative Sponsors
- Appointment of the Task Force
- The SB07-091 Budget
- Task Force Meetings
- Definition of Renewable Resource Generation Development Areas (GDAs)
- Eight Wind GDAs and Two Solar GDAs Designated
- The Process for Renewable Energy Projects to Enter the Electric Power Market
- Local Development Opportunities
- Mapping of Colorado's Renewable Resources

Wind Power Generation Development Areas

- Wind Energy Overview
- Wind Energy in Colorado
- Community and Small-Scale Wind
- Wind Energy and the Western Governors' Association
- Wind Integration

Solar Energy Generation Development Areas

- Utility Scale Solar Technologies
- Concentrating Solar Thermal Power
- Photovoltaic Systems
- Storage of Solar Energy
- Distributed Photovoltaic
- Central Solar Power Policy
- Effective Solar Power Policy
- Colorado Statutory Policy

Hydroelectric Power

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- Opportunities for New Hydropower Development in Colorado
- Summary of Colorado Hydropower Resources

Geothermal

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- Geothermal Direct Use
- Geothermal Heat Pumps
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- PUC Investigation of Geothermal

Biomass

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- Anaerobic Digestion
- Colorado's Biomass

Ethanol and Biodiesel

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- Biodiesel Defined
- Colorado Center for Biorefining and Biofuels

Developing Renewable Resources within Colorado's Electricity Environment

- Colorado Public Policy

- House Bill 07-1281- Colorado’s Renewable Energy Standard
- Colorado Clean Energy Development Authority
- Federal Support
- Renewable Energy and Economic
- Renewable Energy and Colorado’s Climate Action Plan

Colorado’s Electric Generation

- Colorado Generation Resource Mix
- Electric Generation Costs
- Results from the Colorado Energy Forum

Summarizing the Electricity Market Context for Colorado’s Renewable Resource Development

Colorado Transmission

- 2006 Transmission Task Force
- Senate Bill 07-100- Identifying Resource Zones and Transmission Needs
- Future Transmission Plans
- Colorado Transmission Constraints

Colorado’s Electric Utility Industry

- Colorado Electric Service Territories

Renewable Energy, Energy Efficiency, and Net Metering Programs

Enterprise Zones

- Colorado Demographic Data

Conclusion

Acknowledgements

Endnotes

Appendix

Summary and Conclusions

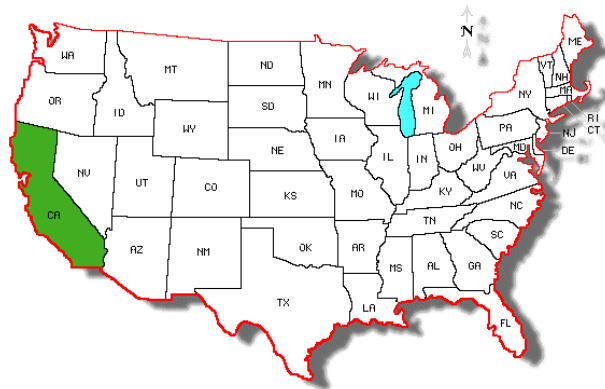
As quantified in this report’s maps and narrative, Colorado has abundant renewable resources that can provide increased opportunities to improve the state’s energy, economic and environmental condition. The state has moves quickly over the past few years to expand the penetration of renewable energy in to Colorado’s electric power marketplace. Colorado will continue to benefit by adding more renewable energy and expanding its limited transmission infrastructure to serve its population and what may evolve as a regional electric power marketplace.

The Task Force identifies a key challenge- the expansion of high voltage transmission to the areas of Colorado that have significant renewable potential. The Task Force report demonstrates that Colorado's existing transmission system has very limited capability to connect our substantial renewable resources to the market. The resolution of these constraints will strengthen and improve Colorado's electric infrastructure and citizens. We commit to work together on these common objectives so that Colorado will achieve the objectives of the New Energy Economy.

Problems & Difficulties Identified

The key challenges identified in Colorado's report are the lack of stable and reliable transmission to areas with high renewable potential. The need for a transmission study along with the renewable energy study is vital.

California



California- RETI- Renewable Energy Transmission Initiative Outline of Plan

Executive Summary

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- Environmental Assessment of CREZs
- Combined Assessment of CREZs
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