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. The group consists of over 60 individuals, representing utility companies, wind developers, government agencies, universities, and other interested stakeholders. The Georgia Wind Working Group seeks to educate individuals, local communities, and other stakeholders on how wind can provide a contribution to Georgia's overall energy needs.

This guidebook is intended to provide individuals, community leaders and utilities interested in developing small or utility scale wind with the tools and information needed to begin their project. We hope that you find this guidebook useful whether you generally are seeking information regarding wind power in Georgia, or if you want to get started with your own wind project.

Table of Contents:

APPENDIX

Appendix A: List of all Georgia State wind maps
Appendix B: List county by county of individuals and contact information for individuals interested in development
Appendix C: General definitions, defining class scale for wind, definition of community, residential, utility scale wind.
Appendix D: Examples of offshore wind projects being developed
Appendix E: Environmental Assessment Report for 20MW wind farm proposed in Johnson County, TN
Appendix F: Important web links, resources
Appendix G: Georgia Model Wind Ordinance
Appendix H: U.S. Department of Energy National Renewable Energy Lab White Paper: *Economic Benefits, Carbon Dioxide (CO2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Georgia.*

I. 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.[1] A community wind project is one that is owned by the community and powers more than one single family home or business. A utility scale wind project is owned by or provides energy to utility company and usually consists of multiple turbines that produce more than 100KW of energy.[2] 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 the mountainous regions of 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[3] (see Appendix C for definitions of Wind Speed and Wind Power).
(see Appendix A for additional maps.

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

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[1] http://windustry.com/what-is-home-and-farm-small-scale-wind
[2] http://www.awea.org/faq/wwt_basics.html
[3] To see a wind resource map of Georgia, please go to www.gawwg.org/resources/georgiawindresourcemap.html

wind energy of class 4 or higher at 50 meters are candidates for a commercial wind farm development. Particular locations in areas with Class 3 winds could have higher wind power class values at 80 meters than shown on a 50 meter wind resource map because of possible high wind shear. Given the advances in technology, a number of locations in Class 3 areas may be suitable for utility-scale wind development as well.[4] Class 2 sites or higher offer possibilities for adding small residential scale wind generators. [5] 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 measure the wind speed for both residential and commercial development. To receive accurate readings from the anemometer, the standard wind sensor tower height used to obtain data for a small wind project is 10 meters.[6] For a utility scale wind project, the height of the tower needs to be 50 meters. [7] 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.[8] [9]

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. The Georgia Wind Working Group in partnership with the Georgia Department of Community Affairs and the University of Georgia Land Use Clinic has developed a Model Wind Ordinance to act as a guide for local jurisdictions to

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[4] http://www.windpoweringamerica.gov/maps_template.asp?stateab=ga
[5] http://www.nrel.gov/gis/wind.html
[6] http://www1.eere.energy.gov/windandhydro/small_wind_system_faqs.html
[7] http://apps1.eere.energy.gov/state_energy_program/update/project_detail.cfm/pb_id=898
[8] http://www.awea.org/faq/basicwr.html
[9] See the "Wind Resource Assessment Guidebook" for more information about anemometers: http://www.nrel.gov/docs/legosti/fy97/22223.pdf

use. 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. For more information, please send an email to **wind@gawwg.org** .

II. Permitting and Procedural Issues

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

In most counties and or cities the local Zoning Boards, County Board of Appeals, or City Councils are in charge of permitting small-scale wind turbines. 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?

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. Utility scale 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. 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.

III. 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.

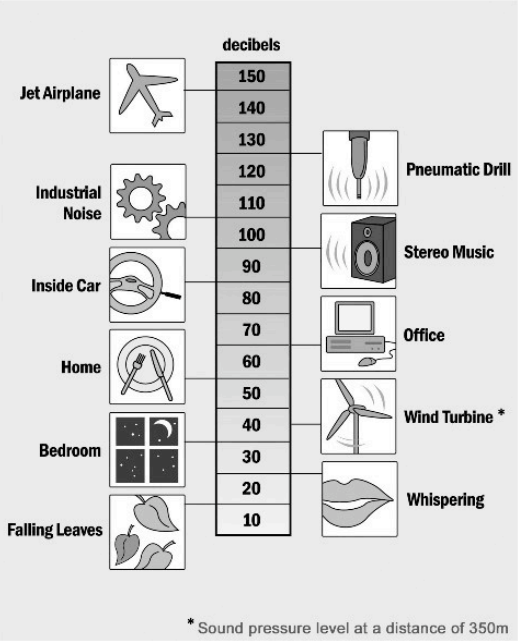
- **Avian/Bat Mortality**: Bird and bat mortality associated with wind blades are the most controversial environmental concern associated with wind energy. However, with the proper siting and mitigation measures, wind turbines can be placed in areas not in the direct line of bird migratory paths and can decrease the mortality of birds. For bats, mitigation measures such as stopping wind turbines during periods of low wind conditions has been shown to dramatically reduce the number of bat fatalities (see below for the full report). Also, it has been found that radar signals can deter bats from an area, so installing radar devices on wind turbines can reduce bat activity around the turbines, thus reducing the number of bats kills.[10] For additional resources please see the following websites:
    - Bat Conservation International, a report prepared for the Bats and Wind Energy Cooperatives, *Effectiveness of Changing Wind Turbine Cut-In Speed to Reduce Bat Fatalities at Wind Facilities*:

