

Arizona Wind Development Status Report

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(for the National Renewable Energy Laboratory and the Arizona Wind Working Group)

Introduction

Wind power development in Arizona has been slow and faltering. Reasons for this include: the perception that Arizona has relatively poor wind resources compared to its neighbors; the fact that inexpensive coal power makes Arizona wind energy less competitive; the reticence of electric utilities to purchase naturally intermittent and variable resources; the burden placed on developers by the differences in local, state, and national guidelines regarding permitting, zoning, and pre-construction environmental monitoring; the checkerboard nature of Arizona land and the fact that much of the wind resource falls on tribal lands, which are governed by entirely different authorities; and lack of access to large available quantities of transmission.¹

Nevertheless, wind power is emerging in Arizona as a viable, stably-priced and local renewable electricity source. The Dry Lake wind plant, located near Snowflake, Arizona is the first utility-scale project to be built in the state of Arizona. The 63 megawatt (MW) project is completely constructed and unofficially went on-line in August, sending power to the electric grid. Several other projects are under way, in various stages of the development process, from wind resource monitoring, to capital investment exploration, to permitting and environmental monitoring.²

Interest in Arizona's wind development potential is growing, as evidenced by a dramatic increase in inquiries to the Arizona Wind Working Group, increased attendance at AWWG events (from 16 in July 2002 to 62 in March 2009), and increased use of the Arizona Wind Resource Map and other web resources that the AWWG maintains.

This report provides an overview of active wind power development projects in Arizona and describes the status of each. Information in this report was obtained from communications with project developers and from public records. It is not intended to be a comprehensive report, but rather a snapshot of the wind industry's activities in Arizona at this time. Some entities that might have been able to provide additional information could not be reached, and they are listed below.

This report also provides, in Appendix A, an economic impact analysis for a range of wind project sizes, performed using tools developed by and for the National Renewable Energy Laboratory.

¹ These reasons were articulated by representatives of the following wind developers: BP Wind Energy, Iberdrola, Semptra Energy, Verde Resources, NZ Legacy, and the Hualapai Tribal Planning and Energy office

² A supplemental explanation of the process steps of wind resource development can be found in Appendix B.

Wind Development Status Report

The status of wind power development in the state of Arizona is presented from several perspectives in the following tables. The first table shows wind development activity described by the major wind development companies. The following three tables summarize the wind energy development activity in the state, separated by land jurisdiction (county, tribal government, federal and state land offices).

Each of these tables refers to a variety of permitting processes, which define the steps in a wind power development's progress toward completion. As described in the attachment in Appendix B, there are multiple permitting and contracting processes involved in getting approval to construct a wind power plant. The permitting processes mentioned in this report include:

- Conditional use permit: Issued by the County, this permit sometimes is restricted to use for the erection of meteorological towers with anemometers for the purpose of measuring the wind resource, requiring additional permitting for the project development phase and construction of a wind power plant. In other cases, one permit can be used both for the erection of meteorological towers and for the construction of a wind power plant.
- Building permit: Issued by the County, in some cases this is required separately for construction.
- A right-of-way permit for land access: Issued by the County, state Land Department, U.S. Forest Service, or the BLM, this permit allows the developer of a wind power plant access to the land to be used for the wind power plant. In the case of Counties, the right-of-way is generally to allow travel and transport of materials across county land to the wind power plant site. The Arizona State Land Department requires a right-of-way for access to and use of state lands for wind power development, but does not require a commercial lease of the land as it can be co-used for wind power development and other purposes. In the case of the BLM, there are separate right-of-way permits for the erection of meteorological towers and for the project development phase and construction of a wind power plant. In addition, developers can obtain rights-of-way from the BLM for just the location of the meteorological tower, or they can obtain a land lease reserving specific acreage for future wind power plant development.³
- Environmental monitoring requirements of the State of Arizona: The Arizona Game and Fish Department (AGFD) works with wind power developers to plan environmental impacts monitoring before and after construction of a wind power plant. Per an interagency Memorandum of Understanding, the Arizona State Land Department is required to consult with AGFD regarding the wind developer's environmental monitoring plans as part of the right-of-way permitting process.
- National Environmental Policy Act (NEPA) process, Environmental Impact Statements (EIS), and biological and cultural assessments: Any development on federal land or using federal funding is required to perform an analysis of potential environmental and cultural impacts. This process involves public participation, and results in the writing of EIS and other required reports.

³ See Instruction Memorandum 2009-043:
http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2009/IM_2009-043.html

Table One – Status by Developer

The following table summarizes the status of developments under way for each of the major wind power developers working in Arizona, based on conversations with representatives of each company.

