

# **Moving to a Clean Energy Economy: Opportunities for North Carolina**

United States Department of Energy  
September 18, 2009

# OVERVIEW: NORTH CAROLINA HAS MAJOR ECONOMIC OPPORTUNITIES IN A CLEAN ENERGY ECONOMY

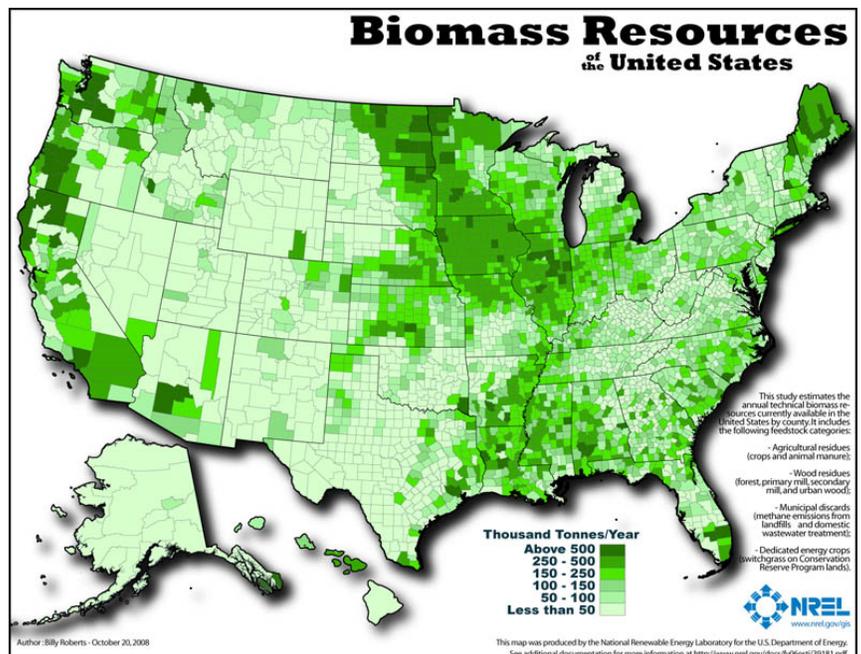
The threat of climate change caused by carbon pollution poses a major challenge to the United States and the world, but it also represents an unprecedented opportunity to create new industries and build a strong, thriving clean energy economy. The clean energy sector is one of the fastest growing industries in the world -- the demand for solar panels and wind turbines, for example, has been growing exponentially over the past few years.

Among industrialized nations, the race is on for the clean energy jobs of the future. China is investing \$12.6 million per hour in clean energy. Denmark has made significant investments in wind capacity and is now home to the world's leading wind turbine manufacturer. With our unrivalled natural, intellectual and scientific resources, the United States can and should emerge as the world's leader in clean energy, but success depends on making the right choices today.

President Obama has called for comprehensive legislation to create a system of clean energy incentives that will catalyze America's industrial and scientific base. It will spark public and private investments in clean energy that will create millions of new jobs.

## Moving to clean energy holds major economic opportunity for North Carolina today and tomorrow:

- **North Carolina has a strong industrial heritage:** though the Tar Heel state has been devastated by the loss of manufacturing jobs over the past decade or more, the state retains a strong manufacturing infrastructure and a hard-working a skilled workforce that could find significant new opportunities in clean energy manufacturing.
- **North Carolina is a leader in science and innovation:** the Tar Heel state is home to innovative companies and world leading scientists, including flagship institutions associated with Research Triangle Park.
- **North Carolina has vast biomass resources that could be converted into power:** According to the Department of Energy's National Renewable Energy Laboratory, North Carolina ranks among the top 20 states for biomass resources - with 10.7 million tonnes of biomass resources available, from agricultural wastes to wood scraps and sawdust produced in the state's furniture mills. (See table 10, "Total Biomass Resources Available (Thousand tonnes/year) in the United States by State," <http://www.nrel.gov/docs/fy06osti/39181.pdf>)



- **North Carolina families could reap huge benefits from energy efficiency:** The state of California has demonstrated the potential for significant consumer savings through energy efficiency. Even though California’s economy has grown significantly since the 1970s, per capita energy use has remained nearly flat. If North Carolina achieved the same per capita bills as California, consumers would be saving 39% on their energy bills. (See Appendix II)
- **Businesses and Industry in North Carolina can also reap major energy efficiency savings:** The Department of Energy has worked with businesses in North Carolina to identify steps that they can take to lower their energy bills. Assistance is provided in the form of no-cost energy assessments conducted by Industrial Assessment Centers (IACs), sponsored by DOE's Industrial Technologies Program. So far more than 3,600 ways have been identified for small- and medium-sized industrial plants in North Carolina to save money and improve productivity through efficiency, with an average payback of only 1.1 years. (See: <http://www.iac.rutgers.edu/database/state.php>)
- **North Carolina is receiving major new funding from the American Recovery and Reinvestment Act:** North Carolina’s families and businesses are benefitting from the investments in the Recovery Act to improve energy efficiency and support cutting-edge companies that are at the forefront of the clean energy economy. See the table below:

