Georgia Wind:
A Guidebook to Wind Development in Georgia
Created by The Georgia Wind Working Group

Foreword:

The Georgia Wind Working Group was formed in 2005 to begin promoting the responsible development and use of wind energy by facilitating stakeholder collaborations, assisting with resource assessments, and enhancing public understanding of the benefits and impacts of wind energy. Although we know that wind will not provide a significant portion of our total electricity capacity in the state, we do see the opportunity for individual and community wind projects as well as utility scale wind to be developed and provide a contribution to our overall energy needs.

This guidebook is intended to provide individuals, community leaders and utilities interested in developing wind with the tools and information needed to begin their project. We hope that you find this guidebook useful whether you are interested to find out more about the impacts wind power will have for Georgia, or if you want to get started with your own wind project.

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SECTION ONE:
Assessing Wind Resources for Land Owners and Wind Developers

What is the difference between Residential, Community and Utility Scale Wind?

Wind energy turbines come in many shapes and sizes based on the power of the wind. Some wind turbines installed only produce enough energy to power part of a home's energy consumption while other projects can produce enough energy to power a few hundred homes. Wind turbines and wind projects are typically split into three categories: residential, community and utility wind projects. A residential wind project is typically made up of one or two small wind turbines, owned by a single individual to power their home and produces 100KW of power or less. A community wind project is one that is owned by the community and powers more than one single family home or business. These projects typically run at 12MW total power generation or less. A utility scale wind project is owned by or provides energy to a utility company and usually consists of multiple turbines that produce 12MW or more energy. These wind turbines projects are typically called wind farms.

What is the Wind Potential of GA?

The wind potential in Georgia can vary greatly depending on location in the state. Georgia's wind maps show a variety of wind energy potential from class 1 to class 4 winds with the stronger winds located in Northwest Georgia as well as the coastal region near Savannah. The maps outline the areas in the State where wind power and wind speed have the greatest potential (see Appendix C for definitions of Wind Speed and Wind Power). (COMING SOON!)

How can an anemometer help assess the wind potential in a specific location?

Wind maps are useful in providing information on the general geographic locations where wind speeds are strong and steady enough to produce energy. However, it takes a more site-specific assessment with an anemometer to find out which sites in a general location hold the best wind potential. Strong, frequent winds are ideal for generating electricity. For a specific location, annual average wind speed is used to calculate the amount of energy in the wind blowing through a wind turbine's rotor per square meter. Wind energy uses a scale of 1 to 7, with 7 being the best location and 1 being the least ideal location. Sites in areas with wind energy of class 4 or higher at 50 meters are candidates for a commercial wind farm development. Class 2 sites or higher offer possibilities for adding small residential scale wind generators. Correct estimation of the energy available in the wind can make or break the economics of a wind farm development.

An anemometer is used to measures the wind speed for both residential and commercial development. Both small residential and large commercial turbines need to be placed on a tower that is at least 30 feet higher than the tallest object in the area in order to get above destructive lower level wind turbulence. Utility scale wind projects require towers 50 meters high and above.

The purpose of a wind anemometer is to help individuals or communities collect data on the wind speeds, variation, direction and consistency at a potential site for wind development. The data collected by the anemometer will help assess if the wind power is strong and consistent enough for a wind project to be developed on the site. The anemometer should be used for at least twelve months to get the proper amount of data for accurate calculations to be made. Typically for a residential site you want speeds averaging 11 miles an hour. (See Colorado's Small Wind Applications Guide for more information: http://www.state.co.us/oemc/programs/renewable/anemometer/demo.htm)

Wind anemometers can be expensive to buy and may inhibit projects from moving forward. The Georgia Wind Working Group is looking at options for developing a wind anemometer loan program for individuals interested in residential or community scale wind projects. Check back in with us to find out any updates about this program concept.

Who can help me get started in my area?

Most counties in Georgia have no permitting or siting procedures for developing wind. If you are interested in contacting someone at the county level who can provide you with the proper information needed to site a turbine see Appendix B for a list of counties and contact information.

Section Two: Permitting and Procedural Issues

What do State, Federal and Local Laws say about wind?

None of the North Georgia jurisdictions that were contacted about wind turbines have provisions in their Ordinances dealing specifically with wind turbine permitting and/or zoning. In most counties/cities, Zoning Boards or the County Board of Appeals (or City Council if within City limits) would need to be contacted to start the process for receiving permission to install a wind turbine. Please see Appendix B for a list of county-by-county contacts and processes dealing with permitting.