Developer	Status
BP Wind Energy <i>International energy company with renewable energy and wind energy development branches</i> Angus Coyle Arizona Development	BP has a lease on about 40,000 acres of BLM land in the White Hills roughly 40 miles northwest of Kingman. The company has been monitoring the wind resource for four years and is beginning the NEPA and EIS process. BP has filed a project development application with the BLM. The project could be up to 500 MW of development, and BP is in the interconnection queue for transmission but does not have a power purchase agreement. Transmission lines cross the lease area.
Citizens' Energy <i>Nonprofit U.S. energy company with wind energy development division and projects across the U.S. & Canada</i>	Could not be reached for comment.
Clipper Windpower <i>International wind energy company with technology, manufacturing and development branches</i> Peter Stricker Strategic Project Development	Clipper has previously engaged in wind resource assessment in Arizona but decided not to pursue project development at those assessment sites. Clipper does have some current activity in the state, but none of the potential projects are far along enough to merit public discussion.
EcoEnergy <i>U.S. wind energy development company with projects across the Midwest</i> Kiril Lozanov Energy Assessment	EcoEnergy has two met towers in place monitoring the wind resource near Holbrook. The company is in negotiation with private landowners and is in the interconnection queue for up to 300 MW of development. EcoEnergy needs to perform more wind resource monitoring before pursuing a power purchase agreement. The proposed development would cross State Trust land, so the company is working with the Arizona Game and Fish Department to develop environmental monitoring plans.
Foresight Wind Energy <i>Subsidiary of Foresight Energy Company; Regional wind energy development company</i> Amy LeGere Development & Government Relations	The Grapevine Canyon wind project, about 22 miles southeast of Flagstaff, is in the NEPA process. The project could be up to 500 MW of development, and would be situated on Flying M ranch lands, a checkerboard of privately owned and Arizona State Trust land. The utility interconnect would cross Coconino National Forest. The proposed 60 MW Sunshine Wind Park project, about 35 miles east of Flagstaff, has all permits in place for construction and is pending a power purchase agreement.

Developer	Status
<p>Gamesa <i>International energy company with primary focus on wind energy development</i> Dan Noble Head of Development</p>	<p>Does not share information about developments as a matter of policy.</p>
<p>Iberdrola Renewables <i>International energy company with renewable energy and wind energy development branches</i> Jesse Gronner Regional director of Business Development</p>	<p>Iberdrola has developed Arizona's first wind power plant, the 63 MW Dry Lake plant near Snowflake, which has a power purchase agreement with Salt River Project. The company has met towers on additional land for future phases of the project, and hopes to construct an additional 63 MW next year. Iberdrola is also exploring additional project phases but is still at early stages in the development process.</p>
<p>Renegy / NZ Legacy <i>Regional land and renewable energy development company seeking wind industry partner for development</i> Rulon Anderson Land Consultant</p>	<p>NZ Legacy owns 10,000 acres in eastern Arizona between Holbrook, Snowflake and St. Johns. The company received a permit from Apache county for monitoring and development that could include up to 150 MW of wind power. The company has applied for conditional use permits on five parcels in Navajo county that could accommodate up to 475 turbines, but there has been public opposition and the permits have not yet been issued. The company does not have transmission interconnection or power purchase agreements for these projects, but according to its website is working with Iberdrola subsidiary Pacific Wind Development.</p>
<p>Sempra Energy <i>International energy company with renewable energy and wind energy development branches</i> Mitch Dmohowski Director Sempra Generation</p>	<p>Sempra has been working with the Cameron Chapter of the Navajo Nation for more than two years on developing a 500 MW wind power plant on Grey Mountain. The company has seven met towers and is negotiating a lease agreement with the Navajo Nation. Sempra has filed for interconnection into the Moenkopi-Eldorado transmission line, and has begun the environmental and cultural monitoring that will be required by the Navajo Nation and the NEPA process. Sempra expects to begin construction of a 250 MW Phase I in 2011.</p>
<p>Verde Resources <i>Arizona-based wind power development company; no projects under construction</i> Mike Boyd, President</p>	<p>Verde Resources has two met towers in place on a 1000-acre parcel in Kingman and is in discussion with utilities for a power purchase agreement for 15-25 MW of development at the site. Verde also has a BLM right-of-way lease and two met towers in place near Kingman, and has done some wind resource monitoring on a 600-acre parcel east of St. Johns.</p>