Recovery Act Announcements – North Carolina	
<b>Weatherization</b>	\$131,954,536
<b>State Energy Program</b>	\$75,989,000
<b>Energy Efficiency &amp; Conservation Block Grant Program</b>	\$58,050,300
<b>Advanced Batteries</b>	\$49,200,000
<b>Wind</b>	\$841,101
<b>Appliance Rebates</b>	\$8,848,616
<b>State and Local</b>	\$1,046,182
<b>Clean Cities Program</b>	\$12,975,388

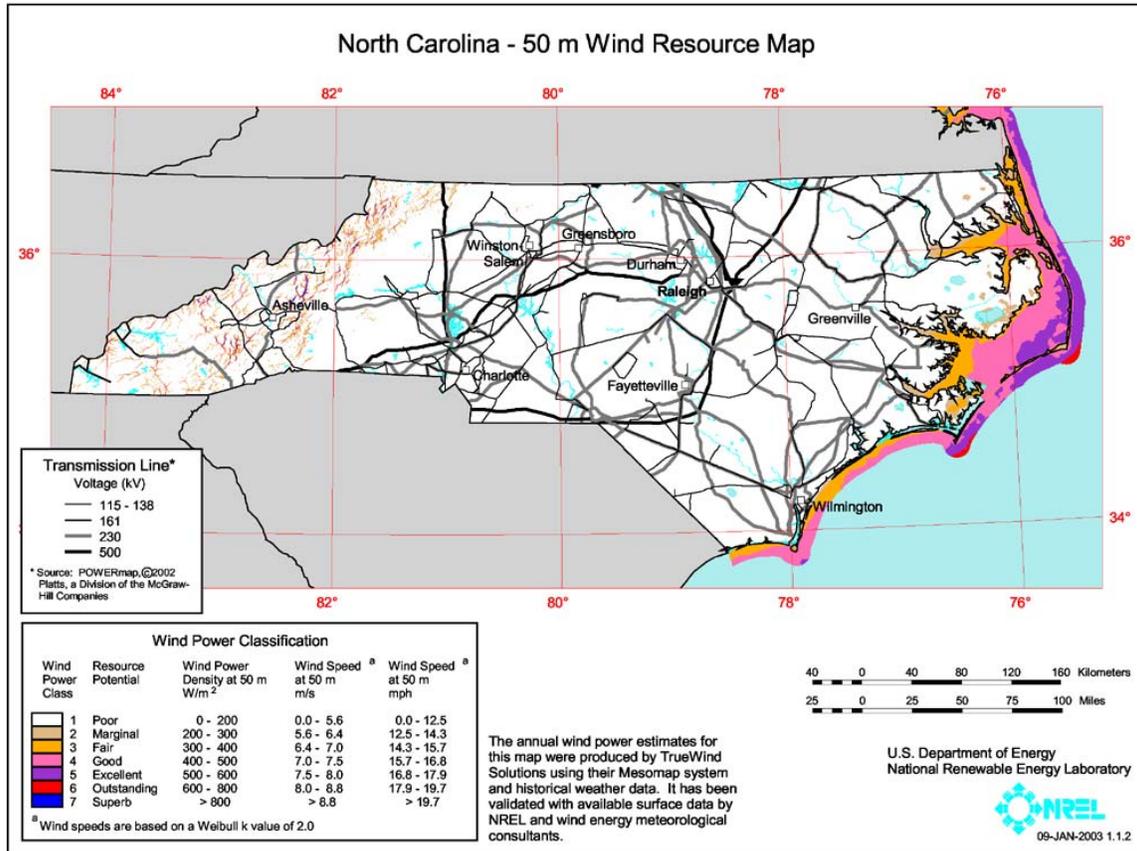
*Note: Figures above reflect funding amounts for announced award selections. Some awards are still under negotiation. Grantees are required to meet certain Recovery Act milestones in spending funds.*



A complete listing of funding announcements for North Carolina is available online at: <http://www.energy.gov/7970.htm>

- **North Carolina is a national leader in nuclear power, the largest source of carbon free emissions.** Comprehensive energy legislation with a cap on carbon pollution would make nuclear energy even more attractive as a carbon-free source of baseload power. North Carolina could continue to meet the need for clean energy through further development of nuclear power.

- North Carolina has major wind energy potential, particularly offshore, and could see 10,000 to 20,000 new manufacturing jobs in the wind industry:** A Department of Energy validated survey of wind energy potential based on wind speeds at 50 meters in elevation shows that North Carolina has major wind resources that can be tapped for renewable energy production (See the map below). In addition to benefitting from the deployment of additional wind power in the state, North Carolina is poised to emerge as a major manufacturer of wind turbines and components. A 2008 report by the Department of Energy and the National Renewable Energy Laboratory found that achieving 20 percent of America’s electricity from wind power would mean 10,000 to 20,000 new manufacturing jobs in North Carolina. (See Appendix I)



**NOTE:** The Department of Energy's Wind Program and the National Renewable Energy Laboratory (NREL) published this new wind resource map for the state of North Carolina. This resource map shows wind speed estimates at 50 meters above the ground and depicts the resource that could be used for utility-scale wind development. Future plans are to provide wind speed estimates at 30 meters, which are useful for identifying small wind turbine opportunities.

