Projections of Wind Generation in the Upper Midwest – 2008 Update

by

Wind Utility Consulting, PC
and
Wind Management, LLC

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Lead Sponsors of this Project

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John Deere Wind Energy Group – John Deere Credit
Iowa Farm Bureau Federation
Iowa Association of Municipal Utilities
Iowa Utility Board

PROJECTIONS OF WIND GENERATION IN THE UPPER MIDWEST – 2008 UPDATE

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Section 1 - Introduction and Overview

At the request of the Iowa Department of Economic Development, Wind Utility Consulting, PC has updated the 2005 and 2007 studies entitled, "Projections of Wind Generation in the Upper Midwest". This updated study makes projections of new wind generation installations in a twelve-state area surrounding Iowa. Figure 1 shows areas within 300 and 600 miles of central Iowa. States included in this study were Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Wisconsin. Thomas A. Wind of Wind Utility Consulting, PC of Jefferson, Iowa partnered with Mr. Rory Artig of Wind Management, LLC in Minnesota to update the study and projections.

The main tasks of this and the original 2005 study include the following:

1) Determine the primary drivers and barriers for installing additional wind turbines or generation facilities in the twelve-state area surrounding Iowa.
2) Project the number of megawatts of wind generation that may be installed in this area through the year 2014.
3) Develop optimistic, reference, and pessimistic scenario projections.
4) Determine the number of wind turbines these projections would require.

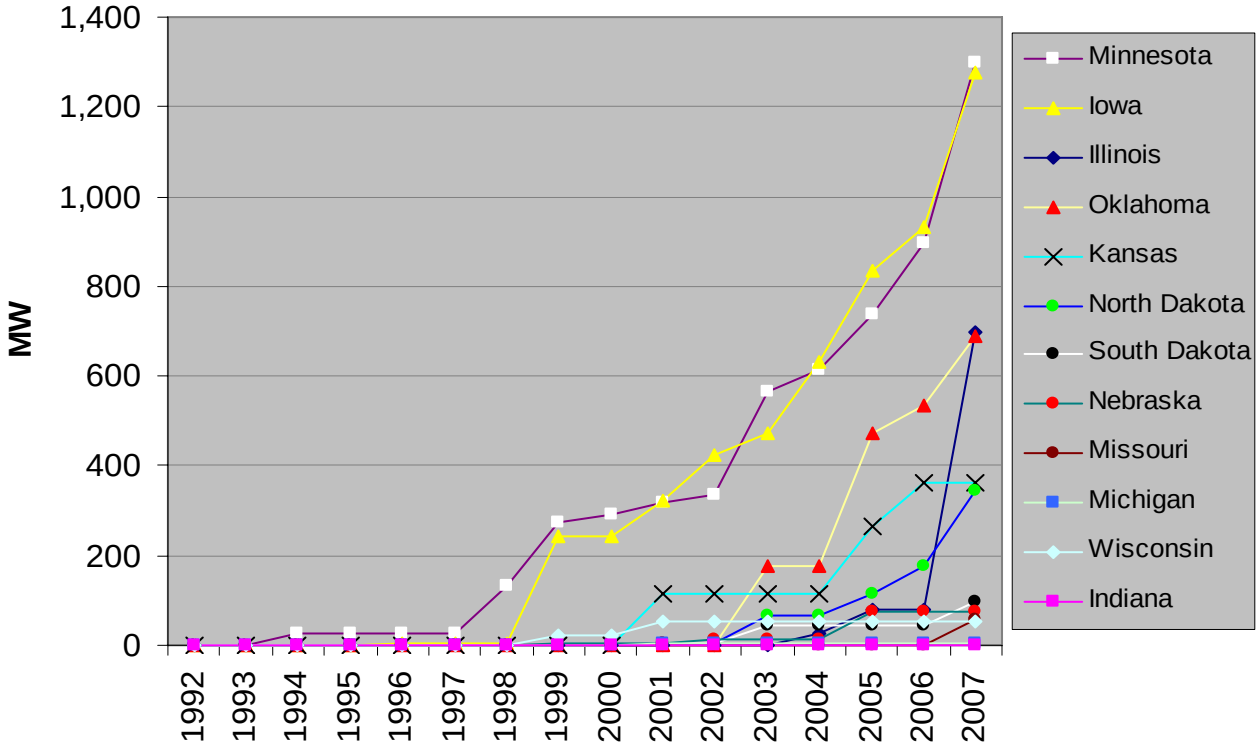
FIGURE 1 – Areas Within 300, 500, and 600 Miles of Central Iowa

Section 2
Historical Development of Wind Generation in Each of the Twelve States

Large-scale wind energy generation in the upper midwestern states essentially started in Iowa and Minnesota in the early 1990's with refurbished 65 kW wind turbines from California. Iowa had a net billing law that encouraged larger customers like schools to install wind turbines to offset purchases from their utilities. This net billing law resulted in Iowa's first utility-scale wind turbine of 250 kW in size, installed by the Spirit Lake school district in 1992. Minnesota also had a net billing law limited to 40 kW that resulted in the installation of many smaller wind turbines and the start of that state's wind industry. The first large project in the Midwest was done for Xcel Energy in southwest Minnesota in 1994, and it contained 73 wind turbines totaling 25 MW. By 1998, Iowa's net billing law and other incentives had resulted in 13 turbines larger than 50 kW totaling 5.4 MW. In that same year, a 107 MW wind farm was installed in Minnesota due to a state mandate. In 1999, the Iowa Renewable Portfolio Standard ("RPS") mandated the installation of 235 MW. These two large wind farms in Minnesota and Iowa jump-started the wind industry in the upper Midwest. Figure 2 shows the historical installations of wind generation in the twelve-state area as of the end of 2007. Although Iowa lost the lead to Minnesota in 2007, it is currently ahead of Minnesota as of May, 2008.

FIGURE 2

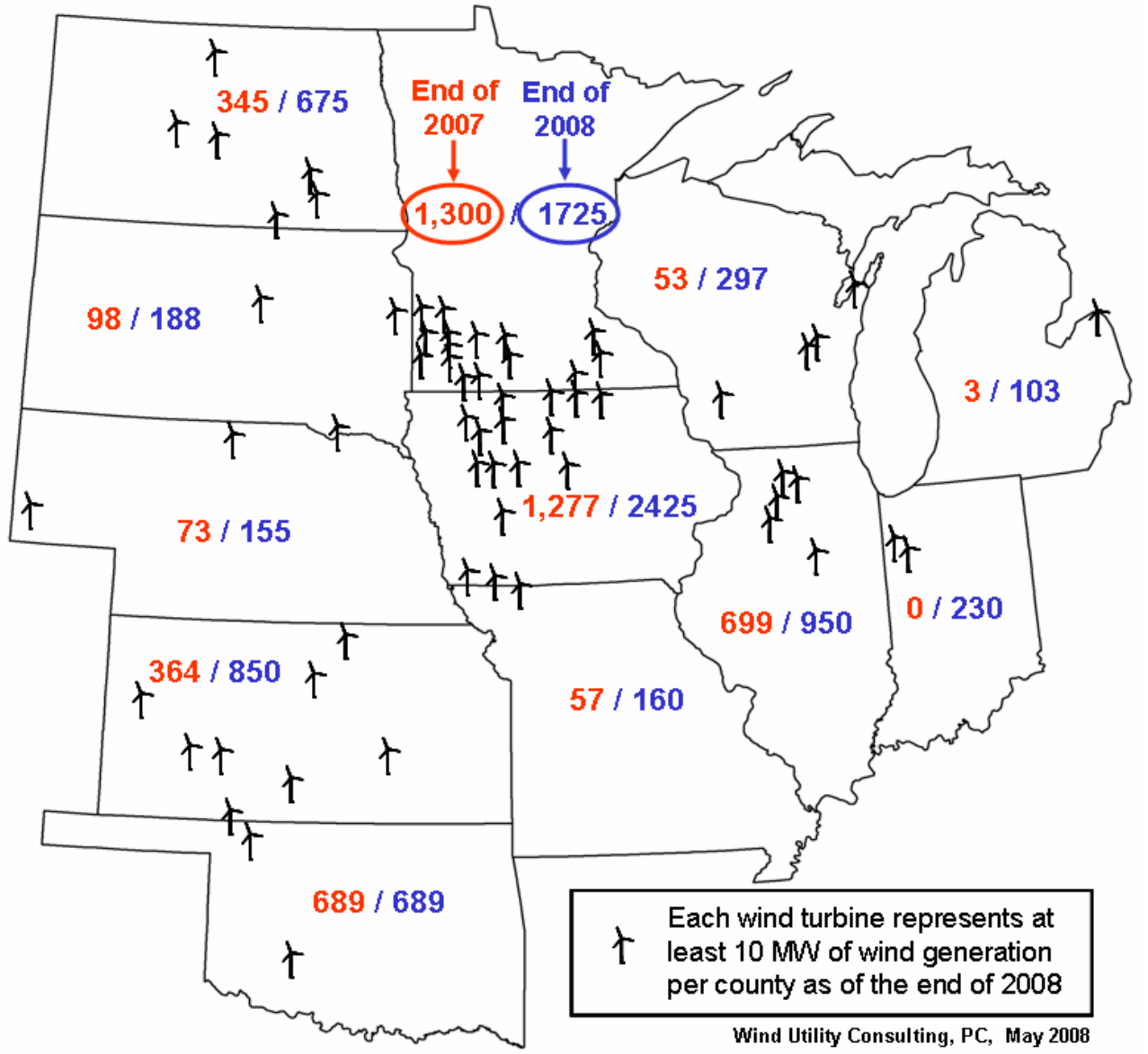
Historical Development of Wind Generation for Each State



Public policies in Iowa and Minnesota hastened the beginning of large-scale wind generation in the upper Midwest and other states have followed their lead. Figure 3 below displays the total wind generation in Megawatts for each of the twelve states at the end of 2007 and at the end of 2008 based on projects now under construction. It also illustrates counties that have at least 10 MW of wind generation existing or under construction in 2008.

FIGURE 3

Total Megawatts of Wind Generation at the End of 2007 and 2008



Section 3 - Factors Driving Wind Generation Installations

Historically, wind generation projects have been driven by public policy initiatives, such as financial incentives or a state-mandated Renewable Portfolio Standard (RPS). California, which has the second-most wind generation, used generous tax breaks for wind developers and forced utilities to pay higher prices for the wind power. Texas, with the most wind generation in the nation, used an RPS, as did Iowa. An RPS jump-starts the wind industry in the state. It usually provides an ongoing renewable energy target, around which both wind farm developers and utilities can more efficiently plan.

The second driving factor is the decline in cost of wind power. Figure 4 illustrates the price of wind generation has declined by over 60% in the U.S. over the last 15 years. For example, wind power costs for new wind generation projects in Iowa have dropped by about one-third since the first large wind farms were installed in Iowa in 1999. Although wind power costs have risen the last three years due to higher steel and concrete prices and surging demand for wind turbines, prices will likely again drop as supplies increase to meet the demand. As wind power costs come down and fossil fuel prices increase, states are more inclined to adopt an RPS, and utilities are more likely to recognize the financial benefits of locking in power prices.