Table Two – Status by County

County	Status
Apache Michelle Johnson Community Development Planning & Zoning	Two companies have permits to install resource assessment equipment: <ul style="list-style-type: none"> • NZ Legacy/Renegy is monitoring wind resources on several ranches. This company is now in the application process for permits to erect up to 75 wind turbines on the site. • Vernon Switch Wind LLC (managed by Foresight Wind) obtained a permit in February 2009 for seven meteorological towers northwest of Springerville.
Cochise Keith Dennis Planning	The county is in the process of modifying its Planning & Zoning regulations and is expected to have new rules, standards and setbacks adopted by September. <ul style="list-style-type: none"> • Clipper Wind has a permit for one met tower on Mule Mountain and is seeking approval for more. • The Fort Huachuca military installation has a 1 MW wind turbine installed and operating.
Coconino Melinda Rockhold Community Development	The county has issued permits to Foresight Wind for several projects: <ul style="list-style-type: none"> • Sunshine Wind Park, near Hwy 40 east of Flagstaff, managed by Foresight Wind, has all of the permits in place for construction. The project does not have a power purchase agreement. • Foresight Wind has permits for five met towers at Aubrey Cliffs, on the Navajo-owned Big Boquillas ranch. • The Grapevine Canyon Project, southeast of Flagstaff, has been monitoring the wind resource with met towers for several years, and is in the public scoping phase of the NEPA process required for construction of the transmission access across national forest. NAU has been monitoring wind power since 2005 at several locations: five met towers at Aubrey Cliffs and one at Aubrey Valley; two met towers on Babbitt Ranches; one met tower at Mesa Butte; and two met towers at Grey Mountain. Several of these are on Navajo Nation land and not subject to County permitting rules.
Graham Karen Ulibarri Planning	No wind power development or permit applications.
Greenlee Phillip Ronnaroo Planning	No wind power development or permit applications.
Mohave Mimi Myers Planning	Two companies are pursuing development in the county: <ul style="list-style-type: none"> • Verde Resources obtained a zoning change for a parcel near Kingman, which has been extended several times (beginning in 2006). The company has not submitted site plans for a building permit. • BP Energy is pursuing development on BLM land in the White Hills northwest of Kingman. The project will only need permits if the project uses county land.

County	Status
Navajo Linda Elliott Public Works Planning & Zoning	Several companies have received permits from the county: <ul style="list-style-type: none"><li data-bbox="553 275 1419 409">• Iberdrola Renewables has building permits and has completed construction of Phase I of the Dry Lake wind plant. An additional 63 MW is planned. Iberdrola will need to submit applications for county permits for additional phases.<li data-bbox="553 422 1419 590">• NZ Legacy has applied for five special-use permits on 25 sections, which would accommodate up to 50 met towers and 475 wind turbines. There has been a lot of public opposition, so the planners are calling more public meetings in September to assist in determining whether to grant the permits.<li data-bbox="553 602 1419 695">• Pacific Wind Development (affiliated with NZ Legacy, but a subsidiary of Iberdrola) has applied for two permits for met towers, but they have not been approved yet.
Yavapai Nicole Russell Planning	No wind power development or permit applications.

Table Three – Status by Tribal Nation

Only tribes located in areas with developable wind resources were contacted.

Tribal Nation	Status
Colorado River Tribes	Could not be reached for comment.
Fort Mohave Jeff Castillo Business & Economic Development Manager	The Fort Mohave tribe conducted a renewable energy development feasibility study several years ago, and had wind monitoring equipment erected at that time. The study concluded that the wind resource was marginal, so the tribe is pursuing solar power development instead.
Havasupai	Could not be reached for comment.
Hopi Roger Tungovia Project Manager Hopi Clean Air Project	The Hopi Tribe worked in partnership with Foresight Wind on the development of part of the Sunshine Wind project on Hopi land. The project is pending the approval of a power purchase agreement. The Hopi Tribe purchased the Clear Creek ranch south of Winslow and has recently erected two 50-meter met towers to monitor wind speed. The Tribe also has one 50-meter met tower on the west side of Hotevilla which has been monitoring wind speeds for about five years. There are also apparently some 30-meter towers near Moenkopi and Tuba City.
Hualapai Jack Ehrhardt Utility & Planning Director	The Hualapai Tribe is in the process of developing its own Utility Authority, and has completed a feasibility study for it. The Tribe has worked with NAU to monitor the wind resource with four met towers at Nelson and Grand Canyon West. The tribe is currently in the negotiation process with Clipper Windpower to develop a project up to 150 MW.
Kaibab Paiute Tony Phillipi Tribal Administrator	Tribal administrators have been talking to wind power developers about feasibility studies or monitoring wind resources. In addition, the tribe's economic development authorities are very much interested in establishing a wind power component manufacturing facility on or near tribal land, and have developed business plans for this purpose.
Navajo Nation Larry Ahasteen Renewable Energy Specialist	The Navajo Nation is in the midst of sensitive negotiations with multiple developers, and will likely have more information available about the result of these negotiations in the near future.
Cameron Chapter Grey Mountain Leonard Gilmore Sempra Energy	The Navajo Nation has a 30-meter met tower in place. The Navajo Tribal Utility Authority and NAU have a 50-meter met tower in place. Sempra has an additional five 60-meter towers in place. There are feasibility studies in the final stages by Sempra, which is vying with Citizens' Energy for permission from the Navajo Nation central government and local Cameron Chapter to develop up to 500 MW of wind power on Grey Mountain. Sempra anticipates project approval and the performance of NEPA and Navajo Nation environmental monitoring within the next two years, with construction on a wind power plant to begin in 2011 or 2012.
San Carlos Apache Charles Russell Planning Department	Tribal officials are interested in pursuing wind power development and are seeking funding to do a feasibility study.
White Mountain Apache	Could not be reached for comment.