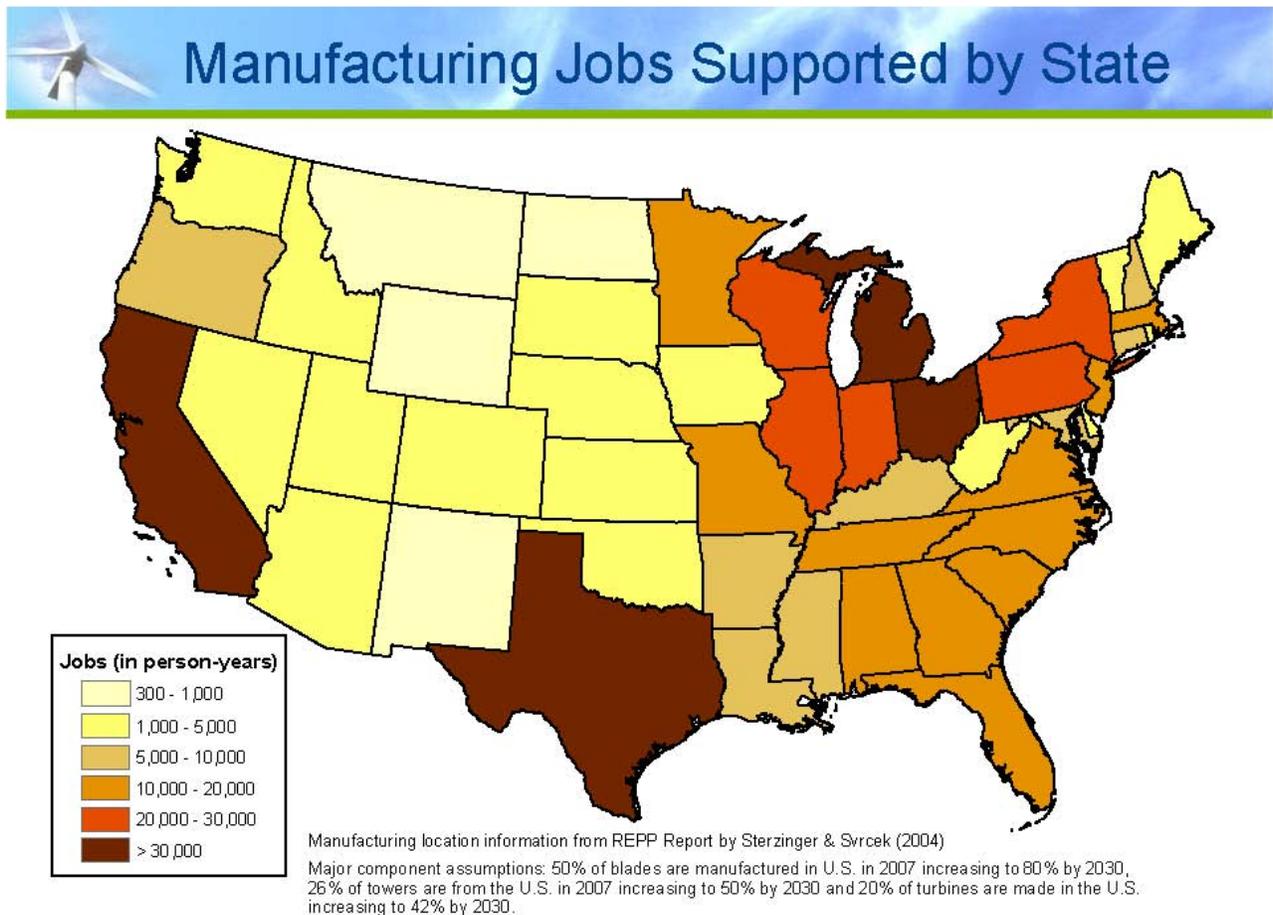
This map indicates that North Carolina has wind resources consistent with utility-scale production. The good-to-excellent wind resource areas are concentrated in two regions. The first is along the Atlantic coast and barrier islands. The second area is the higher ridge crests in western North Carolina.

# APPENDIX I: NORTH CAROLINA AND THE 20 PERCENT WIND SCENARIO

The Department of Energy and the National Renewable Energy Laboratory issued a report in 2008 outlining a scenario where the United States could conceivably generate 20 percent of our electricity from wind power by 2030. (Read the full report at <http://www.20percentwind.org/>)