FIGURE 4 – Decline of Wind Power Costs Over Time

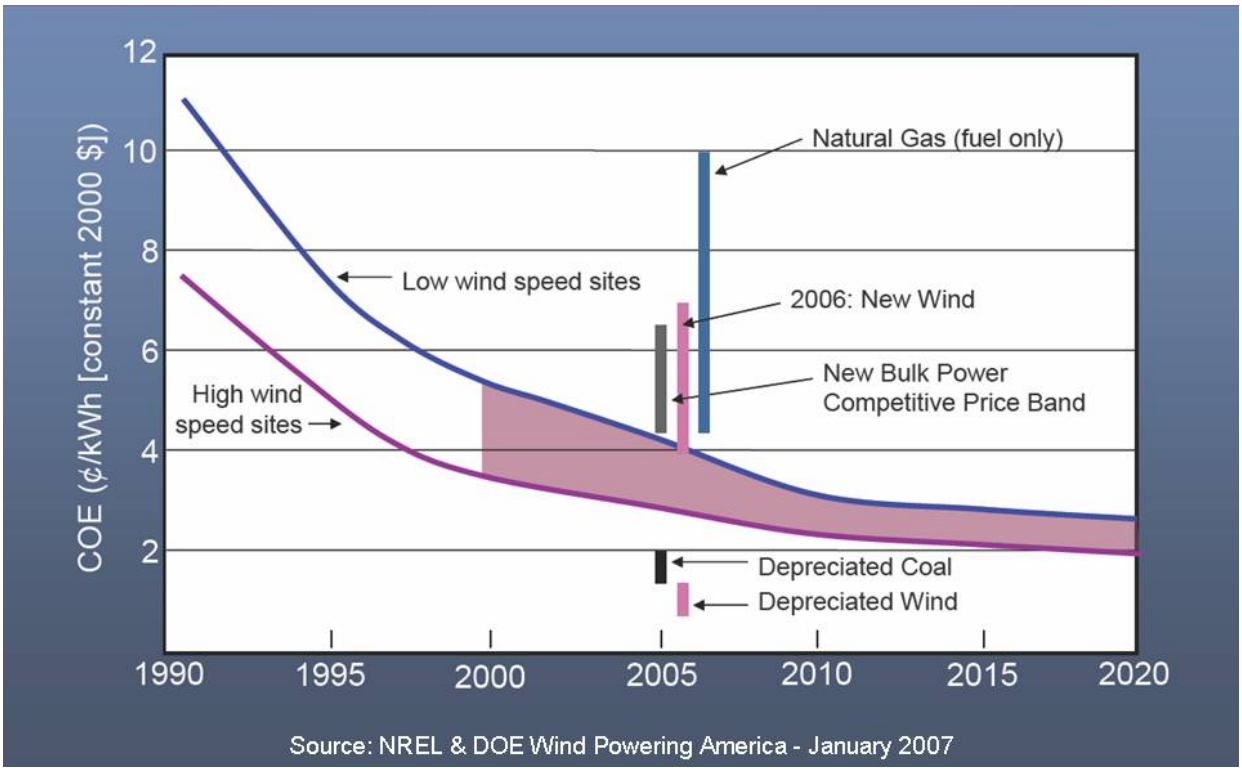
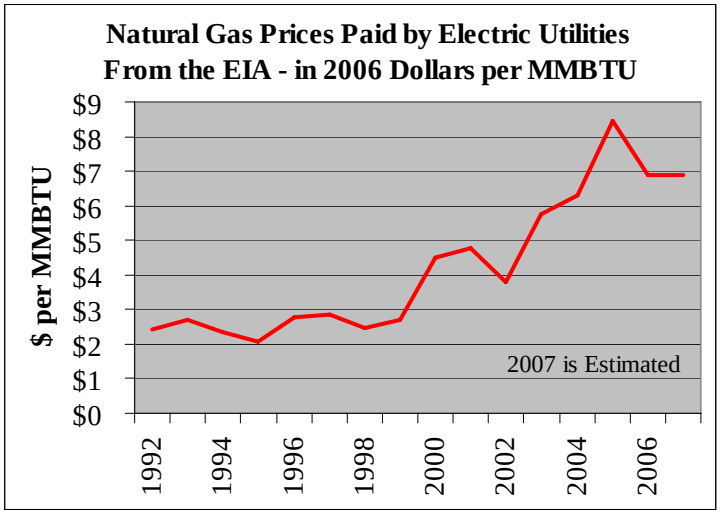


FIGURE 5 – Natural Gas Prices for Utilities



A new very powerful driving factor is the price of natural gas. Figure 5 presents the average historical price paid by electric utilities for natural gas used to generate electricity. Prices have nearly tripled from the typical $2.50 per million BTU ("MMBTU") range during the last decade, to around $7.00 per MMBTU now. With gas prices above $6 per million BTU, wind generation in good windy areas is typically less expensive than gas-fired electric generation. With NYMEX natural gas futures over $10 per MMBTU in May 2008, gas prices should continue to stay above the $6 per MMBTU economic threshold, which should encourage utilities to invest in more wind generation.

Recent increases in the market price of electricity have been driven by the use of natural gas for generating electricity. Significant amounts of gas-fired generation built during the last 10 years now often set the market price of power in the Midwest Independent System Operator ("MISO") area, Mid-Continent Area Power pool ("MAPP") area, and Southwest Power Pool ("SPP") area.

If gas-fired generation sets the market price of power during most of the daily on-peak hours, then wind generation becomes very cost competitive because of the high gas-fired electricity costs. Wind generation costs may be higher than market prices at night when gas may not be used for generation. However, the high daytime market prices typically offset the premium over market prices at night. A real-time market price map of the MISO and MAPP areas can be found on-line at: http://www.midwestmarket.org/page/LMP+Contour+Map+&+Data.

Another aspect of wind power is that the price per MWh is stable and predictable, since it is often specified by a long-term contract. With wholesale market prices being volatile and high for a couple of years now, wind generation's price certainty reduces risk.

The most powerful long-term driver for more wind generation will be future U.S. carbon emission regulations. Since wind generation reduces greenhouse gas emissions, it will likely become one of the leading greenhouse gas mitigation strategies used by utilities in areas having even marginal wind resources. This aspect represents an incredibly large opportunity for the wind industry.

Figure 6 lists the types of incentives that are available in the twelve-state study area. The incentive rating numbers used in the table are a subjective estimate of how effective the various incentive programs will be in encouraging significant commercial-scale wind generation development. This rating is on a scale of 0 – 4, with 0 representing low effectiveness and 4 representing high effectiveness. The source of this information and the ratings shown in the table are from the Database of State Incentives for Renewable Energy (DSIRE), found on-line at **http://www.dsireusa.org/summarytables/financial.cfm**. The "Overall Rating" in the last column is the Consultants' overall assessment of the collective effectiveness of the various incentives. Iowa and Minnesota have the best set of wind generation incentives.

FIGURE 6 – Types of Incentives in the Twelve-State Study Area

State	Personal Tax	Corp. Tax	Sales Tax	Prop. Tax	Rebates	Grants	Loans	Industry Recruit.	Bonds	Production Incentives	Consultants Overall Rating
Illinois				1	1	3 1					3
Indiana				1	4						2
Iowa	1	1	1	3	4	1	2			2	4
Kansas				1							0
Michigan				1	1	4		2			1
Minnesota			2	1	1 18	3	3 1			1 3	4
Missouri		1			3		1 1				1
Nebraska		1			3		1				1
North Dakota	1	1	1	2							2
Oklahoma		1						1			1
South Dakota				2							2
Wisconsin				1	1 3	1 1	1			2	3

Note: A blue dot denotes a state program, a red dot denotes a utility program, and a yellow dot denotes a private program incentive. The numbers in the circles denote the number of those types of programs in the state.

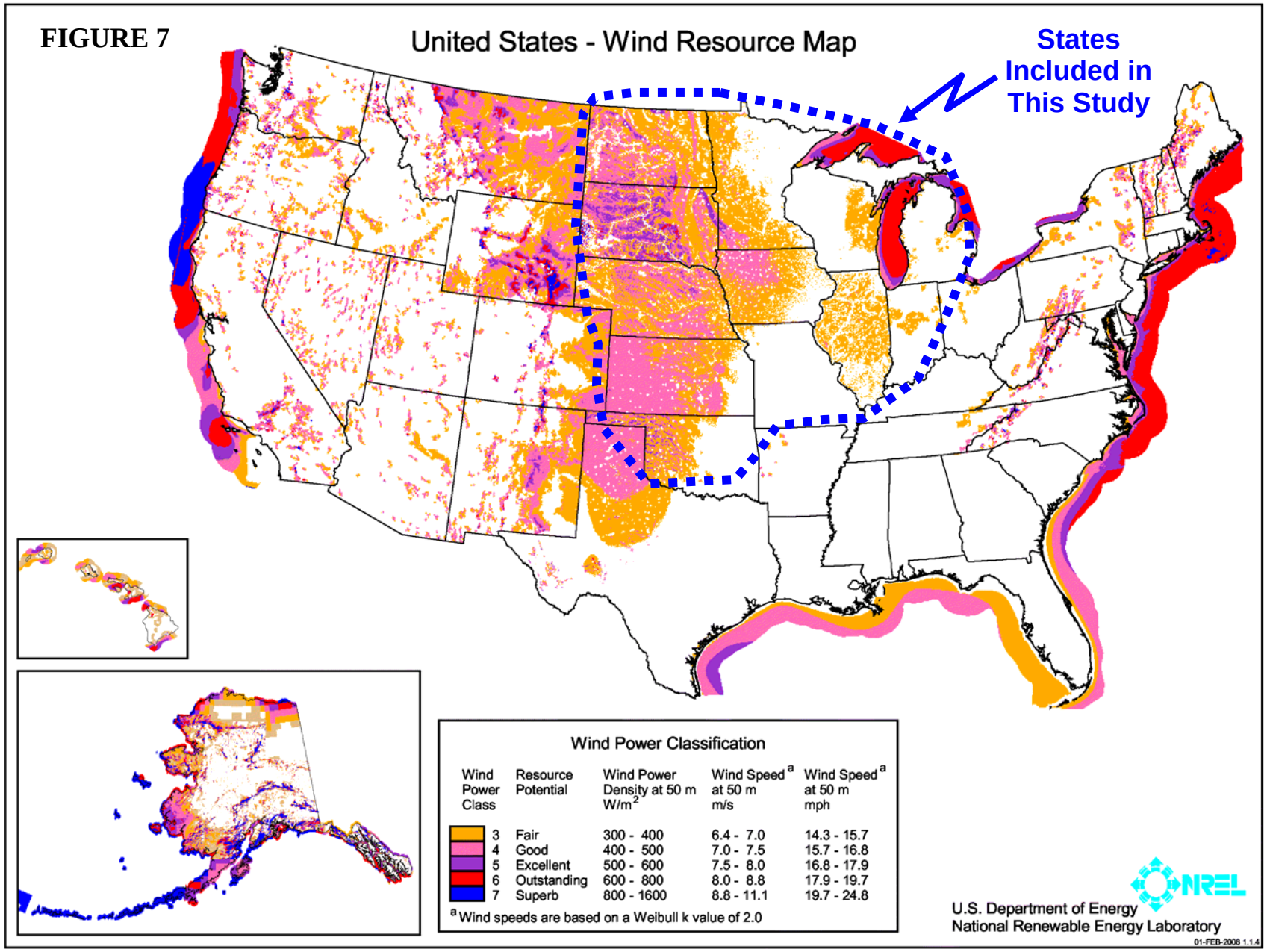
Section 4 - Wind Generation Installation Projections

The amount of wind generation that will be installed in the future depends upon a number of factors, such as:

- RPS mandates
- Market prices of power in the area
- Wind speeds
- Available financial incentives
- Availability of wind turbines
- Installation cost of wind generation
- Availability of transmission capacity in windy areas

Because wind generation tends to be developed first where the average wind speeds are the highest, it is helpful to compare the relative wind speeds in the entire Midwestern area. Figure 7 on the following page is a composite wind speed map for the entire U.S. developed by the National Renewable Energy Laboratory. Areas in purple or orange generally have sufficient wind resources to be economically developable today or in the near future. The map vividly illustrates the incredible wind generation potential in the upper Midwest. All of the twelve states in this study have areas where wind generation is economically developable today.

FIGURE 7


United States - Wind Resource Map
States Included in This Study
Wind Power Classification
Wind Power Class
Resource Potential
Wind Power Density at 50 m W/m2
Wind Speed a at 50 m m/s
Wind Speed a at 50 m mph
3 Fair 300 - 400 6.4 - 7.0 14.3 - 15.7
4 Good 400 - 500 7.0 - 7.5 15.7 - 16.8
5 Excellent 500 - 600 7.5 - 8.0 16.8 - 17.9
6 Outstanding 600 - 800 8.0 - 8.8 17.9 - 19.7
7 Superb 800 - 1600 8.8 - 11.1 19.7 - 24.8
a Wind speeds are based on a Weibull k value of 2.0
NREL
U.S. Department of Energy
National Renewable Energy Laboratory
01-FEB-2006 1.1.4

The consultants developed three projections representing optimistic, reference, and pessimistic assessments of wind generation additions in each of the twelve states in the study area. These projections were based on these sources of information:

- Consultants' general knowledge of wind resources, industry trends, and transmission issues
- Multiple Regression analysis
- Transmission interconnection queue
- Interviews with various industry experts in each state

A multiple regression analysis was developed to project future wind generation development. This analysis was based on the historical development of wind generation in the twelve-state area (excluding Indiana, Michigan and Missouri, where historical data is not available because large-scale wind generation did not exist). This data included the years from 1992 through 2007. During that 16-year period, the eight states collectively had 101 years where there was some amount of wind generation in existence. A relatively simple equation was developed using multiple regression analysis to predict generation installations. This equation used these independent variables:

- Any RPS requirement, given in MW for each year
- A variable that was the percentage of total MWH of electric generation from natural gas for each state by year
- A variable that was the price of natural gas paid by electric utilities in dollars per MMBTU (shown in Figure 5), divided by the generic cost of wind generation in the U.S. at high wind speed sites for the years 1992 through 2007
- The previous year's wind generation total MW installed in the state (lagged dependent variable)

The combination of these four independent variables provided an equation with an adjusted R^2 of 96%. In all cases, the regression analysis predicted growth in wind generation in all twelve states. The regression analysis predictions for the individual states were sometimes higher and sometimes lower than the reference or mean projection adopted by the Consultants. If all of the regression analysis predictions for the twelve states were added together, their total was in between the median and optimistic projections. Given the limited amount of data from the twelve states and the other relevant factors not included in the analysis, the Consultants were surprised that the regression analysis totals were relatively close to the final projections.

In all cases, the projections were based on the continuation of the federal PTC, or some other equivalent federal incentive or mandate having a comparable effect as the PTC. Experience has shown that when the PTC is not extended in a timely manner, installation of wind generation in the U.S. drops dramatically. On the contrary, when investors are confident that the PTC will be in place for a period of time, wind generation installations surge. For example, the new Energy Bill and a subsequent appropriations bill extended the PTC out through the end of 2008, and the ensuing development boom will set new records through 2008. The consultants believe that the volatility in fossil-fuel energy prices will put more pressure on Congress to make sure that renewable energy plays a larger role in our energy future. This pressure should lead to continued incentives or mandates that ensure renewable energy's continued growth.