Table Four – Status by State or Federal Land Jurisdiction

Agency	Status
<p>Arizona State Land Department Ruben Ojeda Rights of Way</p>	<p>In addition to the fully permitted and constructed Dry Lake wind plant, there are several projects in preliminary stages in the North and East parts of the state. The Rights of Way office has compiled a map of these projects but could not make it available for publication in this report.</p>
<p>BLM Arizona Strip field office Laurie Ford</p>	<p>Gamesa has an approved right-of-way application and lease reservation on 17,000 acres. The company has one meteorological tower up, and has received approval for up to five more towers. Gamesa must complete site-specific cultural and biological inventories before erecting the five towers.</p>
<p>BLM Kingman district office Joyce Cook</p>	<p>Foresight Wind and its subsidiary Mustang Wind have three pending applications for rights-of-way with lease reservations totaling 43,000 acres. BLM offered Foresight Wind a right-of-way grant for one met tower with additional stipulations for wildlife studies. Foresight has not filed the studies.</p>
<p>BLM Kingman district office Joyce Cook</p>	<p>BP Energy has an approved right-of-way and has six met towers installed, some of which have been monitoring wind resources for four years. BP has a pending right-of-way application for project development, and has contracted to begin the NEPA and EIS process. The pending development application is for 45,000 acres about 40 miles north of Kingman.</p> <p>Verde Resources has an approved right-of-way and lease reservation on 19,000 acres. Verde has two met towers gathering wind resource data, but BLM-required biological, avian or bat studies have not been submitted. The permit expires in November 2009.</p>
<p>BLM Lake Havasu field office Information from Kingman BLM office</p>	<p>Oak Creek Energy Systems, and its representative Michael Hogan, have two pending applications for right-of-way and lease reservations on a total of 16,000 acres. The land may be in a culturally sensitive area.</p>
<p>BLM Safford field office Roberta Lopez</p>	<p>Iberdrola Renewables has completed construction on Phase I of the Dry Lake wind plant, with 63 MW wind capacity, located 6-18 miles northwest of Snowflake. The total capacity planned for all phases of the project is 378 MW. Iberdrola has approved right-of-way and lease reservation, as well as development right-of-way, on 13,000 acres. Iberdrola, and its subsidiary Pacific Wind Development, also have two pending right-of-way applications for met towers to use in wind resource monitoring for additional phases of the Dry Lake project.</p> <p>Wind Matrix has a right-of-way and land reservation on 1700 acres, and has had four met towers up since 2007. They have not pursued a development right-of-way application, and their permit expires in December 2009.</p> <p>Horizon Wind Energy has a right-of-way application pending for three met towers and a land lease reservation on 29,000 acres.</p>
<p>US Forest Service Terry Lee</p>	<p>There are no wind developments on Forest Service Land.</p>

The Northern Arizona University Sustainable Energy Solutions Group

The NAU Sustainable Energy Solutions (SES) group has managed an anemometer loan and wind resource assessment and reporting program for many years, but is no longer actively loaning out equipment due to lack of funding. The following figure shows the locations of the program's wind resource test sites. Additional information and reports are available through the SES website.⁴

