Southern Great Plains

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

Summary in Brief

The Southern Great Plains region, comprising Kansas, Oklahoma, and Texas, contains oil and gas infrastructure critical to the nation's energy supply, including numerous offshore platforms, onshore oil and gas wells, oil refineries, natural gas processing plants, pipelines, and shipping terminals. Many of these assets are located near the Texas Gulf Coast. Key climate change impacts projected for the region include the following:

Hurricanes

Sea level rise

The intensity of Atlantic hurricanes is projected to increase, and the most intense hurricanes (Category 4 and 5) are projected to occur more frequently. Associated storm surge impacts may be enhanced by higher sea levels. Sea level rise is expected to be greater in some areas because of local land subsidence. Critical oil and gas infrastructure, power plants, and transport infrastructure such as bridges and pipelines located along the Texas Gulf Coast may be at risk of damage from more powerful hurricanes and storm surges amplified by sea level rise. High winds from more intense hurricanes may increase risk of damage to power lines.

Temperatures

Average temperatures are projected to increase, and extremely hot days are likely to occur more often. Heat waves are projected to become more severe and last longer. By mid-century, the average number of cooling degree days (CDDs) may increase by 600–1,000 per year. Increasing air and water temperatures in the Southern Great Plains will reduce the efficiency and available capacity of power plants and transmission lines while also increasing average and peak electricity demand for electricity for cooling in the summer.

Droughts

Precipitation is projected to decrease across most of the region, with the largest declines occurring in the summer. Dry spells may become longer. These changes may lead to more frequent droughts. Combined with increasing demand and competition for water from other sectors, climate change may further limit the availability of water for energy. This includes withdrawals for critical operations such as power generation, oil refining, and the region's growing unconventional oil and gas production.

QUICK FACTS

Southern Great Plains States:	Kansas, Oklahoma, Texas
Population (2013)	33,000,000 (11% of U.S.)
Area (square miles)	412,000 (12% of U.S.)
Energy expenditures	$190 billion

ENERGY SUPPLY & DEMAND		Annual Production	Annual Consumption	*% for electric power*
Electric power	*TWh*	552	465	*n/a*
Petroleum	*MMbbls*	861	1,460	*<1%*
Coal	*million tons*	45	135	*99%*
Natural gas	*Bcf*	9,800	4,800	*39%*

ELECTRIC POWER	Annual Production (TWh)	*% of Total Production*	Capacity (GW)	Power plants >1 MW*
Natural gas	256	*46%*	95	257
Coal	195	*35%*	36	35
Nuclear	47	*8%*	6	3
Hydroelectric	2	*<1%*	2	36
Wind	46	*8%*	18	146
Biomass	2	*<1%*	<1	30
Solar	<1	*<1%*	<1	6

CRITICAL INFRASTRUCTURE

Petroleum		**Electric Power**	
Wells (>1 boe/d):	133,000	Power plants (> 1 MW):	555
Refineries:	36	Interstate transmission lines:	24
Liquids pipelines:	32	**Coal**	
Ports (>200 tons/yr):	13	Mines:	20
Natural Gas		**Waterways**	
Wells:	161,000	Coal and petroleum routes:	11
Interstate pipelines:	41	**Railroads**	
Market hubs:	8	Miles of freight track:	18,600

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.

Examples of important energy sector vulnerabilities and climate resilience solutions in the Southern Great Plains

Subsector	Vulnerability	Magnitude	Illustrative Resilience Solutions
Oil and Gas Exploration and Production	Heightened exposure to damage and disruption from an increasing intensity and frequency of the most intense hurricanes	Increasing numbers of Category 4 and 5 hurricanes by the end of the century	Infrastructure hardening and elevation, improved operations protocols, restoration of coastal habitats
Electricity Demand	Increased demand for cooling energy in the summer, coinciding with reduced available capacity of power generation and transmission	Increasing CDDs by as much as 1,000 degree days by mid-century compared to historical averages	Energy efficiency, demand-side management programs and policies, new peak load capacity
Thermoelectric Power Generation; Electric Grid	Reduced available generation capacity from higher temperatures and decreased water availability, and reduced capacity of electric lines from higher temperatures	Increasing air temperatures by 3.5°F–8.5°F and decreasing summer rainfall by 10%–30% by the end of the century	Alternative water sources and water-efficient power generation technologies, new generation and transmission capacity