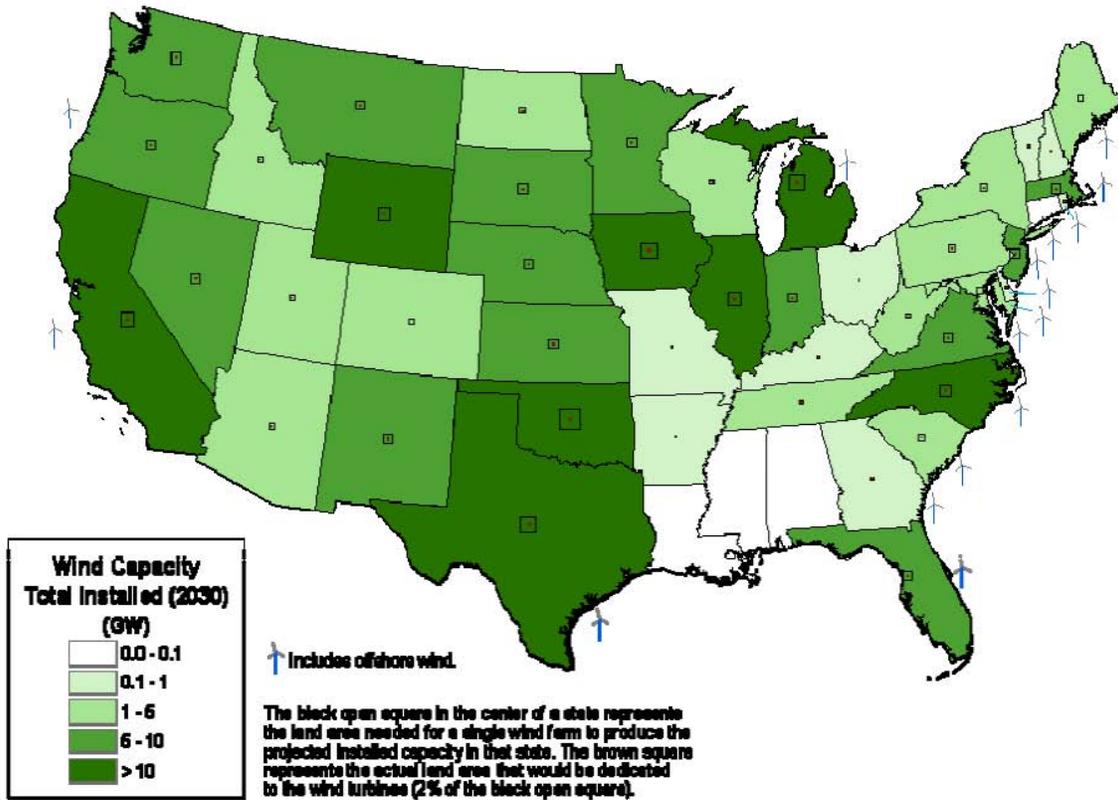
Comprehensive energy legislation under consideration in Congress would help to encourage the further development and deployment of wind power in the United States and achieve President Obama's goal of doubling renewable energy capacity in three years.

Under the 20 percent wind scenario, North Carolina would see a substantial expansion of wind power and an additional 10,000 to 20,000 manufacturing jobs in the industry.





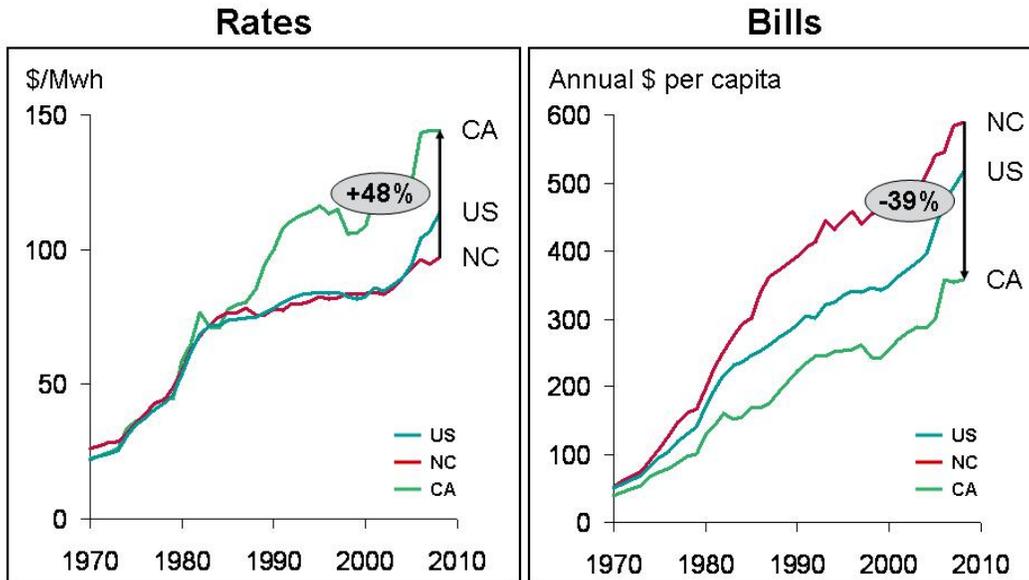
# 46 States Would Have Substantial Wind Development by 2030



# APPENDIX II: ENERGY EFFICIENCY CAN SAVE NORTH CAROLINA FAMILIES MONEY

## Energy efficiency saves money

Despite its high electricity rates, California has maintained **lower than average electric bills** by implementing strong energy efficiency measures.