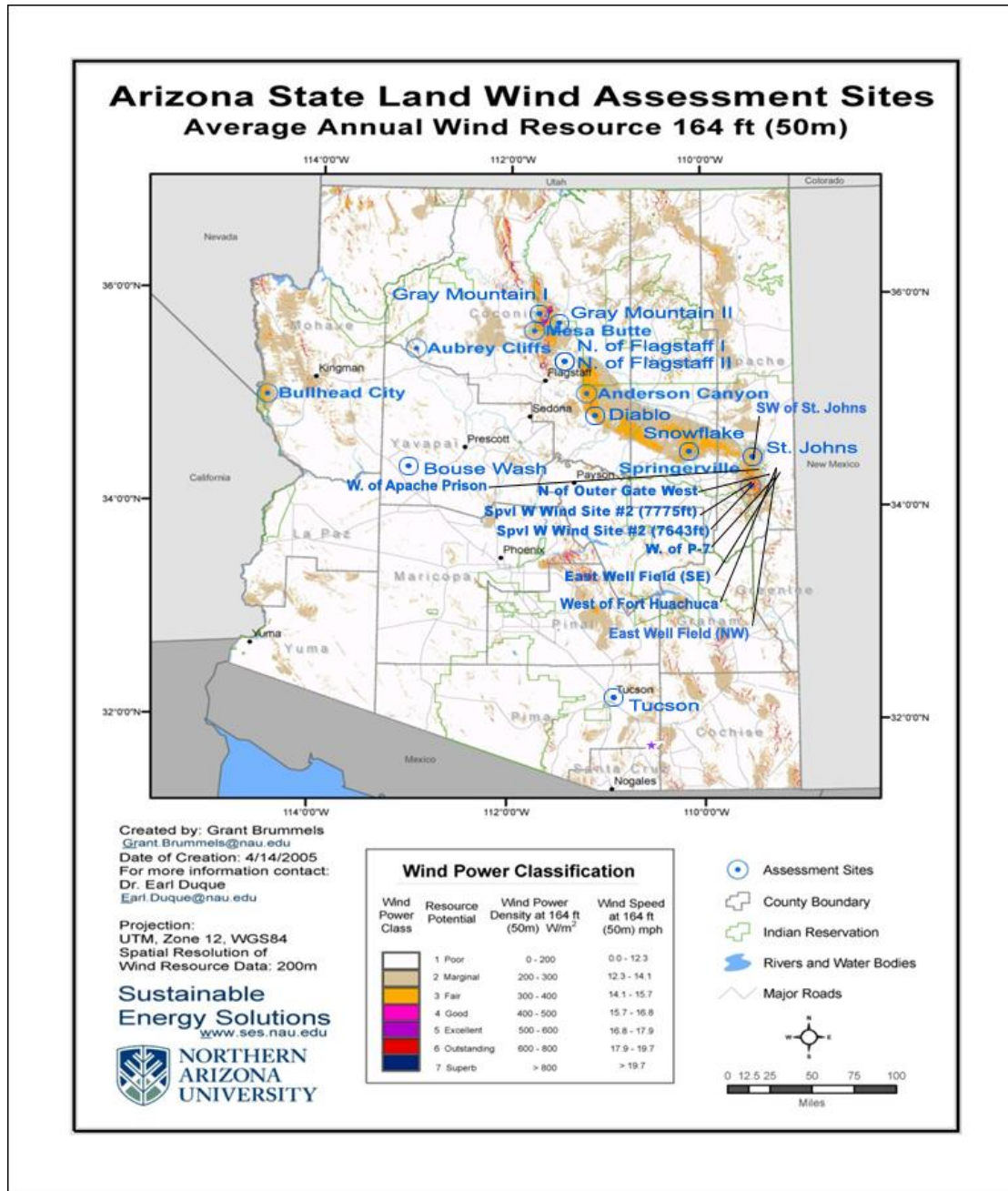


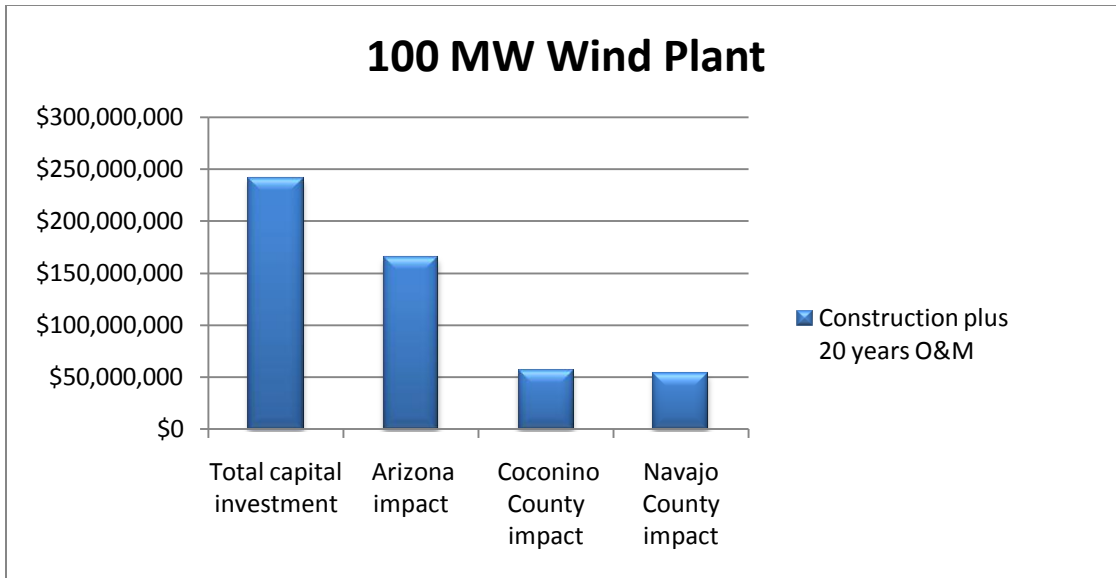
Figure 1. Map of locations of anemometer loan program test sites.