The development of the projections for each state was based on all of the factors listed above. The Consultants assessed the data and selected future growth trends using their collective judgment. The individual trend lines were usually not linear in nature. After the mean projection was determined, the optimistic and pessimistic projections were made in a similar manner.

Notes about future development and a graph depicting the Consultants' projections for each state are shown on the following pages. Each graph shows the optimistic, mean, and pessimistic projections for the total amount of wind generation in MW for each year of the forecast period. The projections for 2008 largely reflect the amount of wind generation under construction that is expected to be finished by the end of 2008. Since the PTC is set to expire at the end of 2008, projects under construction will most likely be finished by then. The pessimistic projection assumes the PTC is not extended until after late 2008. This greatly reduces the installations in 2009. The graphs also have the projected RPS requirements or goals enacted or announced for each state, such as the popular 25% renewables by 2025 pledges being made by governors across the U.S.

The graphs also include the projected percentage of electricity that would be generated in the state by wind generation in the year 2014, given the mean projection. This percentage is a simple calculation of the expected annual production of wind generation in the state, divided by the projected annual electric energy consumed in the state. Since this is based on projected future wind generation capacity factors, there is some uncertainty in the estimate. This calculation also ignores the fact that some wind energy may be exported to meet other state RPS requirements. The wind generation is counted only in the state where it is generated.

The graphs also have a rough estimate of the amount of additional wind generation that has requested interconnection to the electric transmission grid. This transmission queue amount simply reflects the level of serious interest by wind generation developers in each state. No transmission queue information was included for Kansas or Oklahoma.

The next twelve pages provide the background information and graphs showing the projections for each of the twelve states.

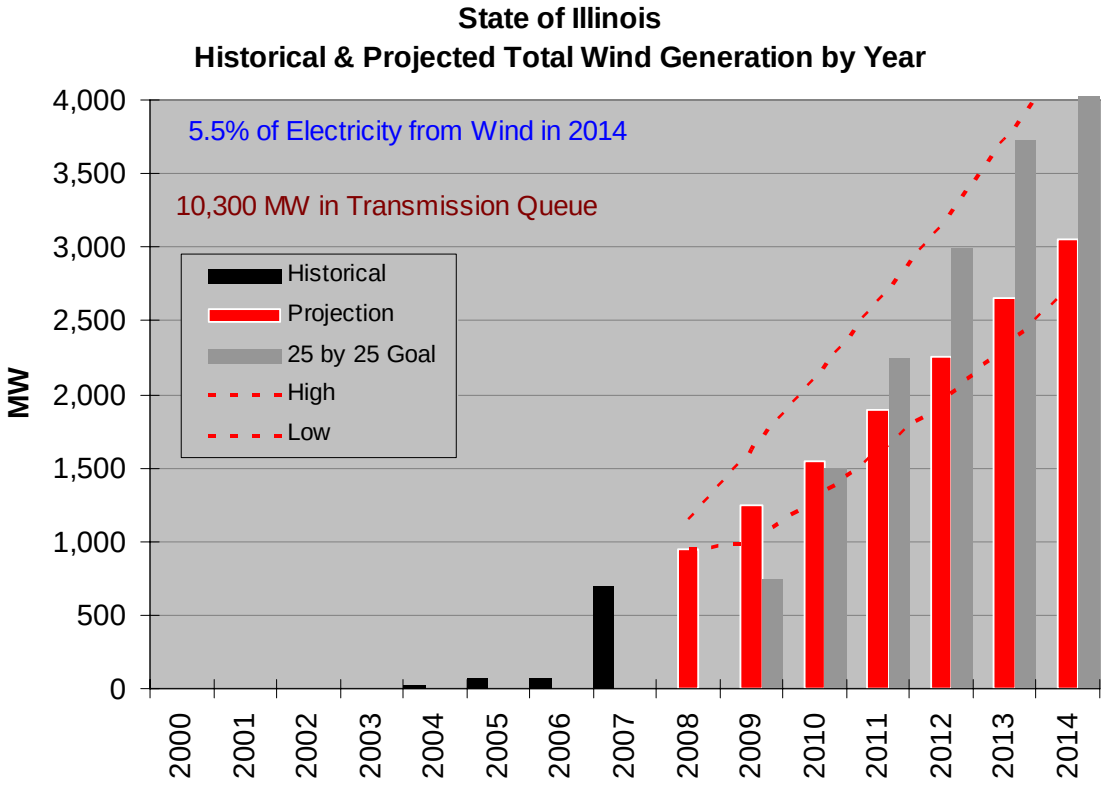
Following these individual state projections on page 23 are graphs and tables comparing and totaling the individual projections for the twelve states.

Illinois

Primary Drivers & Barriers

- The primary driver for wind generation development is the new RPS passed in August of 2007, which calls for 25% renewable energy by 2025 for Exelon and Ameren, the two largest Investor-Owned Utilities ("IOU") in the state.
- The power will be purchased by a yet-to-be established agency of the State of Illinois. Contracts may be awarded as early as 2009.
- Strong wholesale power prices have also encouraged wind development.
- New net metering rules were recently approved by the Illinois Commerce Commission, which will encourage small behind-the-meter projects.
- Local ordinances are hindering the process, with county boards that will not approve wind generation applications because of NIMBY issues, especially near major metropolitan areas.

FIGURE 8 – Illinois Projections

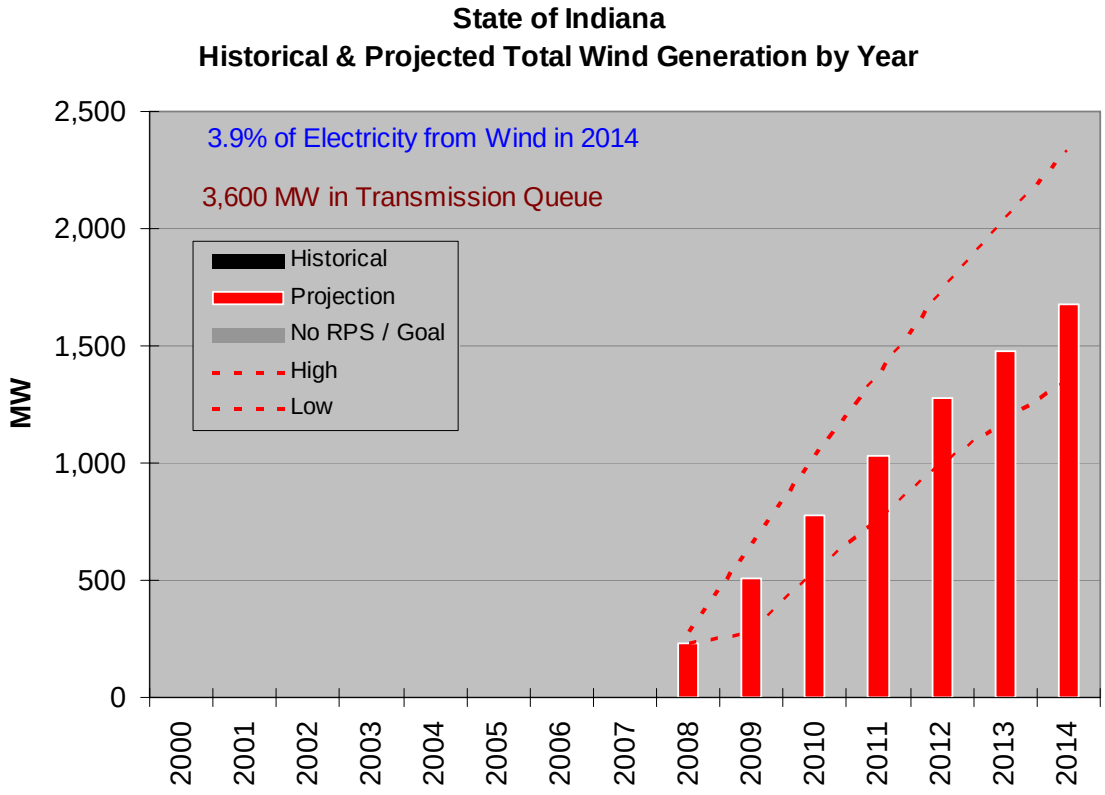


Indiana

Primary Drivers & Barriers

- The primary drivers for additional wind generation in the state of Indiana appear to center around economic development and the creation of new jobs. There is no RPS in Indiana.
- Currently there are no significant incentive programs. The Indiana Office of Energy & Defense Development does offer an Alternative Power and Energy Grant program. There is also a property tax exemption.
- Utilities that are buying or building wind in Indiana are able to sell the power as green energy. Utilities are also anticipating a carbon-constrained future.
- Transmission capacity is not a barrier to development. There is a robust transmission system in the state that connects to population centers in the Midwest and east.
- An RPS would significantly expand wind development.
- Indiana has traditionally been a low-cost coal-fired generation state. However, wholesale market prices are much higher than the existing embedded coal-fired generation.
- The wind resource is limited here, with Class 3 winds in a limited number of counties.

FIGURE 9 – Indiana Projections

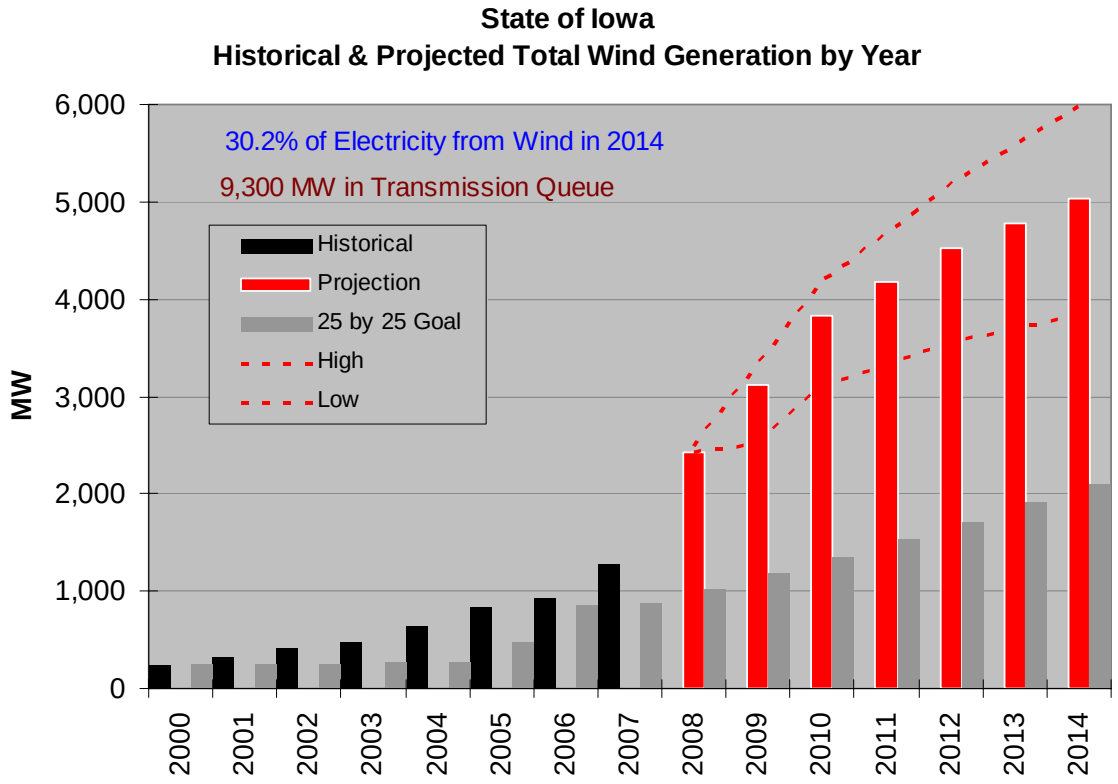


Iowa

Primary Drivers & Barriers

- Large areas of Iowa have a combination of adequate electric load, transmission lines, and good wind resources that can accommodate large wind farms without the need to transmit the wind power long distances. However, the lack of transmission in northwest Iowa has pushed development southeastward where transmission is less constrained.
- Iowa has had progressive support for wind development for many years, including additional incentives for over 500 MW of wind generation. Governor Chet Culver has pushed an aggressive strategy to grow the wind industry in Iowa, and has proposed the popular 25% by 2025 goal.
- However, recent projects are based on a good regulatory climate and favorable economics caused by high wholesale market prices in the MISO real time market.
- Florida Power and Light and MidAmerican have had very aggressive expansion plans that have catapulted wind generation growth in Iowa. Alliant also has a very significant commitment to wind generation. Most other utilities have little wind generation.
- A very significant growth has been projected, based on individual company plans, project announcements, and an aggressive utility commitment to wind power. With a projection of 5,025 MW by 2014, 30% of Iowa's electricity will be wind generated. This large amount will require some new transmission and better management of wind generation's variable output. It appears Iowa will beat the Governor's goal by at least 10 years.