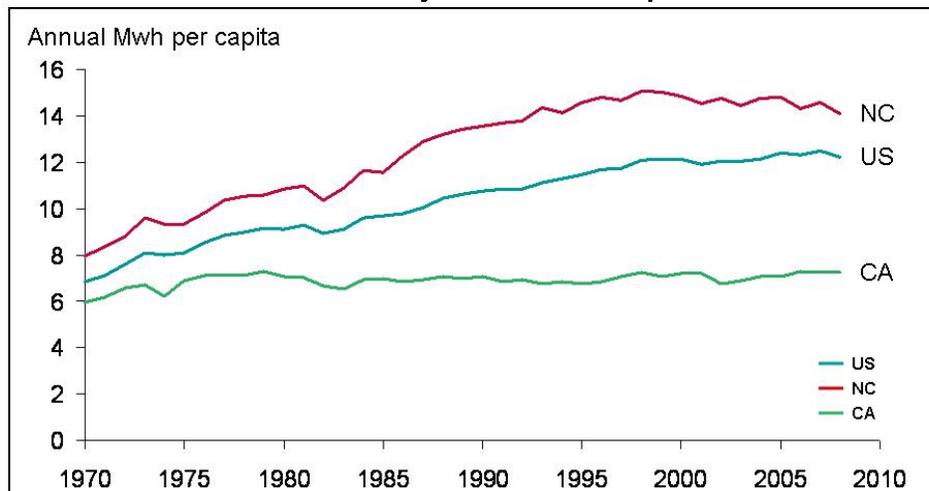


Source: Energy Information Administration, US Department of Energy

## Energy efficiency saves money

Since 1975 California's per-capita electricity consumption has remained flat, while North Carolina's has grown along with the US average.

### Electricity Sales Per Capita



Source: Energy Information Administration, US Department of Energy

# APPENDIX III: COSTS OF INACTION

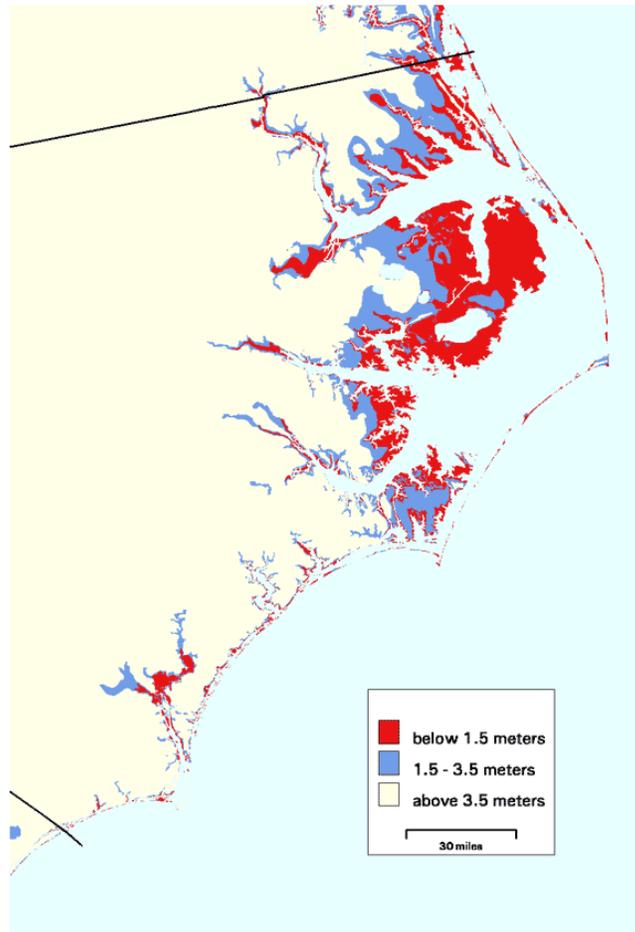
The U.S. Global Change Research Program issued a June 2009 report outlining the projected consequences of climate change, including major negative impacts on the Southeast.

Key issues facing the Southeastern United States:

- **Projected increases in air and water temperatures will cause heat-related stresses for people, plants, and animals.**  
Effects of increased heat include more heat-related illness; declines in forest growth and agricultural crop production due to the combined effects of heat stress and declining soil moisture; declines in cattle production; increased buckling of pavement and railways; and reduced oxygen levels in streams and lakes, leading to fish kills and declines in aquatic species diversity.
- **Decreased water availability is very likely to affect the region's economy as well as its natural systems.**  
Increasing temperatures and longer periods between rainfall events coupled with increased demand for water will result in decreased water availability. The 2007 water shortage in the Atlanta area created serious conflicts between three states, the U.S. Army Corps of Engineers (which operates the dam at Lake Lanier), and the U.S. Fish and Wildlife Service, which is charged with protecting endangered species. Such competition for limited water supplies is expected to continue.
- **Sea-level rise and the likely increase in hurricane intensity and associated storm surge will be among the most serious consequences of climate change.**  
Low-lying areas, including some communities, will be inundated more frequently – some permanently – by the advancing sea. Current buildings and infrastructure were not designed to withstand the intensity of the projected storm surge, which would cause catastrophic damage. If sea-level rise increases at an accelerated rate (dependent upon ice sheet response to warming) a large portion of the Southeast coastal zone could be threatened.
- **Ecological thresholds are likely to be crossed throughout the region, causing major disruptions to ecosystems and to the benefits they provide to people.**  
Ecosystems provide numerous important services that have high economic and cultural value in the Southeast. Climate change may result in abrupt changes to these ecosystems, such as hurricane-induced sudden loss of landforms that serve as storm surge barriers and homes for coastal communities.
- **Quality of life will be affected by increasing heat stress, water scarcity, severe weather events, and reduced availability of insurance for at-risk properties.**  
The Southeast “sunbelt” has attracted people, industry, and investment. The population of Florida has increased by 100 percent during the past three decades and growth rates in most other southeastern states were between 45 and 75 percent. The challenges associated with climate change will affect the quality of life for these residents and affect future population growth.