⁴ See http://wind.nau.edu/anemometer/wind_data.shtml

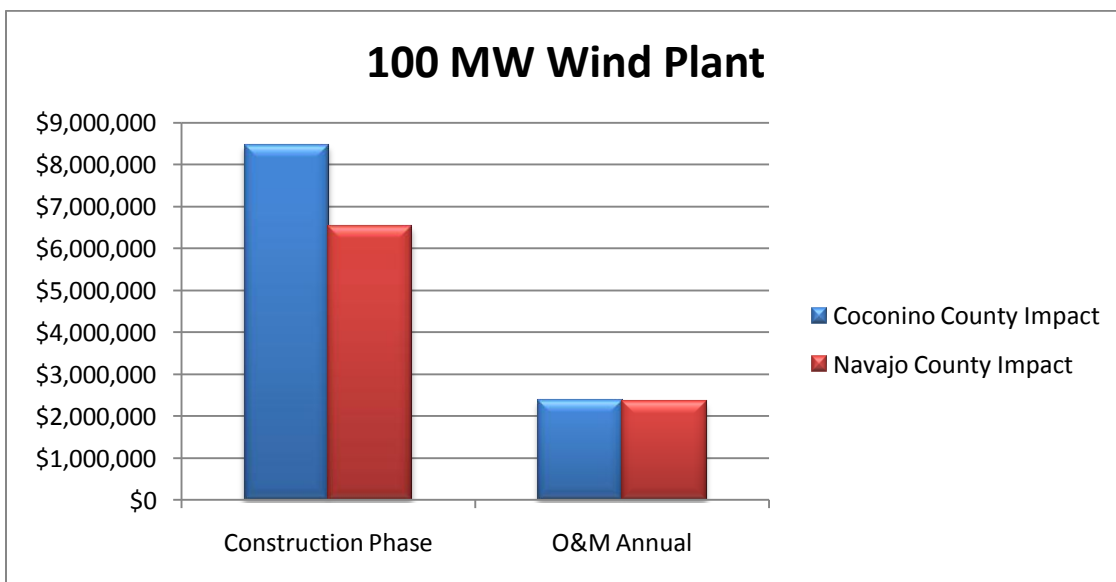
Appendix A – Wind power development economic impacts in Arizona

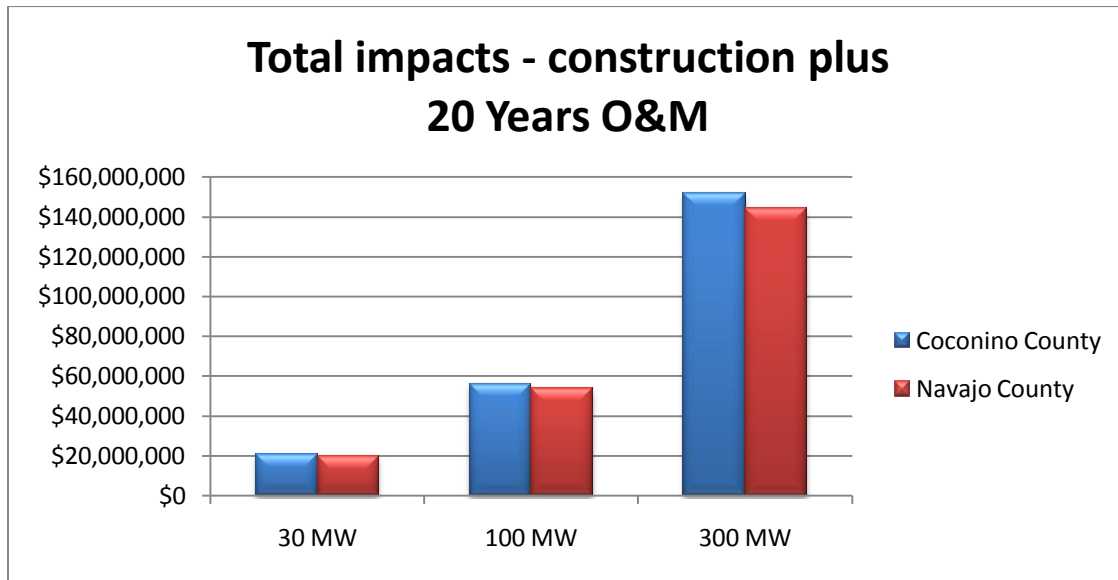
The development of wind power plants within the state of Arizona will have economic impacts on the local area and the state as a whole, such as employment opportunities, increased cash flow, land lease or royalty payments, and tax payments. The following graphs were generated using the National Renewable Energy Laboratory's Jobs and Economic Development Impacts model for wind power development.¹ The graphs show the total (direct, indirect, and induced) impacts for a variety of wind power plant development sizes. All dollars amounts are calculated in 2008 dollars.