Typically a private individual who is looking to install a 100KW system or less does not need to create an Environmental Impact Statement (EIS) for their project. If they are applying for a grant through the United States Department of Agriculture (USDA), then the USDA will determine if there is a need to develop an EIS.

What types of permits will be needed for my wind project?

A. Local Permits are as follows:

1. SLUP – Special Land Use Permit
2. LUP – Land Use Permit
3. Variance
4. Conditional Use Permit

The definitions are similar but vary slightly from jurisdiction to jurisdiction – i.e. A use that would not be appropriate generally or without restriction throughout a particular zoning district and is not automatically permitted by right within a particular zoning district, but which, if controlled as to a number, area, location or relation to the neighborhood, may be found to be compatible and approved by the County Commission/City Council within a particular zoning district as provided in certain instances by ordinance.

What roads and transportation routes are needed to get a wind project on site?

The perfect site to develop your wind resource is not always within easy access to a highway or other road systems. Turbines themselves can weigh more than 1000 lbs and can hold blades that span the size of a football field, which can make them extremely difficult to transport. Special vehicles have even been made to move a turbine onto a wind site. In Georgia, there are two areas where wind will most likely be developed, in the mountains of North Georgia and off the coast near Savannah. In both instances, the cost of transport can be the most expensive part of the wind installation process.

Smaller wind turbines usually do not require the same infrastructure development to transport as larger turbines. However, it's important to develop a strategy for transporting your wind turbine and wind tower before you begin the process.

Section Three: Evaluating Environmental Impacts of Your Wind Energy Project.

What are the key environmental concerns associated with wind generation?

Wind energy in general is a much cleaner and more environmentally friendly energy resource than traditional coal and nuclear power plants. However, there are some environmental concerns that need to be considered before a wind energy site can be developed.

The main environmental concerns are:

- **Aesthetic Impacts**: Wind Turbines tend to be placed on towers 30 feet tall and higher, which causes them to be seen from great distances. Turbines also tend to be placed in open spaces where there are few obstructive objects, which also causes them to be more intrusive to the natural landscape. While some individuals and communities enjoy visual impacts of a wind turbine others do not. Typically, when communities are educated on the positive attributes wind energy can bring to their community, the level of aesthetic concerns tends to drop. The more individuals appreciate the benefits of wind energy, the less they raise concerns about the general visual impact of wind turbines.
- **Avian/Bat Mortality**: Bird and bat mortality associated with wind blades is the most controversial environmental concern associated with wind energy. However, with the proper siting and mitigation measures wind turbines can be placed in areas not in the direct line of bird migratory paths and can decrease the mortality of birds. For additional resources please see the following websites:
    - National Wind Coordinating Committee, *Wind Turbine Interactions with Birds and Bats: A Summary of Research Results and Remaining Questions: http://www.nationalwind.org/publications/avian/wildlife_factsheet.pdf*
    - Proceedings of the Wind Energy and Birds/Bats Workshop, Co-Sponsored by American Wind Energy Association and The American Bird Conservancy, May 2004: http://www.awea.org/pubs/documents/WEBBProceedings9.14.04[Final].pdf
    - DOE/NREL Overview of Research on Avian Interaction with Wind Power Structures, April 2003: http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/workshops/2003_state_lands/avian.pdf

- **Noise**: "Like all mechanical systems, wind turbines produce some noise when they operate. Most of the turbine noise is masked by the sound of the wind itself, and the turbines run only when the wind blows. In recent years, engineers have made design changes to reduce the noise from wind turbines. Early model turbines are generally noisier than most new and larger models. As wind turbines have become more efficient, more of the wind is converted into rotational torque and less into acoustic noise. Additionally, proper siting and insulating materials can be used to minimize noise impacts." See http://windeis.anl.gov/guide/concern/index.cfm for more details.
- **Construction**: Construction of wind turbines may have a temporary and sometimes permanent effect on the surrounding landscape. A developer should contact local and state authorities regarding the possible construction impacts and the requirements necessary for erosion and sedimentation control.

- **Utility Interconnection Impacts**: Wind turbines can be located a considerable distance from the utility connection point. In this case, the distribution/transmission interconnection line could have more impact than the turbines themselves.

What federal environmental laws need to be considered if an Environmental Impact Statement (EIS) is necessary? COMING SOON!

Section Four: Siting and Land Acquisition

What are some good tips for siting a wind turbine?