[10] http://www.msnbc.msn.com/id/32034204/ns/technology_and_science-science/

http://www.batsandwind.org/pdf/Curtailment_2008_Final_Report.pdf

- National Wind Coordinating Committee, *Wind Turbine Interactions with Birds and Bats: A Summary of Research Results and Remaining Questions:* http://www.nationalwind.org/publications/wildlife/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."[11]



Source: AWEA

- **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 an impact on the environment.

[11] http://windeis.anl.gov/guide/concern/index.cfm

IV. Siting and Land Acquisition

What are some good tips for siting a wind turbine?

When deciding where to site the 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/wind-basics/learn-about-wind-energy/wind-basics-know-your-land/know-your-land**
- **http://www.windpower.org/en/tour/wres/siting.htm**
- **http://www.windpoweringamerica.gov/siting.asp**

How can potential developers site wind on my land?

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.pdf**. 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**

V. 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 for specifics. (In Georgia, there are 3 types of electric utilities: an investor-owned utility or electric membership corporation or electric municipal utility.) 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.[12]

VI. 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 Production Tax Credit (PTC) for wind provides a 2.1 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.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US13F&re=1&ee=1** for more details.

- **Rural Energy for America Program (REAP):**
The 2008 Farm Bill, enacted by Congress in May 2008, converted the federal Renewable Energy Systems and Energy Efficiency Improvements Program (formerly Section 9006 of the 2002 Farm Bill), into the Rural Energy for America Program (REAP).

  The program provides farmers with the chance to apply for grants and loan agreements to help fund renewable energy projects and energy efficiency on the farm, including wind projects. The program also provides grants for energy audits and renewable energy development assistance. Congress allocated funding for the new program in the following amounts: $55 million for FY 2009, $60 million for FY 2010, $70 million for FY 2011, and $70 million

[12] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=GA04R&re=1&ee=1

for FY 2012.

See the following websites below for additional information on the program and how to apply for a grant or loan.

- http://www.rurdev.usda.gov/rbs/farmbill/index.html
- http://www.ers.usda.gov/FarmBill/2008/Titles/TitleIXEnergy.htm#ruralAmerica
- http://farmenergy.org/news/usda-announces-reap-funding-for-2009
- http://farmenergy.org/success-stories/reap

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 there 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.
- **The Georgia Clean Energy Production Tax Credit:** As part of *Conserve Georgia* and the *Governor's Energy Challenge*, Georgia offers state income tax credits for 35 percent off the cost of installation for energy efficient and renewable energy property, including wind turbines. The credits are available to taxpayers placing qualified clean energy property in service between July 1, 2008 and December 31, 2012. The following website provides guidance, requirements, forms and other information to assist eligible taxpayers to claim this tax credit. **http://www.gefa.org/Index.aspx?page=423**
- **House Bill 473**

This bill, signed into law in April 2009, was created to provide for grants for clean energy property for a limited period of time from federal funds available for such purposes. For more information on House Bill 473, please visit the Georgia Environmental Facilities Authority website at **www.gefa.org**

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/documents/WindHandbook2004.pdf**
- American Wind Energy Association Financing Guide: **http://www.awea.org/financing/**
- From *The Farmer's Guide to Wind Energy* – "Financing a Commercial-Scale Wind Project": **http://www.flaginc.org/topics/pubs/wind/fgwe08.pdf**

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 early 2006 and released the strategy in December 2006. This strategy was revised in 2009 and has included more information about wind.

