

Northeast

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



Summary in Brief

The Northeast consists of a number of large and densely populated urban and industrial areas, as well as wide-ranging rural areas and deciduous forestland. The climate is characterized by cold winters and warm, humid summers. The region relies primarily on thermoelectric power, including natural gas-fired, nuclear, and coal-fired plants. The Northeast produces large amounts of coal, mainly in West Virginia and Pennsylvania, and has a significant number of natural gas wells. Major climate change impacts projected to increasingly threaten the region's energy infrastructure include the following:



Temperatures

Temperatures are projected to increase, and heat waves are projected to occur more frequently and last longer. Warmer temperatures and longer, more frequent, and more severe heat waves are expected to increase both average and peak demand for cooling energy, while causing available generation and transmission capacity to decline.



Hurricanes

Atlantic hurricane intensity is projected to increase, and the most intense hurricanes (Category 4 and 5) are projected to occur more frequently. Combined with projected sea-level rise, hurricane-associated storm surge is likely to cause greater coastal damage. Coastal power plants, electrical grid components, and fuel transport infrastructure are at risk of damage from more intense hurricanes and sea level rise-enhanced storm surges.



Sea level rise

Heavy precipitation events are projected to occur more frequently, with the number of days with more than one inch of rain increasing 12%–30% by mid-century. Inland flooding from increasingly frequent and intense heavy precipitation events heightens the risk of damage and disruption to roads, railroads, power lines, pipelines, and other low-lying infrastructure.



Downpours

QUICK FACTS

Northeast States: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia

Population (2013) 65,000,000 (21% of U.S.)
Area (square miles) 198,000 (6% of U.S.)
Energy expenditures \$257 billion

ENERGY SUPPLY & DEMAND		Annual Production	Annual Consumption	% for electric power
Electric power	TWh	665	599	n/a
Petroleum	MMbbls	7	1,050	<1%
Coal	million tons	178	95	89%
Natural gas	Bcf	2,820	4,270	39%

ELECTRIC POWER	Annual Production (TWh)	% of Total Production	Capacity (GW)	Power plants >1 MW*
Natural gas	215	32%	69	280
Coal	186	28%	48	86
Nuclear	199	30%	26	17
Hydroelectric	37	6%	8	369
Wind	8	1%	4	84
Biomass	13	2%	3	163
Solar	<1	<1%	<1	129

CRITICAL INFRASTRUCTURE			
Petroleum		Electric Power	
Wells (>1 boe/d):	2,360	Power plants (> 1 MW):	1,270
Refineries:	10	Interstate transmission lines:	37
Liquids pipelines:	12	Coal	
Ports (>200 tons/yr):	20	Mines:	520
Natural Gas		Waterways	
Wells:	113,000	Coal and petroleum routes:	25
Interstate pipelines:	25	Railroads	
Market hubs:	2	Miles of freight track:	16,200

Note: Table presents 2012 data except for the 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 Northeast

Subsector	Vulnerability	Magnitude	Illustrative Resilience Solutions
Energy Demand and Thermoelectric Power Generation	Higher temperatures reduce system efficiency and increase total and peak electricity demand	Air temperature increases of 3.5°F–6.5°F and cooling degree day increases of 100–700 projected by mid-century	Capacity additions, demand-side load management, energy efficiency
Electric Grid	Increased intensity of storms and heavy rainfall, causing wind damage and flooding to power lines and low-lying substations	Recent hurricanes resulting in widespread regional power outages to more than 8 million customers	Physical hardening, submersible equipment, redundant transmission, smart grid and distributed generation, and vegetation management
Fuel Transport and Storage	Increased exposure to damage and disruption from flooding during heavy precipitation events and sea level rise-enhanced storm surge during more intense hurricanes	Sea level rise expected to exceed global average of 1–4 feet by 2100 and coastal flooding impacts from higher frequency of intense hurricanes	Reinforcing shorelines of critical waterways; dredging to maintain shipping access; elevating or rerouting critical rail, road, or pipeline arteries