When deciding where to site wind turbines on a track of land, it's good to keep in mind the following points:

- Wind Speed and Direction: this will vary from season to season and time of day (daily and seasonal Wind Cycles) but after using an anemometer you will better know what the most consistent speed and direction is.
- Wind Shear: Does the wind speed increase significantly at greater heights? This will help you determine how high your turbine pole should be.
- Air Temperature and Pressure: this may affect the amount of energy in wind
- Obstacles: make sure to site your turbine in an area where there are no large trees, buildings, or other large obstructions that might block the winds natural flow.
- Roughness: the smoother the wind, the better for energy generation. Make sure the terrain and density of vegetation on the landscape will not affect the wind flow.

For more information visit the following websites:

- NYSERDA: Wind Power Project Site: Identification and Land Requirements: http://www.powernaturally.org/Programs/Wind/toolkit/13_windpowerproject.pdf
- http://www.windustry.com/basics/03-knowwind.htm
- http://www.windpower.org/en/tour/wres/siting.htm

How can I site a wind turbine on a piece of land I do not own?

Many times the strongest winds are found on land that financial investors and developers of wind projects do not own. This section will help potential investors and landowners who want to lease their property learn more about how to lease, buy or access land for developing wind power projects.
See the following websites:

- Harvesting the Wind: A Legal Guidebook for Homeowners: http://www.powernaturally.org/Programs/Wind/toolkit/12_harvestingthewind.p

df. This website provides landowners interested in leasing their land to developers with the legal information they need to do so.

- To see an example lease agreement please visit the following website: http://www.powernaturally.org/Programs/Wind/toolkit/14a_LeaseAgreements.pdf

Section Five: Technical Issues in Developing Wind Projects.

How are wind facilities interconnected to utility lines?

Generally, small wind generators would connect to the utility at the distribution voltage level. Connecting in at the distribution level would be very case specific, and the wind generator would have to contact the local distribution utility (investor-, cooperative-, or municipally-owned) for specifics. Larger wind generators may connect at a higher level (e.g. transmission voltage), which may be at a utility substation. Contacting the local distribution utility would also be an appropriate first step for larger wind generators.

Please see the following Federal Energy and Regulatory Commission's (FERC) standard interconnection agreements for small generators and for wind energy & alternative technologies:

http://www.ferc.gov/industries/electric/indus-act/gi/small-gen.asp

http://www.ferc.gov/industries/electric/indus-act/gi/wind.asp

Also, the "Georgia Cogeneration and Distributed Generation Act of 2001" provides the following information relevant to interconnection issues:

§ 46-3-56. Requirement to purchase energy from customer generator; safety standards and regulations

(a) An electric service provider will only be required to purchase energy as specified in Code Section 46-3-55 from an eligible customer generator on a first-come, first-served basis until the cumulative generating capacity of all renewable energy sources equals 0.2 percent of the utility's annual peak demand in the previous year; provided, however, that no electric service provider will be required to purchase such energy at a price above avoided energy cost unless that amount of energy has been subscribed under any renewable energy program.

(b) Once the capacity is subscribed, an electric service provider may purchase energy from an eligible customer generator at a cost of energy as defined for a utility by the commission, in the case of an electric utility, or by the appropriate governing body, in the case of any other electric service provider or electric supplier.

(c) A distributed generation facility used by a customer generator shall include, at the customer's own expense, all equipment necessary to meet applicable safety, power quality, and interconnection requirements established by the National Electrical Code, National Electrical Safety Code, the Institute of Electrical and Electronics Engineers, and Underwriters Laboratories.

(d) The commission, in the case of an electric utility, or the appropriate governing body, in the case of other electric service providers or electric suppliers, after appropriate notice and opportunity for comment, may adopt by regulation additional safety, power quality, and interconnection requirements for customer generator that the commission or governing body determines are necessary to protect public safety and system reliability.

(e) An electric service provider may not require a customer generator whose distributed generation facility meets the standards in subsections (a) and (b) of this Code section, to comply with additional safety or performance standards, perform or pay for additional tests, or purchase additional liability insurance.

(f) No electric service provider or electric supplier shall be liable to any person, directly or indirectly, for loss of property, injury, or death resulting from the interconnection of a cogenerator or distributed generation facility to its electrical system.

Section Six: Financing and Risk Insurance

What are some federal tax credits I can take advantage of when I develop wind?