¹ See <http://www.nrel.gov/analysis/jedi/>

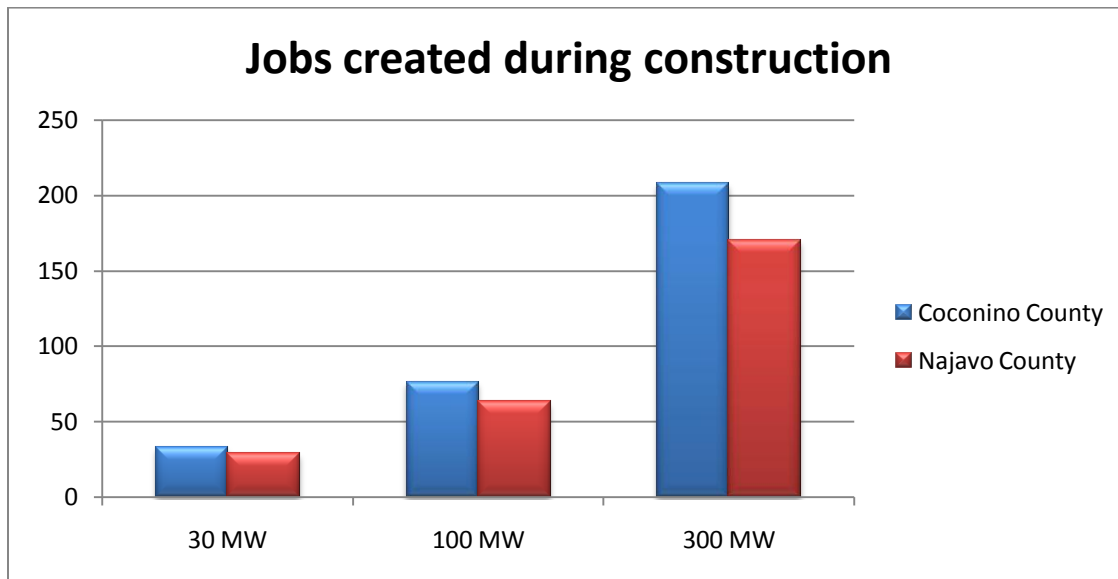


The figure above shows the economic impacts of development of a 100 MW wind plant on the state as a whole, contrasted with the impacts within just one county. Navajo and Coconino County were chosen for this purpose because of their relatively developable wind resources. This figure illustrates the fact that, while the services required by wind power plant development may be available throughout the state, their presence or absence at the local level significantly impact the percentage of the total capital investment that remains in the local economy. The following figure shows in more detail the economic impacts at the county level, and also provides an illustration of the scale difference in impacts between the construction and operation phases of wind power development.

