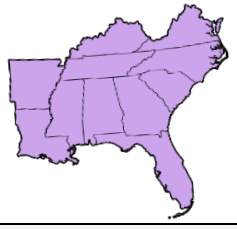
Southeast

Climate Change and the U.S. Energy Sector: Regional vulnerabilities and resilience solutions



Summary in Brief

The Southeast region, characterized by hot and humid summers and mild winters, is predominantly powered by coal, natural gas, and nuclear power plants. The region contains extensive oil and gas infrastructure that is essential to the nation's energy supply. Primarily located near the Gulf Coast, this infrastructure includes oil refineries, natural gas processing plants, offshore platforms, and energy transport infrastructure. Major climate change impacts projected to increasingly threaten the region's energy infrastructure include the following:

Hurricanes

Hurricane storm intensity and rainfall are projected to increase, and the most intense hurricanes (Category 4 and 5) are projected to occur more frequently. Coastal flooding is likely to worsen as sea level rise and local land subsidence enhance hurricane-associated storm surge. Critical oil and gas wells, refineries, and ports located along the Gulf Coast, as well as coastal power plants, transmission lines, and transportation infrastructure, are at risk of damage from intense hurricanes and sea level rise-enhanced storm surges. Heavy rainfall and high winds may damage power lines, power plants, and other energy assets. Transportation infrastructure such as ports, major roads, and rail lines along the Gulf and Atlantic coastlines are vulnerable to storm surges enhanced by rising sea levels.

Sea level rise

Temperatures

Average and extreme temperatures are projected to increase, and heat waves are likely to become more severe, occur more often, and last longer. Electricity demand for cooling rises with increasing air and water temperatures, yet higher temperatures reduce the capacity of thermoelectric power plants and transmission lines.

QUICK FACTS

Southeast States:	Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia
Population (2013)	79,000,000 (25% of U.S.)
Area (square miles)	503,000 (14% of U.S.)
Energy Expenditures	$343 billion

ENERGY SUPPLY & DEMAND		Annual Production	Annual Consumption	*% for electric power*
Electric power	*TWh*	1,170	1,120	*n/a*
Petroleum	*million barrels*	116	1,680	*2%*
Coal	*million tons*	140	208	*94%*
Natural gas	*Bcf*	4,640	6,410	*49%*

ELECTRIC POWER	Annual Production (TWh)	*% of Total Production*	Capacity (GW)	Power plants >1 MW*
Natural gas	432	*37%*	155	325
Coal	399	*34%*	103	134
Nuclear	275	*24%*	39	22
Hydroelectric	30	*3%*	23	214
Wind	<1	*<1%*	<1	2
Biomass	24	*2%*	6	166
Solar	<1	*<1%*	<1	51

CRITICAL INFRASTRUCTURE

Petroleum		**Electric Power**	
Wells (>1 boe/d):	12,400	Power plants (> 1 MW):	1,024
Refineries:	31	Interstate transmission lines:	32
Liquids pipelines:	18	**Coal**	
Ports (>200 tons/yr):	27	Mines:	516
Natural Gas		**Waterways**	
Wells:	62,300	Coal and petroleum routes:	56
Interstate pipelines:	60	**Railroads**	
Market hubs:	5	Miles of freight track:	32,800

Note: Table presents 2012 data except number of oil wells, which is 2009 data.
*Some plants use multiple fuels, and individual generating units may be <1 MW.
Sources: AAR 2014, EIA 2011, EIA 2013a, EIA 2013b, EIA 2013c, EIA 2014a, EIA 2014c, EIA 2014d, EIA 2014e, EIA 2014f, EIA 2014g, EIA 2014h, US Census Bureau 2014, USACE 2014

Examples of important energy sector vulnerabilities and climate resilience solutions in the Southeast

Subsector	Vulnerability	Magnitude	Illustrative Resilience Solutions
Oil and Gas Exploration and Production	Increased exposure to damage and disruption from an increasing frequency of powerful hurricanes combined with sea level rise	Increasing number of Category 4 and 5 hurricanes by the end of the century	Elevating and hardening infrastructure, improving emergency preparedness protocols, restoring coastal habitats
Fuel Transport	Increased exposure to damage and disruption from sea level rise-enhanced storm surge during intense hurricanes	Increasing sea level rise by 0.06–0.48 inches per year from 1992–2050, depending on the location and magnitude of ice sheet melt	Reinforcing shorelines of critical waterways; dredging to maintain shipping access; elevating or rerouting critical rail, road, or pipeline arteries
Thermoelectric Power Generation; Electric Grid; Electricity Demand	Higher temperatures resulting in increased average and peak electricity demand and reduced generation and transmission capacity	Increasing air temperatures by 2.5°F –8.5°F and increasing numbers of cooling degree days (CDDs) by 450–1,150 degree days by mid-century	Increasing energy efficiency, demand-response programs, installing new generation and transmission capacity