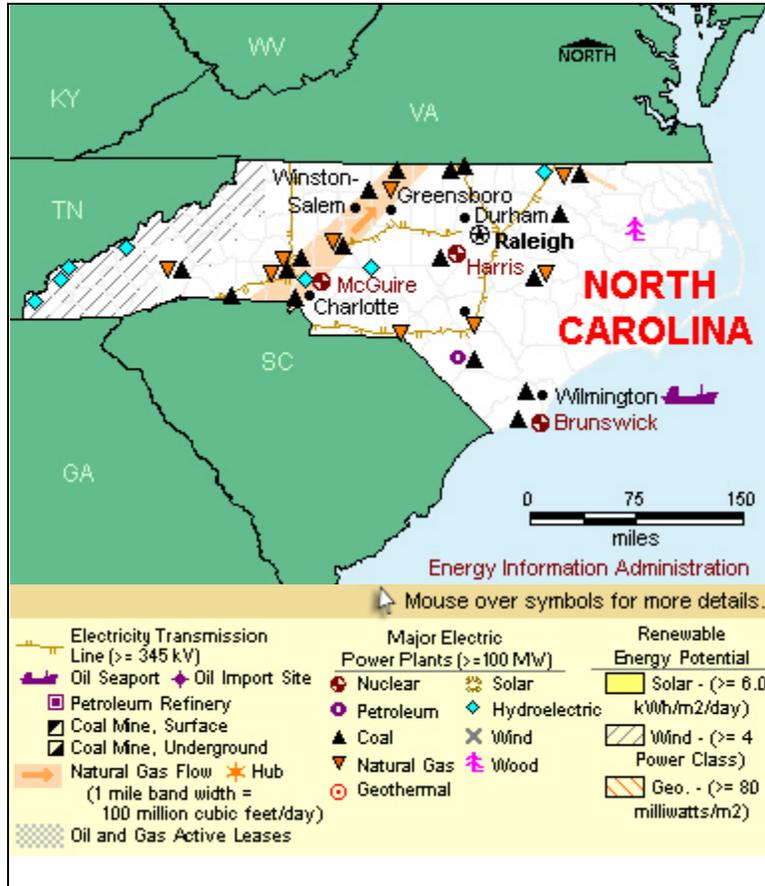
Source: <http://www.globalchange.gov/images/cir/pdf/southeast.pdf>

# Land Vulnerable to Sea Level Rise - North Carolina



Source: U.S. EPA. Clarification of the map and the methodology are available online at: <http://www.epa.gov/climatechange/effects/downloads/ncshorec.pdf>

# APPENDIX IV: NORTH CAROLINA STATE ENERGY PROFILE U.S. ENERGY INFORMATION ADMINISTRATION



## North Carolina Quick Facts

- North Carolina is one of the top nuclear power producers in the United States.
- The Dixie Pipeline, a major supplier of propane to the Southeast, terminates in Apex, North Carolina, where a terminal and above-ground storage tanks are located.
- Several rivers in western and central North Carolina provide hydroelectric power, North Carolina's only substantial energy resource.
- North Carolina's electricity consumption is among the highest in the Nation.

## Overview

### Resources and Consumption

North Carolina energy resources include several rivers in western and central North Carolina that provide substantial hydropower resources and high wind power potential off the State's Atlantic Coast. North Carolina's industrial sector leads State energy consumption by a small margin, followed closely by the transportation, commercial, and residential sectors. North Carolina is a leader in the energy-intensive chemical manufacturing industry.

### Petroleum

North Carolina acquires all of its petroleum products from other States or from abroad. The Colonial and Plantation pipelines from the Gulf Coast supply the State with petroleum products. The Dixie Pipeline, a major supplier of propane to the Southeast, terminates in Apex, North Carolina, where a terminal and aboveground storage tanks are located. Tankers from other States and other countries deliver petroleum products to the ports of Wilmington and Morehead City.

## Natural Gas

Several interstate natural gas pipelines supply North Carolina, including the Transcontinental Gas Pipeline Co. system that originates in the Gulf Coast and passes through the State on the way to major population centers in the Northeast. The industrial sector is the leading natural gas-consuming sector, although consumption from residential and commercial users is also substantial. Nearly one-fourth of North Carolina households use natural gas as their main source of energy for home heating.