FIGURE 10 – Iowa Projections

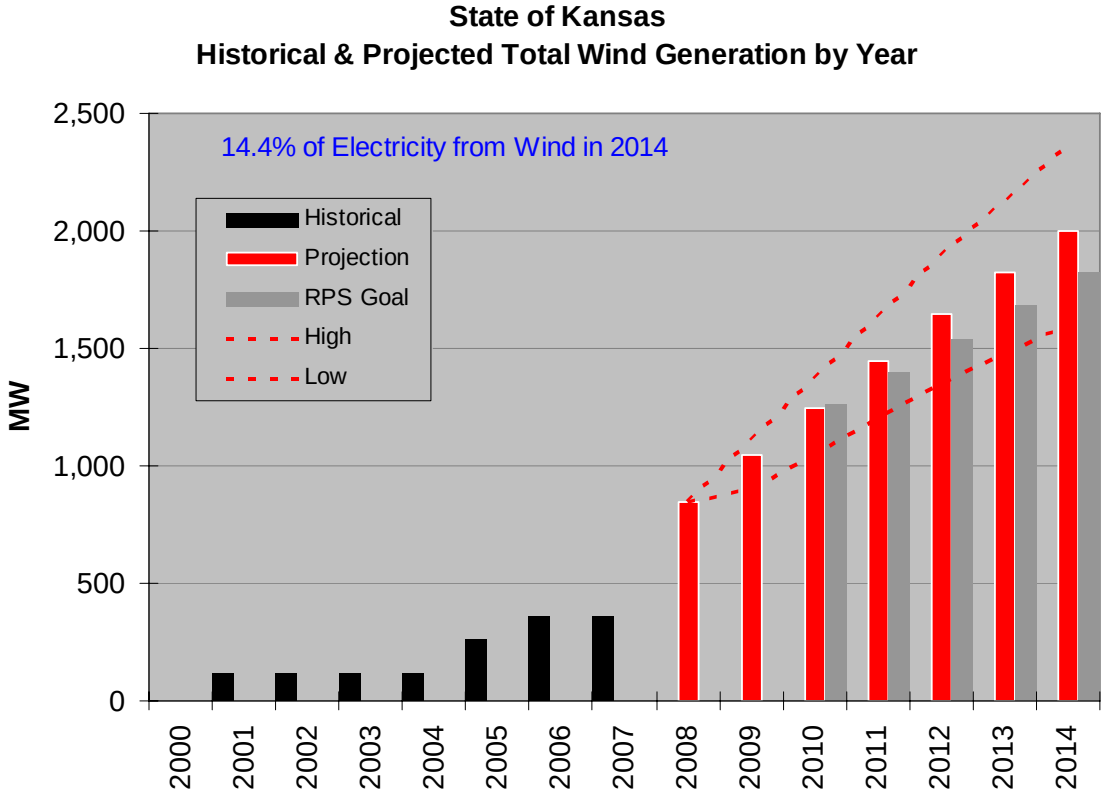


Kansas

Primary Drivers & Barriers

- Governor Kathleen Sebelius' announcement in 2006 concerning voluntary goals of wind development has pushed wind generation development in Kansas. The major Kansas utilities are expected to voluntarily buy or develop 10% renewable energy by 2010, and 20% by 2020.
- A lack of legislative support for an RPS may delay some future wind generation installations.
- A newly established Kansas Wind Working Group has a priority of encouraging "community wind" or locally owned smaller developments through proposed legislation.
- Lack of transmission in western Kansas has hindered development in the windiest areas. However, a relatively new Kansas Electric Transmission Authority has announced an RFP for a large transmission line in western Kansas.
- ITC Great Plains has announced plans to construct a major transmission line in western Kansas, and Westar is moving forward to upgrade transmission capacity between Hutchinson and Salina.

FIGURE 11 – Kansas Projections

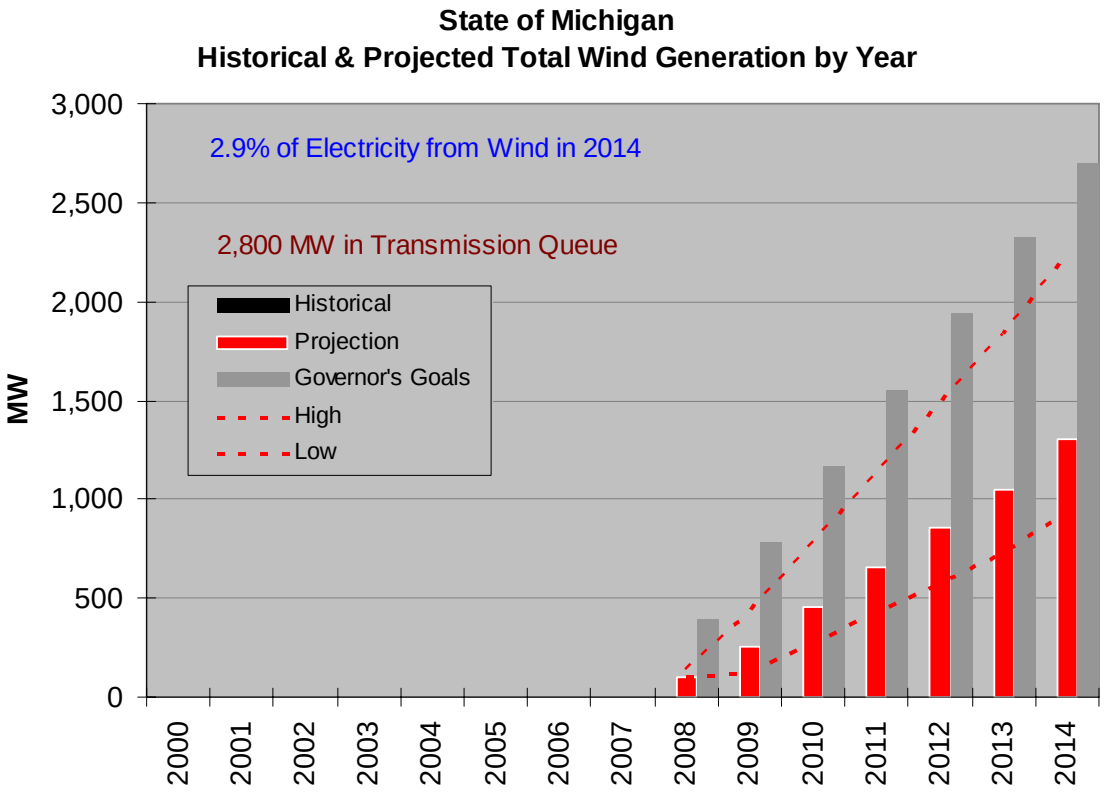


Michigan

Primary Drivers & Barriers

- An RPS has passed the state house, and is expected to be enacted. This RPS legislation has been pending since 2003, but it now has the governor's attention and full support. If enacted, it is expected to call for 10% wind generation by 2015.
- There is a great need in Michigan for additional electric generating capacity.
- Green pricing is widely available in Michigan and is increasing the interest in wind generation.
- It is possible that net metering legislation might pass, and that could encourage small-scale up to mid-size wind turbine development.
- Michigan's HB 5218 proposes creation of a full system of feed-in tariffs with prices for an array of renewable energy technologies.
- Lack of an RPS is the largest impediment to large-scale wind farm development in Michigan.
- Only one utility has announced its intention to add more wind to its generation mix.

FIGURE 12 – Michigan Projections

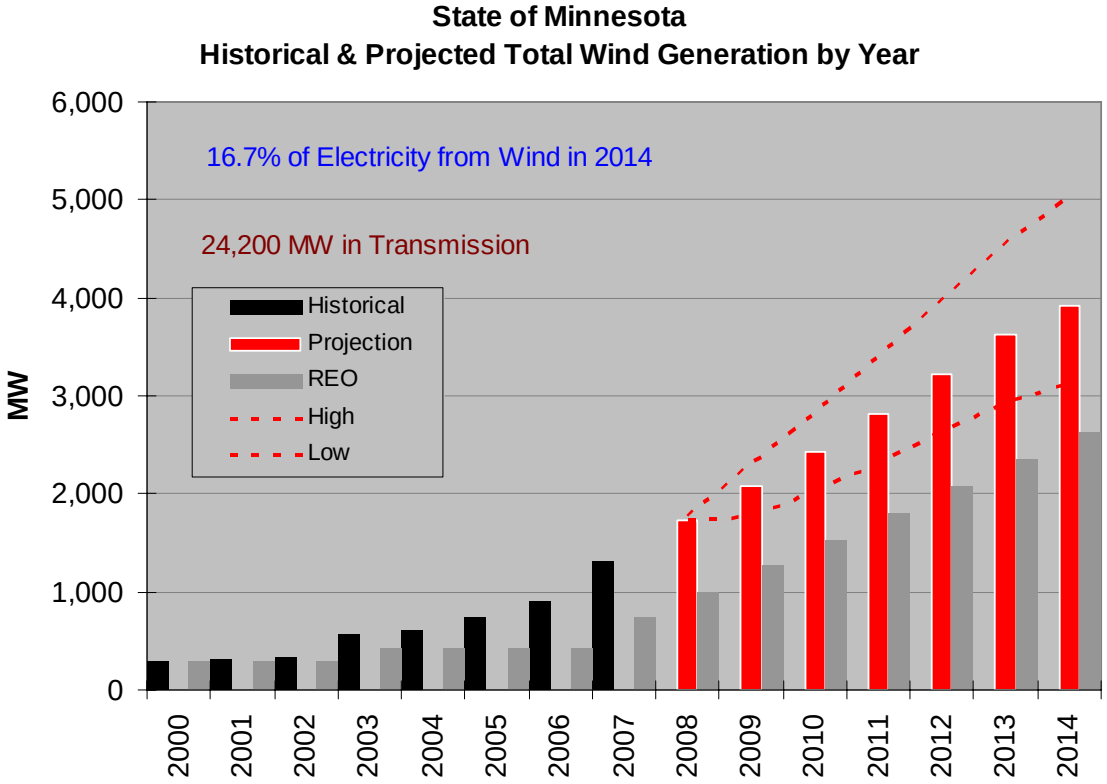


Minnesota

Primary Drivers & Barriers

- New legislation in February of 2008 (HF 3537) calls for the state to implement a system of renewable energy feed-in tariffs. This bill requires electric utilities to accept generation from renewable power that is "fed into" the grid and to pay for that generation. The proposed law limits feed-in tariffs to "community-based" projects connected at distribution voltages.
- In 2007, Minnesota enacted its renewable energy standard calling for the state to supply over 25% of its electricity with renewable energy by 2025.
- Governor Pawlenty has a goal of 800 MW of community-based energy development ("C-BED") BY 2010. A lack of legislative agreement on what qualifies as C-BED is stalling enactment of that bill.
- The Midwestern Governors' Association "Energy Security and Climate Stewardship Platform for the Midwest" was signed by Governor Pawlenty and it contains aggressive wind power and transmission components.
- The slow pace of construction of new high voltage transmission lines is the largest impediment to wind farm development in Minnesota's highest wind resource area along the Buffalo Ridge in southwestern Minnesota.

FIGURE 13 – Minnesota Projections

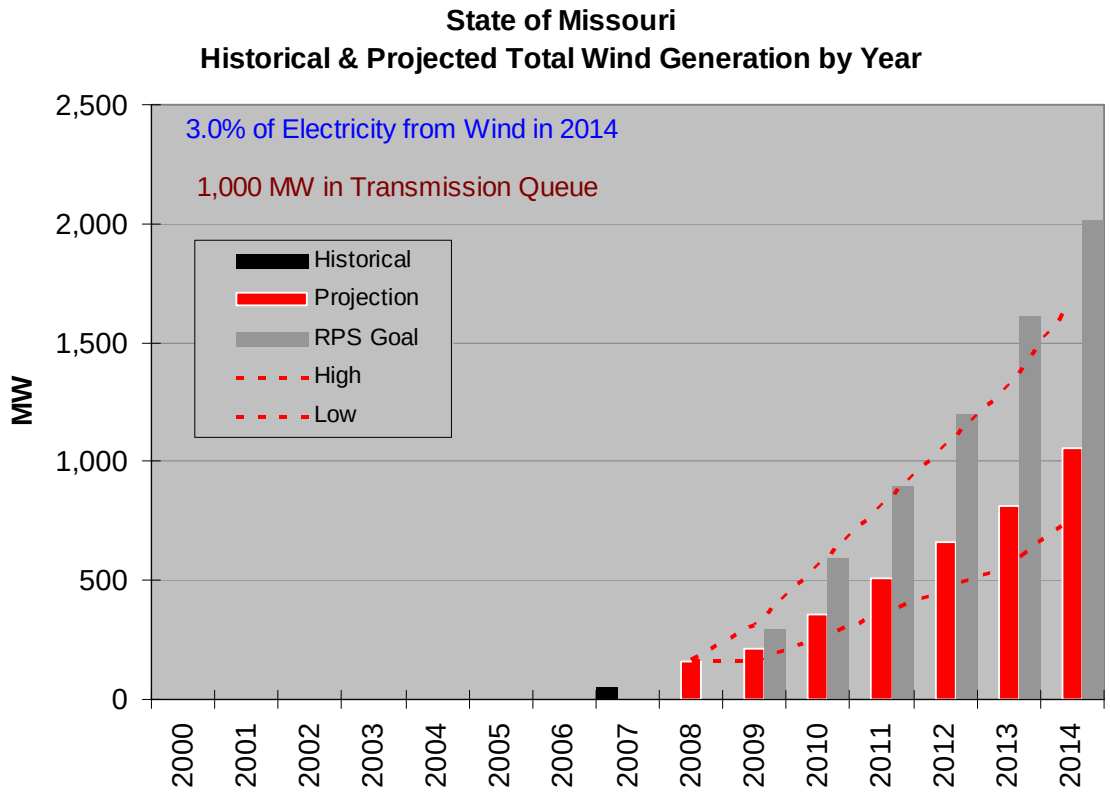


Missouri

Primary Drivers & Barriers

- In 2007, the Missouri General Assembly passed SB 54, which includes renewable energy targets for the investor-owned utilities to supply 4% of its electricity with renewable energy by 2012, and then increasing this target to 11% by 2020. Energy efficiency measures can be used to meet the target.
- Missouri's Public Service Commission can assign different "weights" to renewable energy that is generated in Missouri, which creates an incentive to build projects in Missouri, rather than import the generation from another state.
- Although Ameren and KCPL will add about 200 MW of wind generation in the near future, it may not be installed in Missouri.
- Transmission may be an impediment to large wind farm development in Missouri, especially moving power from west Missouri to east Missouri. The windiest areas in the northwest part of the state are under the jurisdiction of SPP, while the eastern part of the state is overseen by MISO.
- Following the opening of a new four-turbine wind farm in April of 2008, Rock Port in Northwest Missouri has become the first U.S. town to all of its electricity from wind power--that is when the wind blows.