- **The Wind Energy Production Tax Credit:** The Federal government recently extended the production tax credit for wind energy through 2007. The Production Tax Credit (PTC) for wind provides a 1.9 cent-per-kilowatt-hour (kWh) tax credit for electricity generated with wind turbines over the first ten years of a project's operations, and is a critical factor in financing new wind farms. See: **http://www.windustry.com/resources/legislation.htm** for more details.
- **Section 9006 of the Farm Bill**: The United States Department of Agriculture, Farm Security and Rural Investment Act of 2002 provides farmers with the chance to apply for grants and loan agreements to help fund renewable energy projects on the farm including wind projects, in the section titled 9006 of the farm bill. See the websites below for additional information on how to apply for a grant or loan.
  http://www.eere.energy.gov/windandhydro/windpoweringamerica/filter_detail.asp?itemid=770 and http://www.windustry.org/farmbill/default.htm

What are some key incentives for wind in GA?

- **The Georgia Bi-Directional Metering Law** provides individual and community scale wind developers with the option of selling a percentage of their excess wind energy back to their utility providers when their renewable energy system is hooked up to the meter. Under the law, wind energy is included as renewable energy resource that can be sold back to the utility. The utility company's regulatory body is required to set a buy back rate for the renewable energy resource from the individual or commercial facility. Therefore, the rate at which the utility buys the excess energy from the individual or commercial facility can vary by utility company. The law is made eligible to any residential energy system of 10KW or less and any commercial energy system of 100 KW or less. See: http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=GA02R&state=GA&CurrentPageID=1&RE=1&EE=1 for more details on the law.

Are there additional resources available to provide me with information on financing a wind energy facility and risk insurance for the project?

There are many resources available that can help individuals and developers with information on how to finance a wind power project. See below for a few of the resources available:

- **Community Wind Financing: http://www.elpc.org/energy/windhandbook2004.pdf**
- **American Wind Energy Association Financing Guide: http://www.awea.org/financing/**

What policies could be adopted in Georgia in the future to further benefit wind energy development?

The State of Georgia initiated development of a Comprehensive State Energy Strategy for Georgia in 2006. The State is giving consideration to several policy options that other states have adopted to support the development of renewable energy resources, including wind. These policy options include:

1. Improvement of the Georgia Bi-Directional Metering Law
2. Development of a Clean Energy Tax Credit for Georgia
3. Creation of a Georgia Clean Energy/ Public Benefits Fund
4. The establishment of a Renewable Energy Portfolio Standard in Georgia.

To learn more about the Georgia Energy Strategy visit the website, www.georgiaenergyplan.org.

Section Seven

What is the Overall Benefit of bringing wind power to Georgia?

Wind energy provides a clean renewable source of energy without the environmental and health problems that traditional coal and nuclear power plants cause. Wind energy has also proven to be a great boost to rural areas, bringing good jobs and economic benefits with it. Modern wind turbines are quiet, efficient and graceful and have become very popular in places where they have been developed.

Overall Benefits Include:

- Wind produces zero emissions
- It provides local jobs and new manufacturing jobs for the growing industry
- Wind provides new tax revenue for local towns
- It requires no additional resources to operate (ie: additional fuel sources such as fossil fuels or water for cooling)
- Wind is an inexhaustible resource

How will wind development improve the State's economy?

- When wind projects are developed in rural communities, they can have a great impact on the local economy. Please see the links below to find out more about how wind energy can benefit your local economy.
    1. **http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/wpa/flowers_windpower_2005.pdf**
    2. **http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/wpa/33590_econ_dev.pdf**
    3. **http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/econ_clemmer.pdf**

- **Follow the link below for a wind energy calculator:**

http://www.windustry.org/calculator/default.htm

- Wind power can provide even more economic and socio-economic benefits to the local community and the state as a whole when it's developed at the utility scale. See:

http://www.powernaturally.org/Programs/Wind/toolkit/20_economicandsocioeconomicimpacts.pdf

How will wind power improve tourism?

See: http://www.auswea.com.au/WIDP/assets/4Tourism.pdf

APPENDIX

Appendix A: Georgia State Wind Maps: COMING SOON!

Appendix B: A list County by County of individuals and their contact information for those interested in wind development in North Georgia (As of June, 2006)

1. **GILMER COUNTY**
Contacts
Zoning Administrator - Brian Jones
Land Development Officer – James Holloway
(706) 635-3406

Code adopted February 26, 2004
Mountain Protection Ordinance
Major City – Ellijay
Website - http://www.gilmercounty-ga.gov/

(Notes: There is currently no provision for installing wind turbines in Gilmer County. Any action to construct turbines would require plan submittal to the Board of Commissioners. In addition, all Mountain Protection Ordinance requirements must be met.)