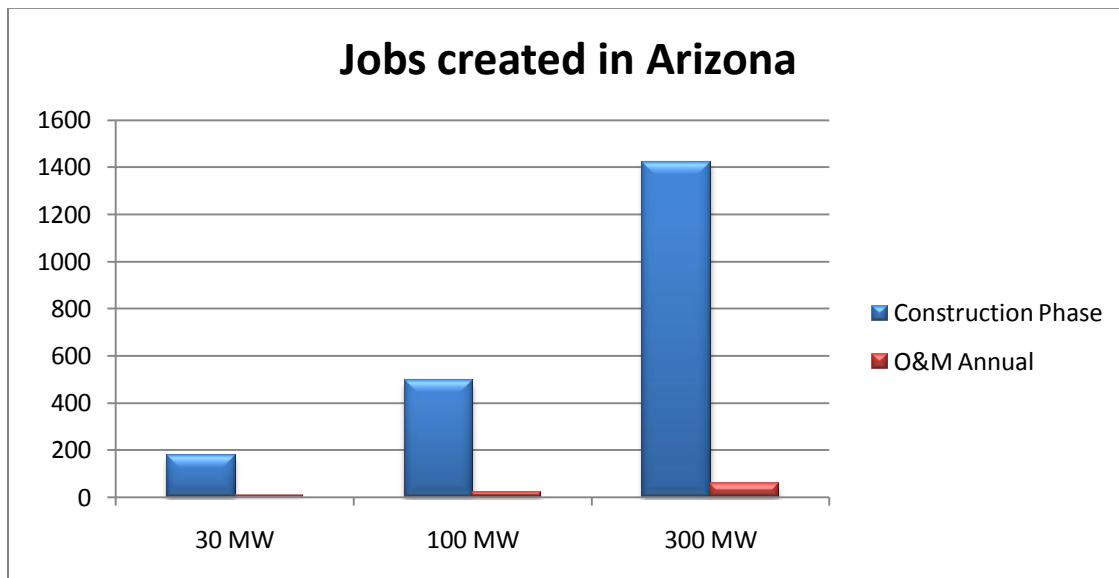
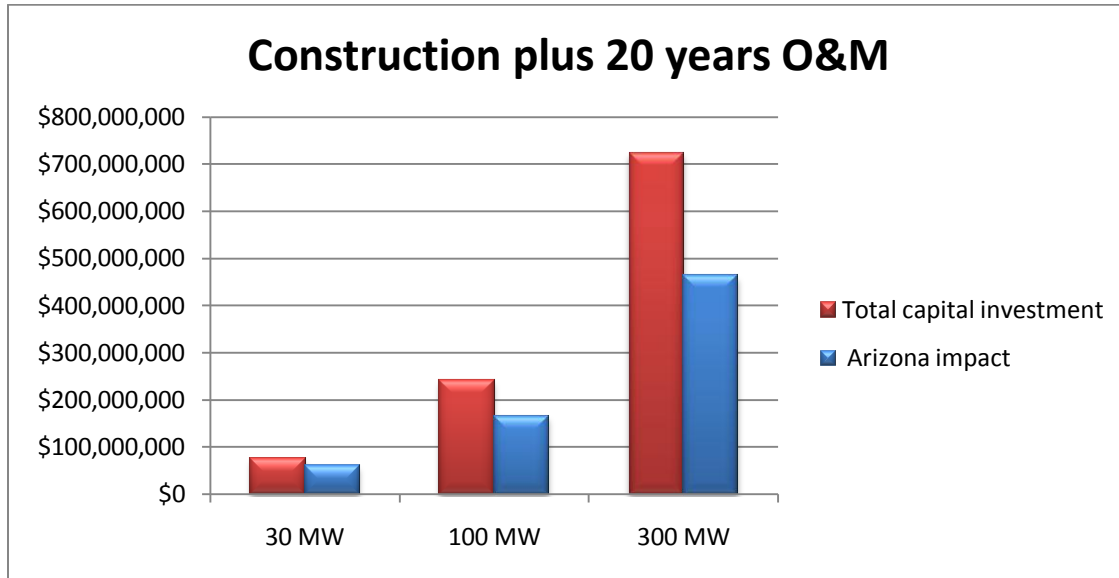




The figure above shows the total economic impacts, calculated for Coconino and Navajo County, for three different sizes (30 MW, 100 MW, and 300 MW) of wind power plant development. These include the impacts from the construction phase as well as 20 years of operation and maintenance. The total is presented in 2008 dollars. The following figure shows the quantity of jobs created during the construction phase of development of various sizes of wind power plant. Again, this figure illustrates the scale of impact as well as the discrepancy in impacts between areas with different quantities and types of services available.



Lastly, these figures show the impacts on the state as a whole of three different wind power plant development sizes. The first shows the total economic impact, calculated in 2008 dollars. In addition, the percentage of the total capital investment that stays in the state as economic impacts can be seen. The second figure shows job creation in Arizona for these same wind plant sizes, presented for the construction phase (generally about a year) and the operations and maintenance phase (these jobs last about 20 years).



Appendix B - The wind power development process

The document that follows is an overview of the wind power development process and the tasks involved in each step of the process. This overview was produced by Dale Osborn of Distributed Generation Systems, Inc., for the National Renewable Energy Laboratory in 1998. The information presented is complete, but some of the intricacies of the process have changed in the intervening decade since this document was first released.