FIGURE 14 – Missouri Projections

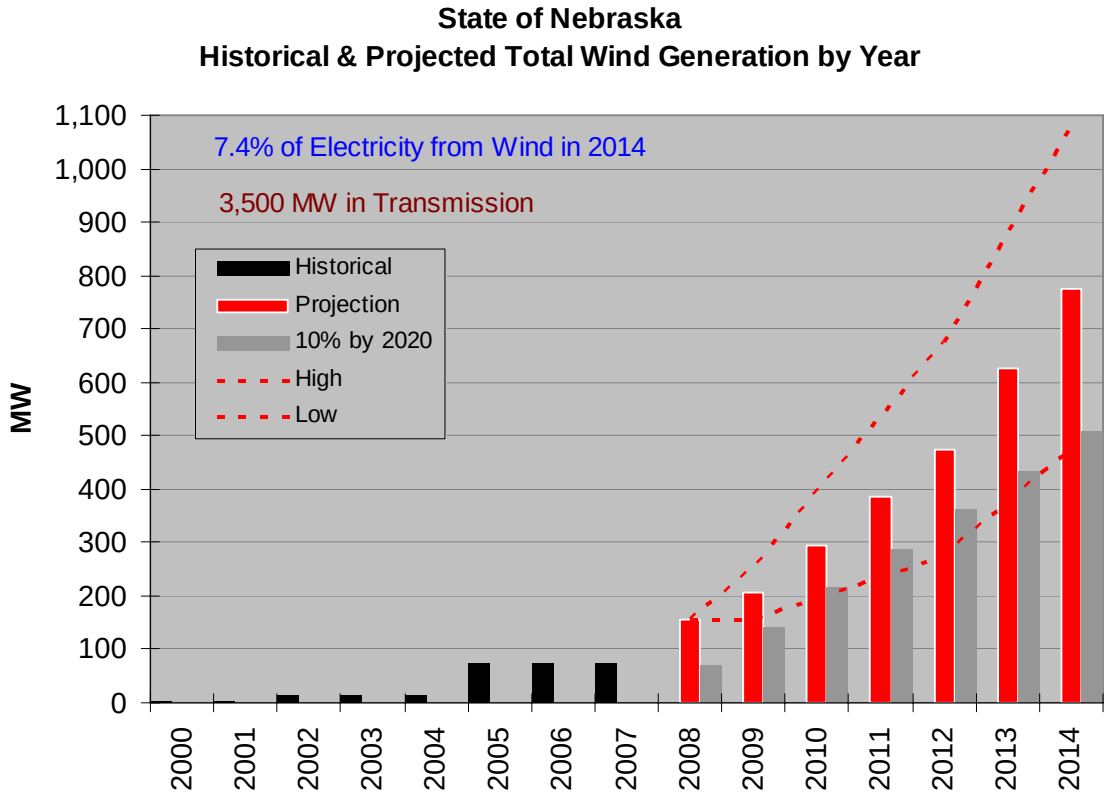


Nebraska

Primary Drivers & Barriers

- The Rural Community Based Energy Development Act – CBED (LB 629) passed in 2007, along with a sales tax exemption and eminent domain waiver option for CBED projects. This gives Public Power a way to utilize the federal PTC more effectively.
- The Nebraska Public Power District (NPPD) announced that it will purchase power from two new wind-powered projects, which will combine to produce 122 MW of wind energy. Nebraska is a 100% public power state, and support from NPPD is crucial to wind development. Seven different locations are being studied by NPPD as possible locations for future wind generation in the state.
- There are no net metering laws or RPS requirements, and near-term passage of either is doubtful.
- Because transmission capacity is very limited in rural areas of Nebraska, there has been some discussion of creating a transmission authority to encourage transmission investments.
- The resistance from rural electric coops has prevented the growth of wind power for many years.

FIGURE 15 – Nebraska Projections

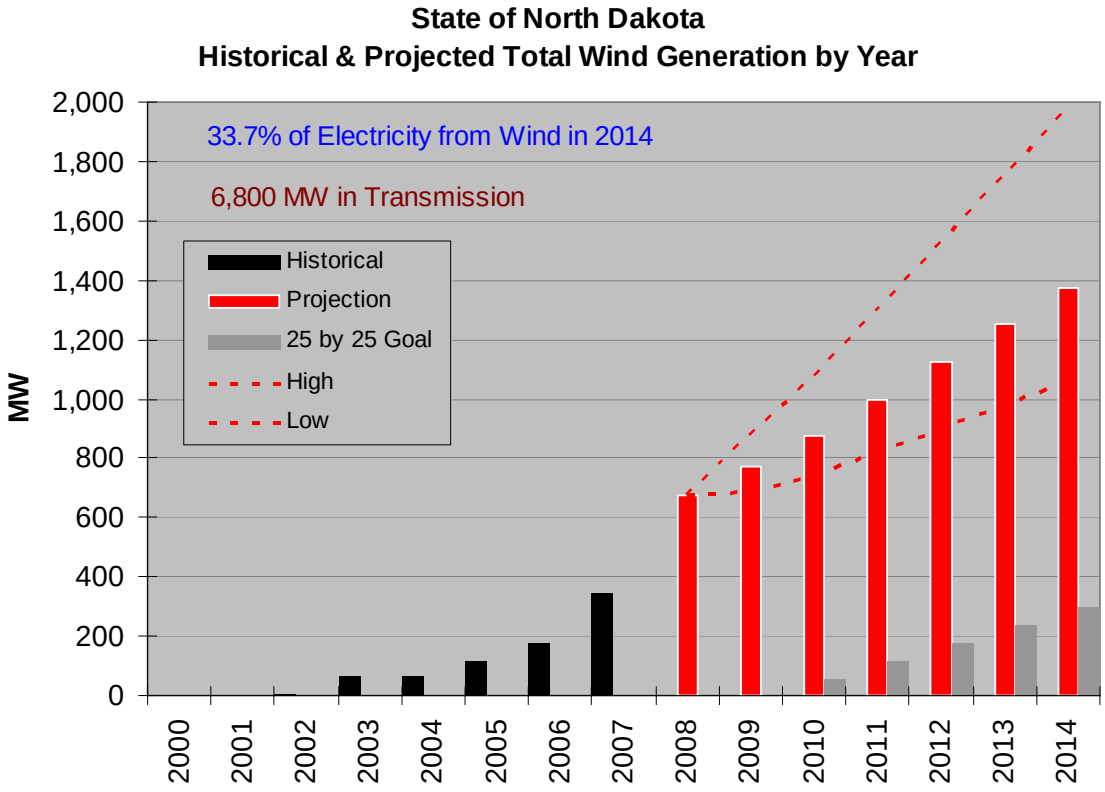


North Dakota

Primary Drivers & Barriers

- The dominance of the fossil-fuel industry has precluded any RPS in North Dakota.
- Some utilities offered a "green fee" of $3 for a 100 kWh block to its customers, and many are now charging only fifty cents for that same 100 kWh block. One REC has challenged the logic in overcharging for this service, and does not charge at all.
- Minnkota has a voluntary goal of 11% of its generation to be renewable, and would like to increase that to 20%. It has been buying wind power from Florida Power and Light.
- All export transmission capacity is committed to coal-fired generating capacity. New wind generation additions are added by taking advantage of the existing line capacity, which requires coal-fired generation to be backed down at times.
- North Dakota has historically exported over half of its electricity generation. As new wind generation is being squeezed onto the existing transmission grid, wind power will become a larger part of that export. Projected wind generation in 2014 will equal over 30% of the electricity actually used in North Dakota. However, the wind generation will represent a much smaller percentage of the actual electricity generated in the state.

FIGURE 16 – North Dakota Projections

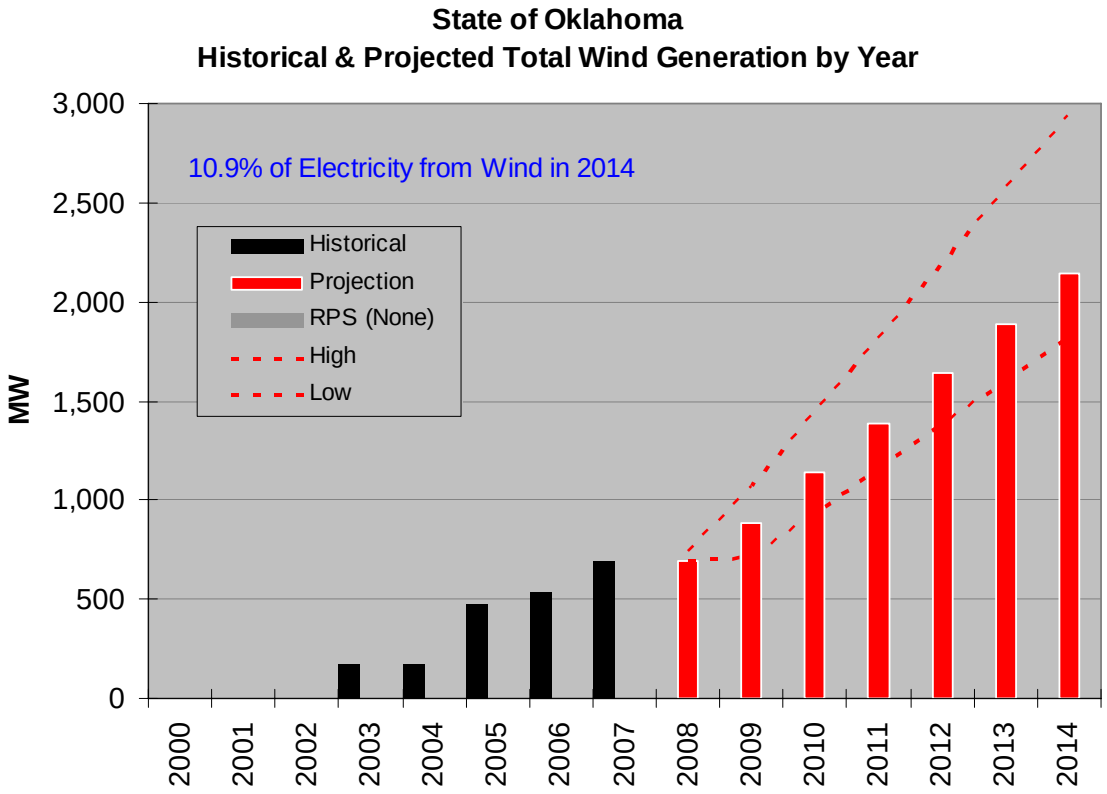


Oklahoma

Primary Drivers & Barriers

- There is no RPS in Oklahoma, but the state does offer an income tax credit for renewable energy. Some of the utilities will surpass 10% renewable energy by 2012, so an RPS may not be necessary. Consumers are requesting green power and the utilities are interested in locking in electricity prices.
- Incentives to build more transmission lines and a longer term federal PTC extension are more likely to increase wind development than an RPS.
- More than one-third of the state has excellent wind resources. The western half of the state has the best wind resource, but few transmission lines. OG&E has announced its desire to construct roughly 250 miles of 345 kV transmission lines to bring the wind energy to the load.
- Existing wind farms have very high capacity factors. Although Oklahoma is ninth in the nation for installed wind generation capacity, only Texas outranks Oklahoma in the capacity factor of its turbines.
- OG&E has announced a goal of 600 MW additional wind generation, and PSO has recently issued an RFP for 200 MW of wind power.