## Coal, Electricity, and Renewables

North Carolina's electricity production is high. Coal-fired power plants typically account for more than three-fifths of North Carolina's electricity generation, and nuclear power typically accounts for about one-third. Hydroelectric and natural gas-fired power plants produce most of the remainder. North Carolina's coal-fired power plants burn coal shipped primarily by rail from West Virginia and Kentucky. North Carolina is one of the top nuclear power producers in the United States. The State has three nuclear power plants. Hydroelectric power plants located along several rivers in central and western North Carolina produce substantial amounts of electricity. North Carolina's electricity consumption is among the highest in the Nation. As is typical in the South, many North Carolina households (nearly one-half) use electricity as their main energy source for home heating.

## Data

### Economy

Population and Employment	North Carolina	U.S. Rank	Period
Population	9.2 million	11	2008
Civilian Labor Force	4.5 million	10	Jul-09
Per Capita Personal Income	\$33,636	37	2007

Industry	North Carolina	U.S. Rank	Period
Gross Domestic Product by State	\$400.2 billion	9	2008
Land in Farms	8.5 million acres	32	2007
Market Value of Agricultural Products Sold	\$10.3 billion	8	2007

### Prices

Petroleum	North Carolina	U.S. Avg.	Period
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<a href="#">Domestic Crude Oil First Purchase</a>	—	\$63.08/barrel	Jun-09
<a href="#">No. 2 Heating Oil, Residential</a>	—	\$2.29/gal	Jun-09
<a href="#">Regular Motor Gasoline Sold Through Retail Outlets (Excluding Taxes)</a>	\$2.08/gal	\$2.15/gal	Jun-09
<a href="#">State Tax Rate on Motor Gasoline (other taxes may apply)</a>	\$0.30/gal	\$0.22/gal	Aug-08
<a href="#">No. 2 Diesel Fuel Sold Through Retail Outlets (Excluding Taxes)</a>	—	\$2.04/gal	Jun-09
<a href="#">State Tax Rate on On-Highway Diesel (other taxes may apply)</a>	\$0.30/gal	\$0.22/gal	Aug-08
Natural Gas	North Carolina	U.S. Avg.	Period
<a href="#">Wellhead</a>	—	\$6.37/thousand cu ft	2007
<a href="#">City Gate</a>	\$5.18/thousand cu ft	\$5.63/thousand cu ft	Jun-09
<a href="#">Residential</a>	\$26.76/thousand cu ft	\$13.81/thousand cu ft	Jun-09
Coal	North Carolina	U.S. Avg.	Period
<a href="#">Average Open Market Sales Price</a>	—	\$26.20/short ton	2007
<a href="#">Delivered to Electric Power Sector</a>	\$ 3.54/million Btu	\$ 2.23 /million Btu	May-09
Electricity	North Carolina	U.S. Avg.	Period
<a href="#">Residential</a>	10.36 cents/kWh	11.86 cents/kWh	May-09
<a href="#">Commercial</a>	7.88 cents/kWh	10.12 cents/kWh	May-09
<a href="#">Industrial</a>	5.86 cents/kWh	6.89 cents/kWh	May-09
<a href="#">➔ See more Price data for all States</a>			

## Reserves & Supply

Reserves                      North Carolina                      Share of U.S.                      Period

<a href="#">Crude Oil</a>	—	—	2007
<a href="#">Dry Natural Gas</a>	—	—	2007
<a href="#">Natural Gas Liquids</a>	—	—	2007
<a href="#">Recoverable Coal at Producing Mines</a>	—	—	2007
Rotary Rigs & Wells	North Carolina	Share of U.S.	Period
Rotary Rigs in Operation	0	0.0%	2008
Crude Oil Producing Wells	0	0.0%	2008
<a href="#">Natural Gas Producing Wells</a>	—	—	2007
Production	North Carolina	Share of U.S.	Period
<a href="#">Total Energy</a>	573 trillion Btu	0.8%	2006
<a href="#">Crude Oil</a>	—	—	Apr-09
<a href="#">Natural Gas - Marketed</a>	—	—	2007
<a href="#">Coal</a>	—	—	2008
Capacity	North Carolina	Share of U.S.	Period
<a href="#">Crude Oil Refinery Capacity (as of Jan. 1)</a>	0 barrels/calendar day	0.0%	2009
<a href="#">Electric Power Industry Net Summer Capability</a>	27,644 MW	2.8%	2007
Net Electricity Generation	North Carolina	Share of U.S.	Period
<a href="#">Total Net Electricity Generation</a>	9,156 thousand MWh	2.9%	May-09