2. PICKENS COUNTY
Contacts
Director of Planning and Development – Norman Pope – (706) 253-8850
Planning and Development Officer – Rodney Buckingham
Major Cities – Jasper, Nelson, Talking Rock
Website – http://www. pickenscountyga.org

(Notes: There is currently no provision for installing wind turbines in Pickens County. Any action to construct turbines would require approval by the appropriate Departments and/or the Board of Commissioners.)

3. WHITFIELD COUNTY
Contacts
Zoning Administrator – Jean Garland – (706) 275-7401
Major City - Dalton
Website - http://www.whitfieldcountyga.com/

(Notes: There is currently no provision for installing wind turbines in Whitfield County. Any action to construct wind turbines would require submitting a plan to the Board of Commissioners.)

4. FANNIN COUNTY
Contacts
Land Development – Marie Woody (706) 632-8361

Currently no Zoning Ordinance
Website – http://www.fannincountyga.org/

(Notes: There is currently no provision for installing wind turbines in Fannin County. Any action to construct wind turbines would require approval by the Board of Commissioners.)

5. MURRAY COUNTY

Contacts
Land Development – Zoning Administrator – Dick Barnes – (706) 517-1400
Mountain Protection Ordinance adoption is in process
Website currently under construction

(Notes: There is currently no provision for installing wind turbines in Murray County. Any action to request permission to construct turbines would start in the Zoning Department. The process would then go to the Murray County Appeals Board where a decision would be made. The decision would be based on a combination of Zoning recommendations and a presentation to the Appeals Board)

6. UNION COUNTY

Contacts
Environmental Department – Director – Randy Day – (706) 439-6057
e-mail – ucbi@alltel.net
Website - http://www.unioncountyga.gov/home.htm
Lamar Paris – Sole Commissioner

(Notes: There is currently no provision for installing wind turbines in Union County. Any action to request permission to construct turbines would start in the Environmental Department.)

Appendix C: General definitions, defining class scale for wind, definition of community, residential, utility scale wind.

Class Scales for Wind: Wind potential is classified according to wind power classes, which are based on typical wind speeds. These classes range from Class 1 (the lowest) to Class 7 (the highest). In general, at 50 meters, wind power Class 4 or higher can be useful for generating wind power with large turbines. Given the advances in technology, a number of locations in the Class 3 areas may suitable for utility-scale wind development as well. (Source: Wind Powering America)

Community Scale Wind: A community wind project is one that is owned by the community or public power entity and powers more than one single family home or business. These projects 'typically' run at 12MW total power generation or less.
Residential Scale Wind: A residential wind project is typically made up of one or two small wind turbines, owned by a single individual to power their home and 'typically' produces 100KW of power or less.
Utility Scale Wind: A utility run wind project is owned by or produces energy for a privately owned utility company and usually consists of multiple turbines that produce a total of 12MW or more.
Wind Power Density: Wind power density, measured in watts per square meter of blade surface, is used to evaluate the wind resource available at a potential site. The wind power density indicates how much energy is available for conversion by a wind turbine. The wind power density is normally measured in class scales (see definition above).
Wind Speed: Wind speed determines how much energy is available for conversion to electricity. For wind farm applications, developers seek sites with an annual average wind speed of at least 7.0 meters per second (15.7 miles per hour), measured at a wind turbine hub height above ground of 50 meters (164 feet). For more information on wind speed and wind power see the website: http://www.eia.doe.gov/cneaf/solar.renewables/rea_issues/wind.html

Appendix D: Links to Offshore Wind Power Project Developments:

1. **Off-Shore Wind Farm Approval Process, NC: http://www.crest.org/articles/static/1/binaries/REPP_Offshore_Wind_Approval.pdf**
2. **Cape Wind Project:** http://www.capewind.org/
3. **Long Island Power Authority Project:** http://www.lipower.org/cei/offshore.html

Appendix E: Environmental Assessment Report for 20MW Wind Farm in Johnson County, TN

1. http://www.tva.gov/environment/reports/windfarm/

Appendix F: Important Web Links, Additional Resources:

- United States Department of Energy's Wind Powering America Program: http://www.eere.energy.gov/windandhydro/windpoweringamerica/
- The National Renewable Energy Laboratory Wind Technology Center: http://www.nrel.gov/wind/