FIGURE 17 – Oklahoma Projections

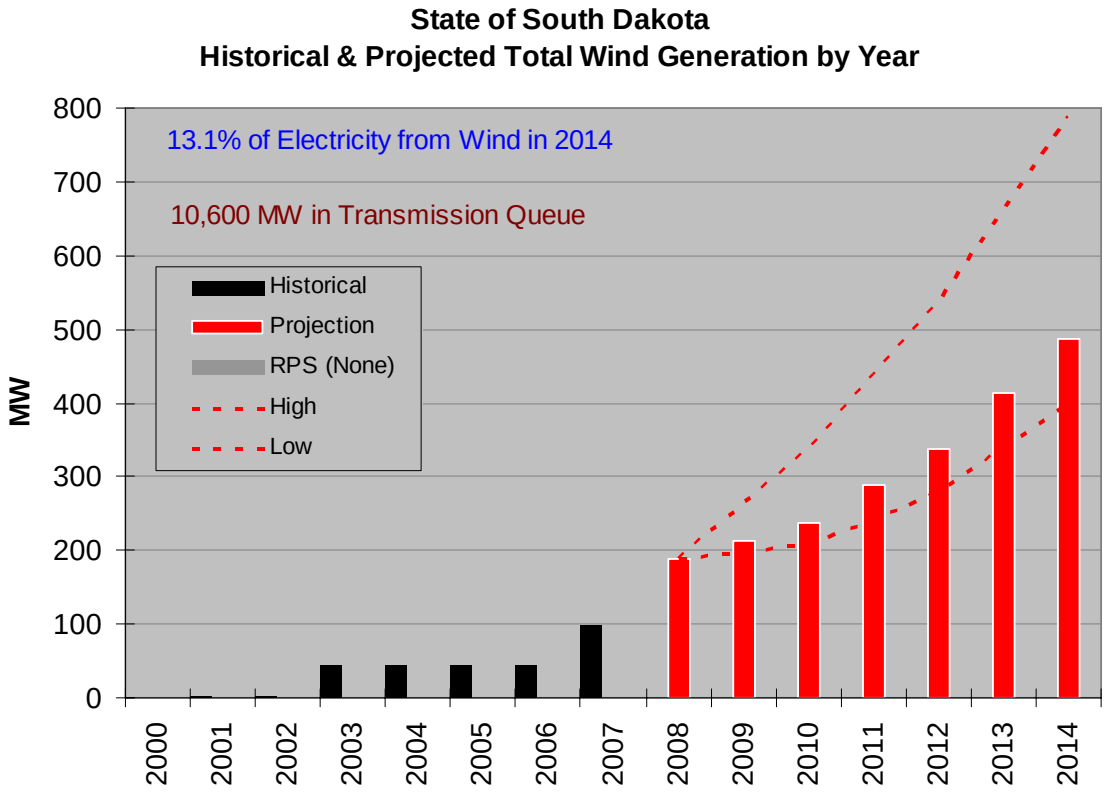


South Dakota

Primary Drivers & Barriers

- South Dakota currently has limited excess transmission infrastructure for accommodating large wind farms. To encourage construction of new transmission capabilities, a partial rebate is available to developers that also construct transmission lines to serve their wind farm facilities. The total rebate cannot exceed 50% of the combined cost of the transmission lines and wind farm collector system.
- The South Dakota Public Utilities Commission is reviewing three proposed transmission line projects that will collectively have hundreds of megawatts of capacity available. These proposed lines are in Brookings, Grant and Deuel counties, with an extension to the Minnesota border.
- Legislation enacted in March 2008 exempts wind farms with nameplate capacities of 5 MW or greater from all taxes on real and personal property levied by any government entity. In lieu of these taxes, facilities pay alternative annual taxes of $3/kW of capacity and 2% of the gross receipts of the wind farm. To qualify for this alternative taxation, wind developments must be constructed after July 1, 2007.
- There is currently no statewide law governing net metering in South Dakota, although small turbines used for self generation receive property tax relief.

FIGURE 18 – South Dakota Projections

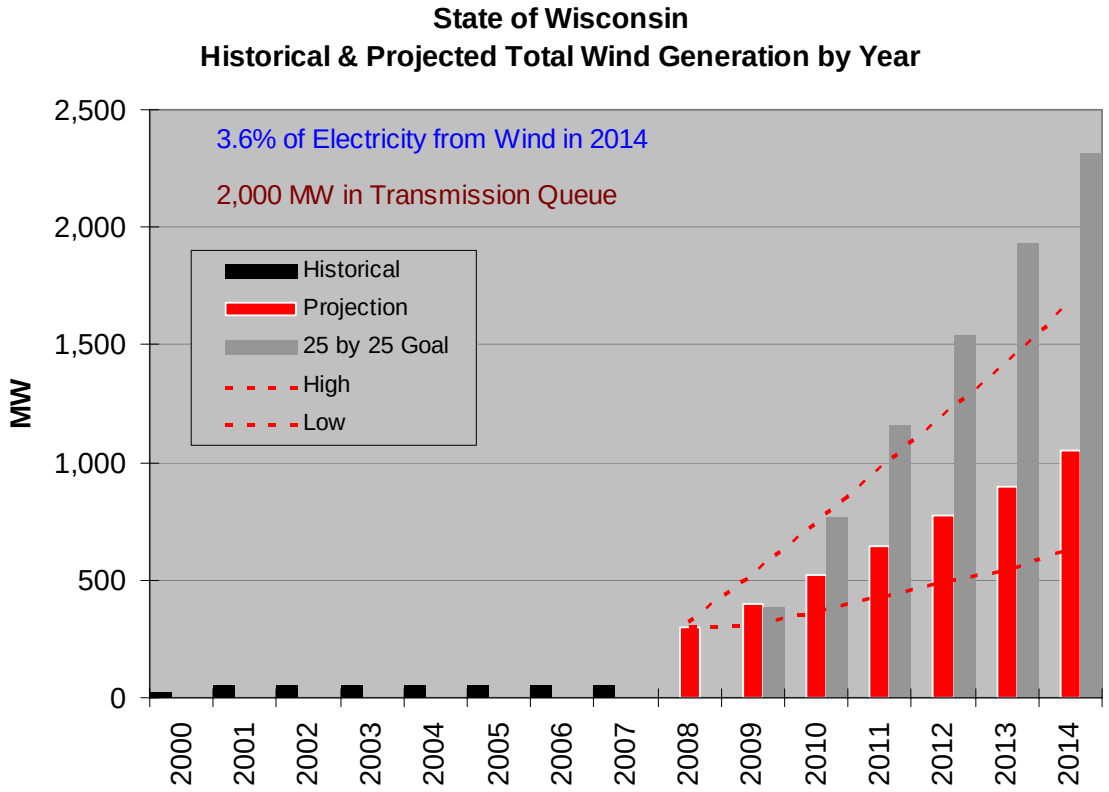


Wisconsin

Primary Drivers & Barriers

- Wisconsin's Renewable Portfolio Standard currently is 10% by 2015, although Governor Doyle has made the 25 by 25 pledge.
- State Agency Renewable Energy Purchase (Act 141) requires the state agencies to purchase 10% of their electricity in renewables by December 31, 2007.
- Most of the utilities have green pricing programs and they are fully subscribed by customers.
- The state has purchased 92,400 MWh from three utilities. This renewable energy must be over and above the renewable energy developed for the RPS.
- Wisconsin is sponsoring a study to look at developing wind in Lake Michigan.
- There are about 300 MW of projects identified by the utilities in Wisconsin. Another 500 MW are being proposed, but no Power Purchase Agreements are in place for those yet.
- Right now local governments regulate the siting of turbines and those ordinances are becoming more and more restrictive. The state may step in and develop uniform standards for siting across the state. NIMBY issues are slowing down development in Wisconsin.

FIGURE 19 – Wisconsin Projections

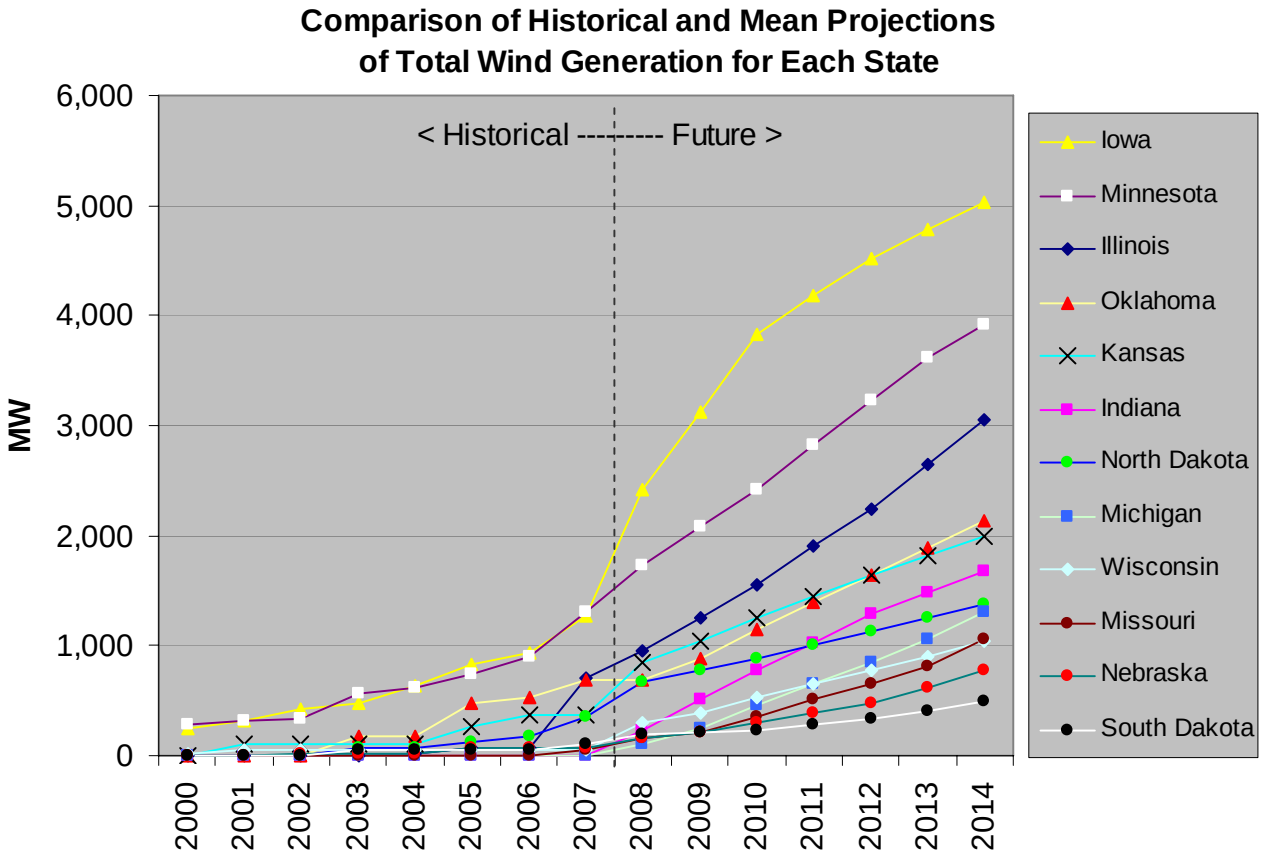


Section 5 – Projection Comparisons, Totals, and Summaries

Figure 20 below shows the historical and future trends of total wind generation for each of the twelve states in the study. Wind generation is projected to grow significantly in each of the twelve states.

Although Iowa and Minnesota have led the other Midwest states with about the same amount of wind generation in the past, Iowa is expected to significantly pull away from the others over the next seven years. With Iowa having a third less electricity sales than Minnesota, this surge in growth represents a significant commitment by Iowa to wind power.