<a href="#">Petroleum-Fired</a>	24 thousand MWh	1.1%	May-09
<a href="#">Natural Gas-Fired</a>	221 thousand MWh	0.3%	May-09
<a href="#">Coal-Fired</a>	4,784 thousand MWh	3.6%	May-09
<a href="#">Nuclear</a>	3,468 thousand MWh	5.3%	May-09
<a href="#">Hydroelectric</a>	483 thousand MWh	1.7%	May-09
<a href="#">Other Renewables</a>	169 thousand MWh	1.5%	May-09
Stocks	North Carolina	Share of U.S.	Period
<a href="#">Motor Gasoline (Excludes Pipelines)</a>	2,181 thousand barrels	3.9%	Jun-09
<a href="#">Distillate Fuel Oil (Excludes Pipelines)</a>	1,637 thousand barrels	1.3%	Jun-09
<a href="#">Natural Gas in Underground Storage</a>	—	—	Jun-09
<a href="#">Petroleum Stocks at Electric Power Producers</a>	1,019 thousand barrels	2.3 %	May-09
<a href="#">Coal Stocks at Electric Power Producers</a>	6,868 thousand tons	3.5%	May-09
Production Facilities	North Carolina		
<a href="#">Major Coal Mines</a>	None		
<a href="#">Petroleum Refineries</a>	None		
<a href="#">Major Non-Nuclear Electricity Generating Plants</a>	Roxboro (Progress Energy Carolinas Inc) • Belews Creek (Duke Energy Carolinas • LLC) • Marshall (Duke Energy Carolinas • LLC) • Lincoln Combustion (Duke Energy Carolinas • LLC) • Richmond (Progress Energy Carolinas Inc)		
<a href="#">Nuclear Power Plants</a>	McGuire (Duke Energy Carolinas • LLC) • Brunswick (Progress Energy Carolinas Inc) • Harris (Progress Energy Carolinas Inc)		

➔ [See more Reserves and Supply data for all States](#)

## Distribution & Marketing

Distribution Centers	North Carolina		
Oil Seaports/Oil Import Sites	Wilmington		
<a href="#">Natural Gas Market Centers</a>	None		
Major Pipelines	North Carolina		
Crude Oil	None		
Petroleum Product	Colonial • Plantation.		
Liquefied Petroleum Gases	Dixie		
<a href="#">Interstate Natural Gas Pipelines</a>	Columbia Gas Transmission Corp. • East Tennessee Natural Gas Co. • Transcontinental Gas Pipeline Co.		
Fueling Stations	North Carolina	Share of U.S.	Period
Motor Gasoline	6,878	4.3%	2008
Liquefied Petroleum Gases	51	2.1%	2009
Compressed Natural Gas	12	1.5%	2009
Ethanol	16	0.8%	2009
Other Alternative Fuels	138	11.1%	2009
<a href="#">➔ See more Distribution and Marketing data for all States</a>			

## Consumption

per Capita	North Carolina	U.S. Rank	Period
<a href="#">Total Energy</a>	299 million Btu	39	2007
by Source	North Carolina	Share of U.S.	Period
<a href="#">Total Energy</a>	2,700 trillion Btu	2.7%	2007
<a href="#">Total Petroleum</a>	182.1 million barrels	2.4%	2007

<a href="#">Motor Gasoline</a>	107.9 million barrels	3.2%	2007
<a href="#">Distillate Fuel</a>	35.5 million barrels	2.3%	2007
<a href="#">Liquefied Petroleum Gases</a>	12.1 million barrels	1.6%	2007
<a href="#">Jet Fuel</a>	7.2 million barrels	1.2%	2007
<a href="#">Natural Gas</a>	237,364 million cu ft	1.0%	2008
<a href="#">Coal</a>	33,606 thousand short tons	3.0%	2007
by End-Use Sector	North Carolina	Share of U.S.	Period
<a href="#">Residential</a>	715,851 billion Btu	3.3%	2007
<a href="#">Commercial</a>	573,467 billion Btu	3.1%	2007
<a href="#">Industrial</a>	643,740 billion Btu	2.0%	2007
<a href="#">Transportation</a>	766,904 billion Btu	2.6%	2007
for Electricity Generation	North Carolina	Share of U.S.	Period
<a href="#">Petroleum</a>	43 thousand barrels	1.2%	May-09
<a href="#">Natural Gas</a>	1,786 million cu ft	0.3%	May-09
<a href="#">Coal</a>	1,958 thousand short tons	2.8%	May-09
for Home Heating (share of households)	North Carolina	U.S. Avg.	Period
Natural Gas	24%	51.2%	2000
Fuel Oil	12%	9.0%	2000
Electricity	49%	30.3%	2000
Liquefied Petroleum Gases	13%	6.5%	2000
Other/None	2%	1.8%	2000

➡ [See more Consumption data for all States](#)

Environment

Special Programs

North Carolina

Clean Cities Coalitions

Centralina Clean Fuels Coalition • Triangle (Raleigh-Durham/Chapel Hill).

Alternative Fuels

North Carolina

Share of U.S.

Period

[Alternative-Fueled Vehicles in Use](#)

29,335

4.2%

2007

Ethanol Plants

0

0.0%

2008

Ethanol Plant Capacity

0 million gal/year

0.0%

2008

[Ethanol Consumption](#)

1,301 thousand barrels

0.8%

2007

**Electric Power Industry Emissions**

North Carolina

Share of U.S.

Period

[Carbon Dioxide](#)

78,533,282 metric tons

3.1%

2007

[Sulfur Dioxide](#)

365,244 metric tons

4.0%

2007

[Nitrogen Oxide](#)

60,636 metric tons

1.7%

2007

➡ [See more Environment data for all States](#)

— = No data reported. \* = Number less than 0.5 rounded to zero. NA = Not available. NM = Not meaningful due to large relative standard error or excessive percentage change. W = Withheld to avoid disclosure of individual company data.