When the State Energy Strategy was first released, the state gave consideration to several policy options that other states had adopted to support the development of renewable energy resources, including wind. These policy options included:

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

The 2009 State Energy Strategy Update addresses some of these suggested policies and discusses the steps that have been taken since 2006 to strengthen wind energy development in Georgia. These steps include:

1. The development of Georgia's Clean Energy Property Tax Credit
2. GEFA, Green Power EMC and the Georgia Wind Working Group partnering together on a grant proposal to install wind turbines at two schools in North Georgia. The wind turbines will be part of a curriculum on renewable energy and introduce students and the surrounding community to wind as a renewable energy resource.
3. The establishment of the Energy Innovation Center, which integrates Georgia's research, business and government resources to attract and grow clean energy businesses in Georgia and to promote the state's natural and economic resources, including wind power.

In the future, the state plans to take the following actions to further Georgia's wind energy future:

1. Continue to support state tax incentives and research on renewable energy

2. Evaluate the Georgia Bi-Directional Metering Law to support renewable energy development

To learn more about the Georgia Energy Strategy, visit the website **http://www.gefa.org/Index.aspx?page=93#a4**

VII. 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:** The Wind Project Calculator was developed to assist in performing cash flow modeling for community wind projects. You will need to enter specific information about the type of turbine you are considering, the estimated annual average wind speed, information about electricity use and electric rates, and information about financing and income taxes:
  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 does the federal government see wind as meeting the role of Georgia's future energy needs?

- The U.S. Department of Energy's "20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply" report: http://www.20percentwind.org/
- Economics of Wind in Georgia – Fact Sheet (see Appendix H)

How will wind power improve tourism?

Wind power has been shown to have very few negative impacts on tourism. In most cases, the presence of wind turbines makes no difference on the likelihood of tourists visiting the area again. Many people have said that the presence of the turbines is visually appealing, and knowing that the turbines create clean energy makes them even more attractive, thus leading more people to visit areas with wind turbines in place.
See the following information about studies conducted on tourism in popular areas:

- **Scotland:** http://www.bwea.com/pdf/mori_briefing.pdf
- **Vermont:** http://www.revermont.org/press/neksurvey.pdf
- **Australia:** http://www.auswind.org/accreditation/windinfo/assets/4Tourism.pdf

APPENDIX

Appendix: Georgia State Wind Maps
(insert maps here)

Appendix B: List county by county of individuals and contact information for individuals interested in 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 install 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. Class 2 winds are suitable for small-scale wind projects.[13]
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

[13] http://www.windpoweringamerica.gov/maps_template.asp?stateab=ga

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).[14]

Wind Turbine: A Wind Turbine, or windmill, is a wind energy conversion system that converts wind energy into electricity through the use of a wind turbine generator, and may include a nacelle, rotor, tower, guy wires and pad transformer.[15]

Wind Turbine – Horizontal Axis: A horizontal axis wind turbine (HAWT), the most common type seen today, is built with a propeller-type rotor on a horizontal axis. The propeller is turned towards the wind. [16]

Wind Turbine – Vertical Axis: A vertical axis wind turbine (VAWT) most commonly has an egg beater shape, is usually built with 2 or 3 blades, and does not have to face the direction of the wind. A VAWT is not used as much as an HAWT because it is less efficient; has lower wind speeds on the lower part of the rotor because of slow speeds close to the ground; is not self-starting; may need guy wires, which are impractical in heavily farmed areas; and the whole machine has to be taken down in order to replace the main bearing for the rotor. [16]

Appendix D: Links to Offshore Wind Power Project Developments:

1. Bluewater Wind, Delaware: **www.bluewaterwind.com**
2. The study conducted by Georgia Tech and Southern Company about Georgia's wind potential: **http://www.energy.gatech.edu/news-events/release.php?id=1437**
3. The Virginia Coastal Energy Research Consortium: **www.vcerc.org**
4. Minerals Management Service (MMS) Rules for Offshore Wind - "Final Rule: Renewable Energy and Alternate Use of Existing Facilities on the Outer Continental Shelf": **http://www.mms.gov/offshore/alternativeenergy/regulatoryinformation.htm**

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

- **http://www.tva.gov/environment/reports/windfarm/**

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[14] http://www.eia.doe.gov/cneaf/solar.renewables/page/wind/wind.html
[15] From the Georgia Model Wind Ordinance (Appendix G)
[16] http://www.windpower.org/EN/tour/design/horver.htm

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

Appendix G: The Georgia Model Wind Ordinance
http://www.gawwg.org/resources.html

Appendix H: U.S. Department of Energy National Renewable Energy Lab White Paper: ***Economic Benefits, Carbon Dioxide (CO2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Georgia.***
http://www.windpoweringamerica.gov/filter_detail.asp?itemid=1954