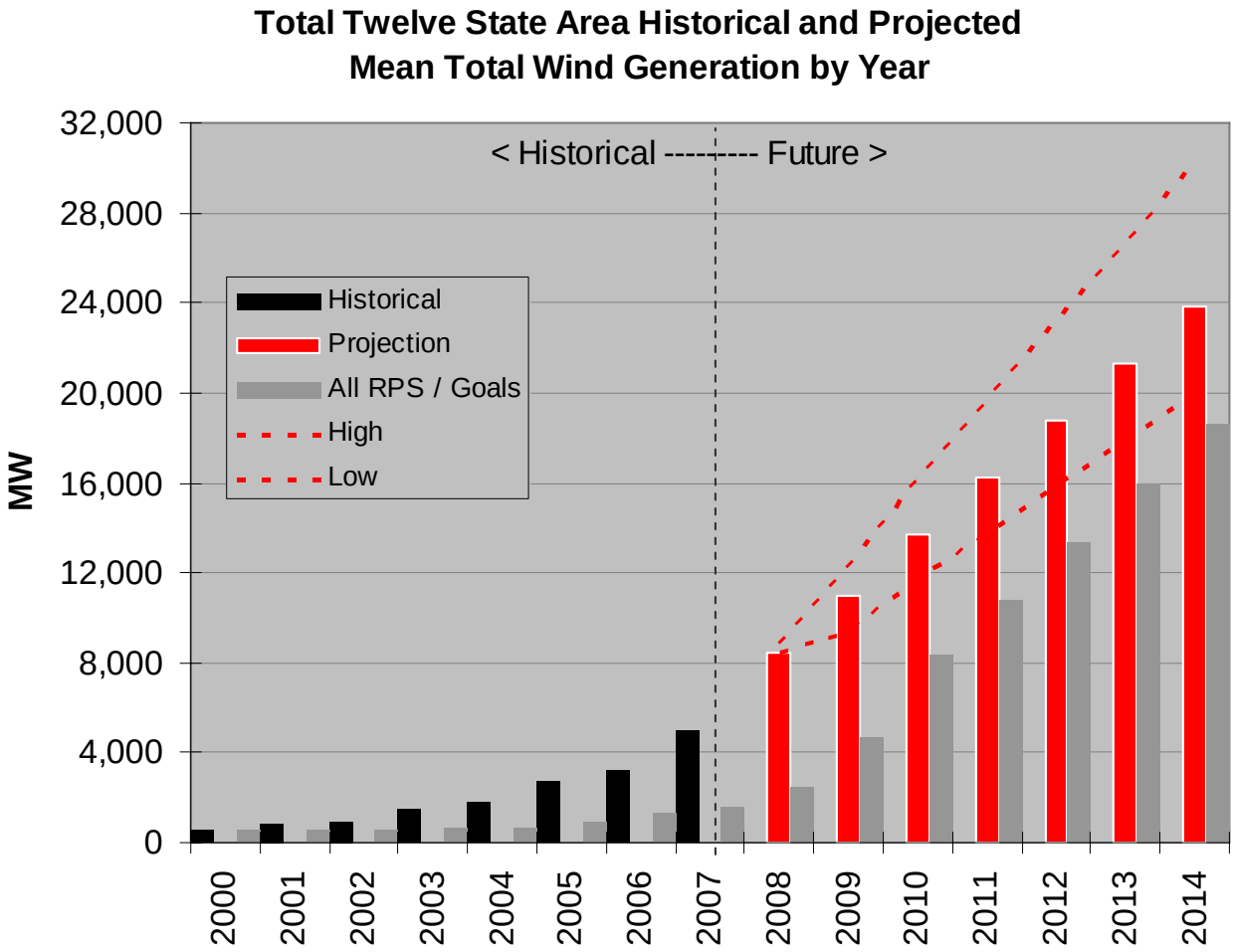
FIGURE 20
Comparison of Historical and Projected Total Wind Generation for Each State



The total amount of wind generation in the twelve states is projected to increase sharply from 4,960 MW at the end of 2007 to 23,870 MW for the mean projection in 2014, as shown by the red bars in Figure 21. This represents a **380%** increase in wind generation over the next seven years.

The optimistic forecast is 30,220 MW, representing a 510% increase. The pessimistic forecast is 19,970 MW, representing a 300% increase in seven years. These optimistic and pessimistic forecasts do not reflect the sum total of the twelve individual optimistic and pessimistic forecasts. For various reasons, it is likely that some wind generation growth in some states will be higher than projected, and other states will have lower growth than projected. To account for this diversity in outcomes, the sum total increase of the optimistic projection above the mean projection was reduced by 25%. A similar adjustment was made to the pessimistic projection.

FIGURE 21
Total Twelve-State Area Wind Generation MW by Year



This new wind generation forecast represents a significant increase from the previous two forecasts by the Consultants, which were completed in late 2005 and mid-year 2007. Those projections are depicted in Figure 22, along with this year's projection. For example, the amount of wind generation existing or under construction for completion this year exceeds last year's projection, (which was done only twelve months ago), by over 2,000 MW. It even exceeded last year's optimistic projection by over 1,000 MW. Although the Consultants have been accused of being overly conservative, this explosive growth has caught most industry watchers, including the American Wind Energy Association, off guard.

As the three lines in Figure 22 suggest, actual growth has always exceeded the projections, and the new projections keep getting higher. For example, 2012 was the last year projected in the 2005 study. This year's projection for the year 2012 is 8,900 MW higher, or 89% higher than the 2005 study.

FIGURE 22
Comparison of This Mean Projection to Previous Mean Projections

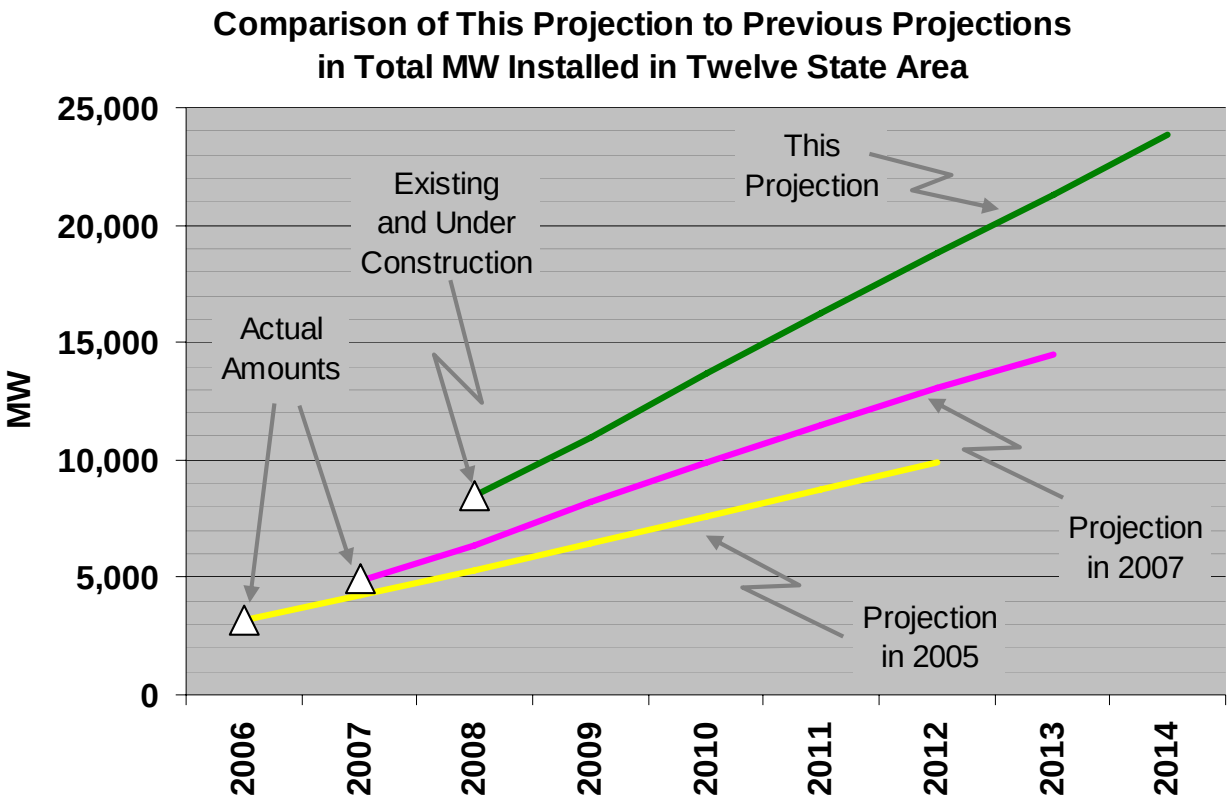


Figure 23 illustrates the cumulative growth in the wind generation in the twelve-state area. This data excludes the amount of wind generation that existed at the end of 2007. Therefore, this graph only represents new wind generation projected to be installed. For example, in 2014, the optimistic projection (green bar) shows an increase of 25,300 MW above the amount at the end of 2007. The mean projection shown by the blue bar indicates a growth of 18,900 MW over the next seven years. Even the pessimistic projection (shown in tan) has 15,000 MW of new wind generation, an astonishing growth of 300%. This scenario represents a delayed renewal of the federal PTC. If the PTC is not renewed and not replaced with another driver such as a federal RPS or carbon tax, then growth would nearly be halted for a couple of years. As discussed previously, this is a very unlikely scenario.

FIGURE 23 – Cumulative Additional Wind Generation in Twelve State Area

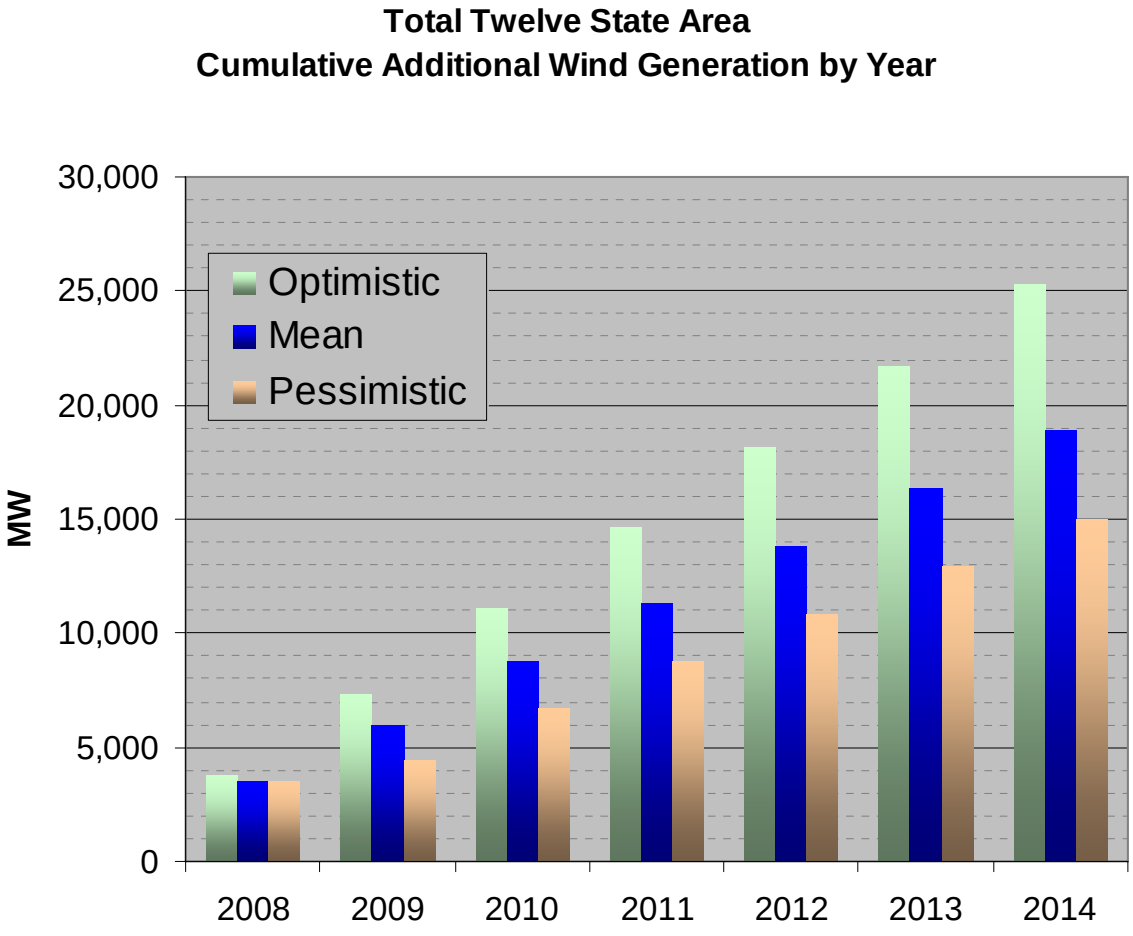
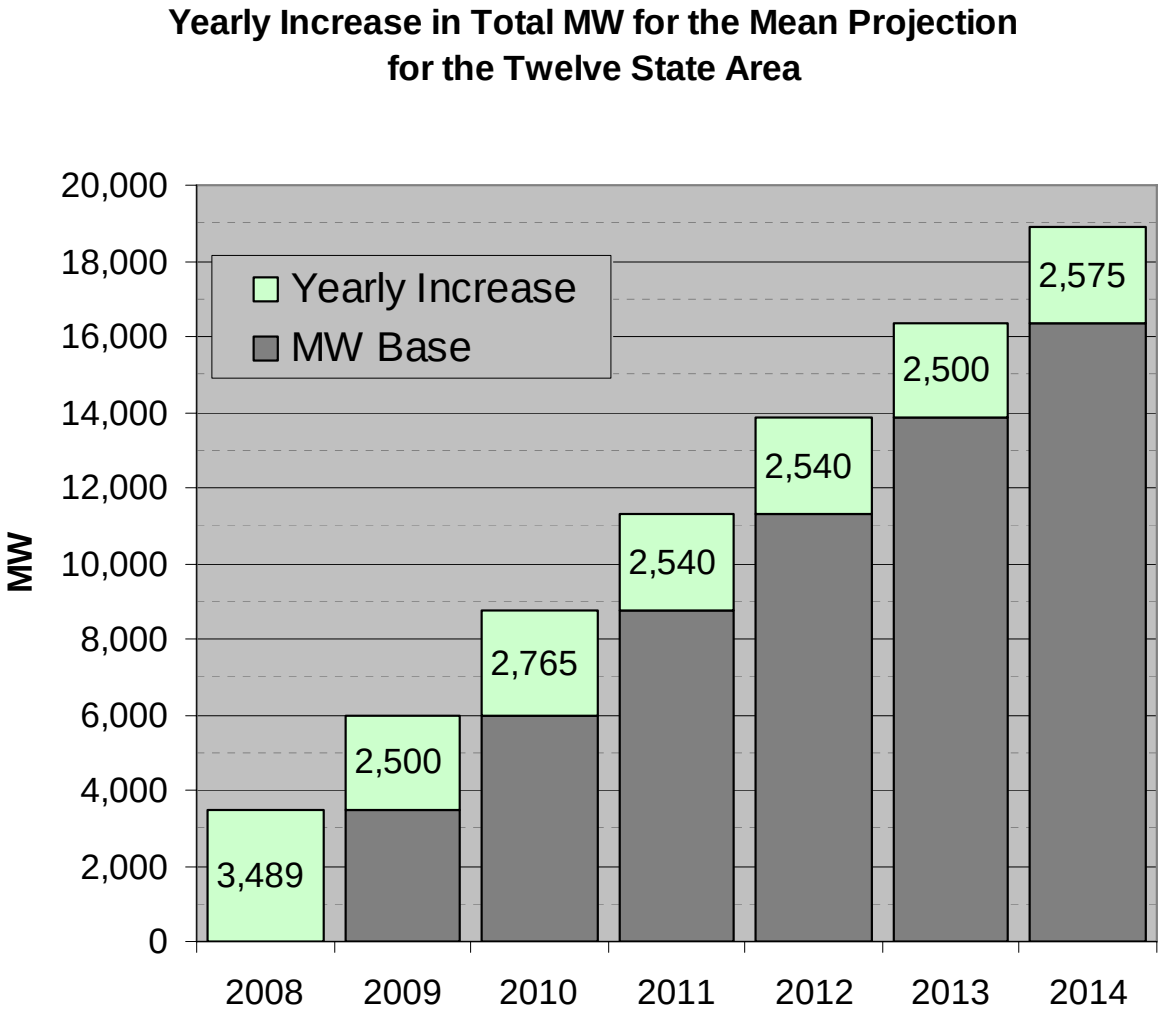


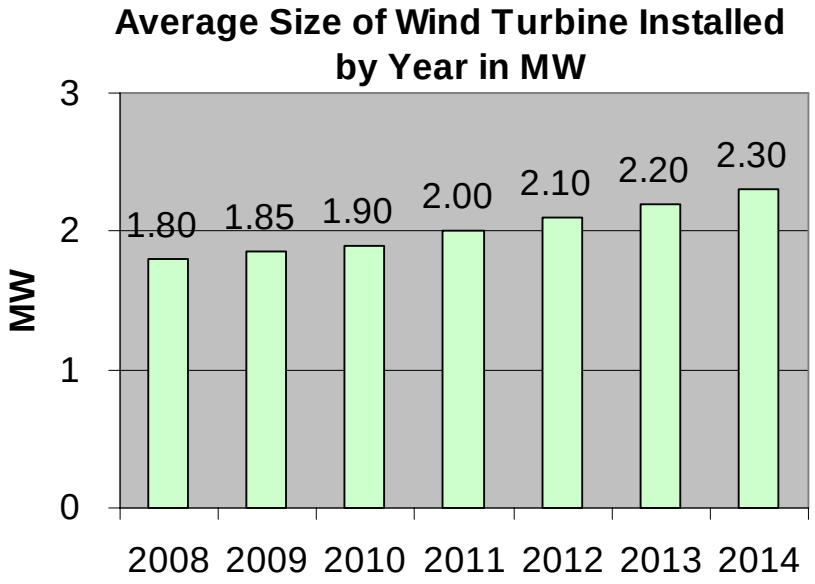
Figure 24 further illustrates the mean projected growth of wind generation by year. The green shaded bars represent the annual growth in wind generation MW for the twelve states. They are stacked up each year on top of the previous year's growth. Again, the median growth by 2014 is expected to total 18,900 MW.

FIGURE 24
Yearly Increase in Total Wind Generation in Twelve-State Area



The size of wind turbines have been increasing for the past three decades and this trend will increase in the future, although at a slower pace. The average size of utility-scale wind turbines installed in the twelve-state area was 1.65 MW in 2007 and is projected to be 1.8 MW this year. Figure 25 shows the Consultants' projection of this average size over the next seven years. The increase in size has slowed down since General Electric entered the wind industry. This has been beneficial for the industry and should lead to more prototype testing of new turbines prior to their wide-spread sale. This should increase the overall reliability of new large wind farms.

FIGURE 25
Projected Average Size of New Wind Turbines in Twelve State Area



Because of this trend toward larger new wind turbines, it will take fewer turbines to provide the same MW increase of wind generation capacity. Figure 26 depicts the projected annual and cumulative total number of new wind turbines out through 2014 for the twelve states combined. For example, in 2014, 1,120 new wind turbines are projected to be installed that year, which will bring the total number of wind turbines added since 2007 to 9,480. This is on top of the approximately 4,000 wind turbines already installed in 2007 in the twelve states.

FIGURE 26

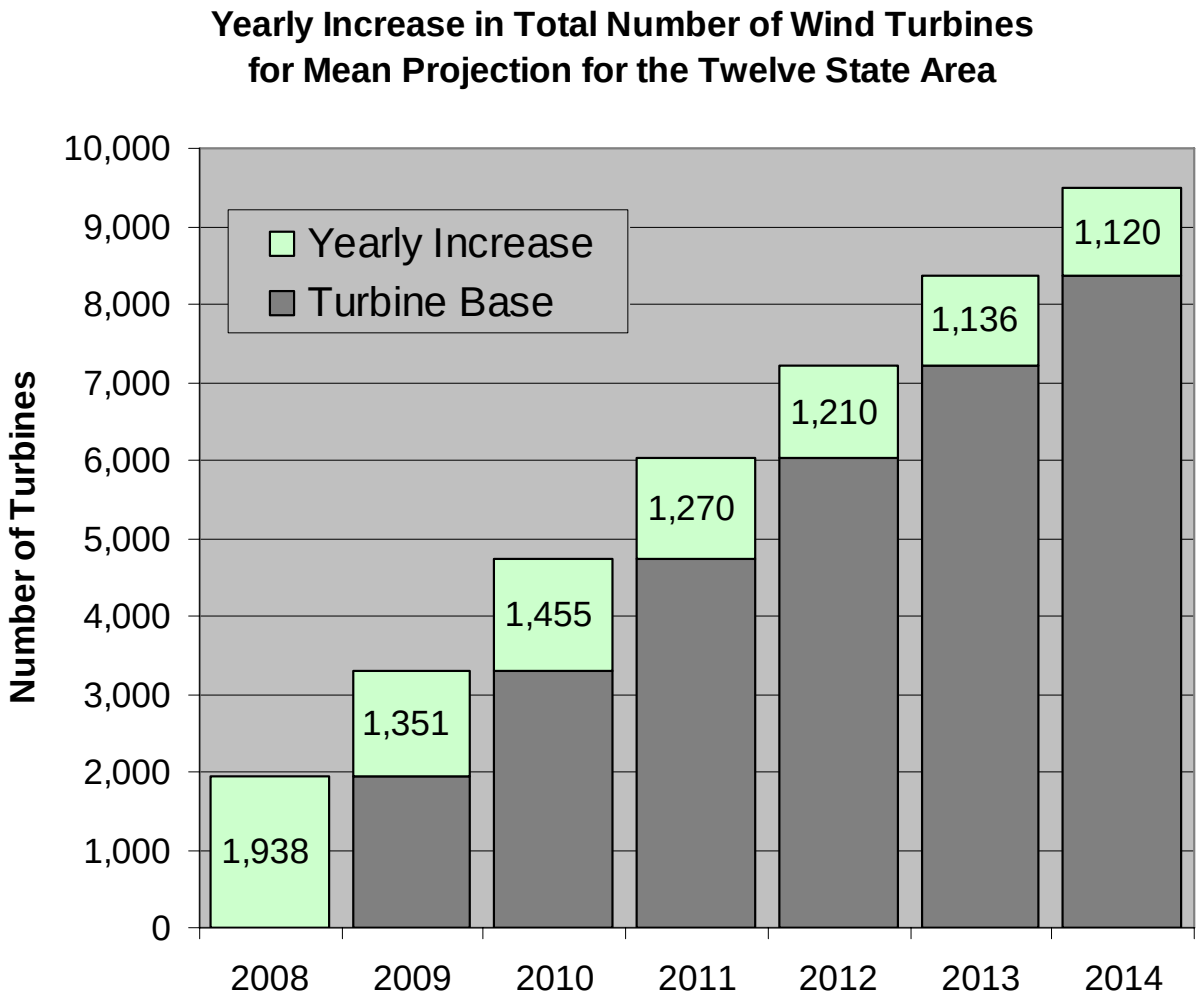


Table 1 and Table 2 on the following pages provide tabular data for the MW projections by state and the projected number of wind turbines to be added over the next seven years. Most of this data has already been displayed in the previous graphs.

TABLE 1
Projections of Total Cumulative Additional
Wind Generation Megawatts by Year for Twelve-State Area

Mean Projection	2008	2009	2010	2011	2012	2013	2014
Illinois	251	551	851	1,201	1,551	1,951	2,351
Indiana	230	505	780	1,030	1,280	1,480	1,680
Iowa	1,148	1,848	2,548	2,898	3,248	3,498	3,748
Kansas	486	686	886	1,086	1,286	1,461	1,636
Michigan	100	250	450	650	850	1,050	1,300
Minnesota	425	775	1,125	1,525	1,925	2,325	2,625
Missouri	103	153	303	453	603	753	1,003
Nebraska	82	132	222	312	402	552	702
North Dakota	330	430	530	655	780	905	1,030
Oklahoma	0	200	450	700	950	1,200	1,450
South Dakota	90	115	140	190	240	315	390
Wisconsin	244	344	469	594	719	844	994
	=======	=======	=======	=======	=======	=======	=======
Mean Projection	3,489	5,989	8,754	11,294	13,834	16,334	18,909
Pessimistic Projection	3,489	4,399	6,703	8,782	10,860	12,899	15,013
Optimistic Projection	3,834	7,335	11,102	14,643	18,184	21,685	25,262

TABLE 2
Projections of Incremental and Cumulative New Wind Generation by Year for Twelve-State Area

Mean Projection	2008	2009	2010	2011	2012	2013	2014
Cum. Additional MW	3,489	5,989	8,754	11,294	13,834	16,334	18,909
Yearly Increase in MW	3,489	2,500	2,765	2,540	2,540	2,500	2,575
Average MW / WT	1.80	1.85	1.90	2.00	2.10	2.20	2.30
Incremental Turbines	1,938	1,351	1,455	1,270	1,210	1,136	1,120
Cumulative Turbines	1,938	3,290	4,745	6,015	7,225	8,361	9,480
Pessimistic Projection							
Cum. Additional MW	3,489	4,399	6,703	8,782	10,860	12,899	15,013
Incremental MW	3,489	910	2,304	2,079	2,079	2,039	2,114
Average MW / WT	1.80	1.85	1.90	2.00	2.10	2.20	2.30
Incremental Turbines	1,938	492	1,213	1,039	990	927	919
Cumulative Turbines	1,938	2,430	3,643	4,682	5,672	6,599	7,518
Optimistic Projection							
Cum. Additional MW	3,834	7,335	11,102	14,643	18,184	21,685	25,262
Incremental MW	3,834	3,501	3,766	3,541	3,541	3,501	3,576
Average MW / WT	1.80	1.85	1.90	2.00	2.10	2.20	2.30
Incremental Turbines	2,130	1,893	1,982	1,771	1,686	1,591	1,555
Cumulative Turbines	2,130	4,023	6,005	7,775	9,462	11,053	12,608

Section 6 - Conclusions of the Study

The Consultants have concluded that there will very likely continue to be strong growth in wind generation in the upper Midwest. This conclusion is based on the fundamental drivers: high natural gas prices (above $6 per MMBTU), more reliance on natural gas for electric generation, high wholesale market prices for power, the implementation of RPS programs and 25 by 25 goals in several states, and the widespread expectation of carbon emission regulations. .

The mean projection of new wind generation in the twelve-state area totals 18,900 MW over the period from 2008 through 2018. This represents a fleet of 9,500 new large wind turbines in the upper Midwest. This represents nearly a 50% increase in wind generation MW when compared to last year's projection.

The pessimistic projection suggests an additional 15,000 MW of new wind generation by 2014, representing a fleet of 7,500 new wind turbines.

The optimistic projection calls for an additional 25,300 MW of wind generation requiring about 12,600 new wind turbines.

All of these projections are based on the continuation of some type of federal financial incentive, state or federal mandate for renewable energy generation, or the federal adoption of carbon emission regulations.

There will be areas in each state where wind generation development will be constrained, due to various reasons, such as low wind speed, transmission limitations, and NIMBY issues. However, the Consultants believe there are enough viable areas for development in the states to meet even the most optimistic projections.

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May 5, 2008