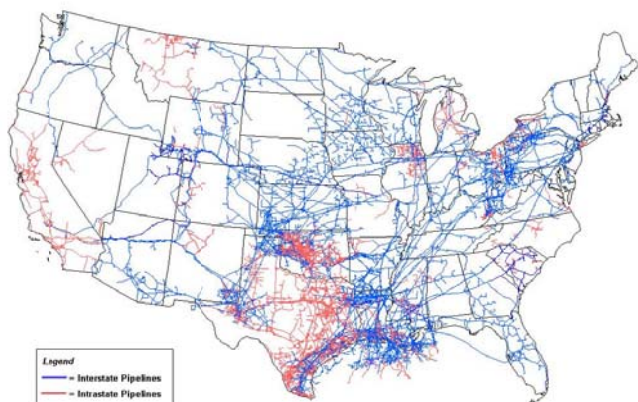


Transportation of natural gas and petroleum products requires millions of miles of pipelines to move natural gas and oil from wellsites to millions of customers and homes across the United States.

## Pipeline Types

There are three types of natural gas and petroleum product pipelines – gathering, transmission and distribution (sales) lines.

1. **Gathering lines** are used to transport natural gas and crude oil from wells to processing facilities or larger transmission lines. These lines are typically short with small diameters.



Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System

*Pipeline network in the U.S.*

2. **Transmission lines** transport natural gas, oil or refined products from processing facilities to cities, countries and even other continents. Including onshore and offshore lines, there are more than 300,000 miles of transmission pipelines in the U.S.
3. **Distribution lines** transfer the processed products to homes and businesses.

Along these lines are compressor stations, which compress natural gas and increase the pressure to ensure continuous forward movement. There are currently more than 1,400 compressor stations in the U.S. that are safely and efficiently moving large volumes of natural gas and petroleum.

## KEY POINTS

- Buried pipelines are the safest, most efficient way to transport natural gas from the wellhead to market (homes and businesses).
- Pipelines meet or exceed federal, state and local regulatory requirements.

As development of natural gas and oil broadens into new areas, additional pipelines are needed. For example, in the Marcellus Shale in New York, Pennsylvania and West Virginia the total natural gas pipeline capacity is only a fraction of what will be needed in the future. To provide clean, affordable, abundant, American natural gas, several new pipelines must be constructed to transport millions of cubic feet of natural gas per day to customers.

## Pipeline Right-of Way

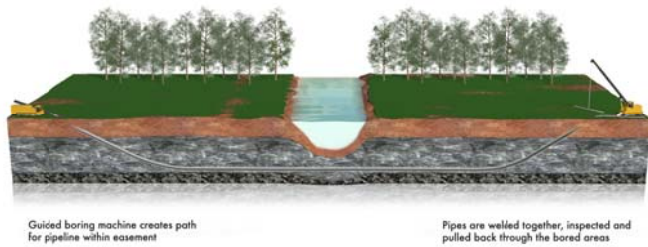
A right-of-way (ROW), or easement, is a written contractual agreement between the pipeline company and property owners granting access to private land. The ROW can range from 25 to 150 feet wide and allows enough room for unobstructed aerial surveillance, inspection, maintenance and testing. Permanent pipeline markers are also strategically placed along roads, railways and other intervals to identify the pipeline's approximate location.



### Routing and Construction

Pipeline ROWs are designed with consideration for soil conditions, geographic or population characteristics and the type of product transported. Pipe sections are fabricated to meet government and industry safety standards for pipe size and strength, wall thickness and coating material. In most cases, pipelines are located underground, but certain circumstances, such as the Alaska pipeline, warrant aboveground installation. Directional boring and trenching are the two primary methods used to install pipeline.

Directional boring is used when there is a need to cross underneath a sensitive area such as a river or road. This technique results in minimal surface impact.



Minimum 30' below the riverbed

Trenching is used in areas where construction space is less restrictive. Trenches are constructed within the ROW and the top soil is stockpiled separately to be used to secure the pipeline and complete site restoration.

Federal regulations require transmission lines to be buried at a safe depth and clearance from other underground utilities.

In a rural setting, a pipeline might run in a straight line. However, in an urban setting this may not be possible as it may need to be routed to avoid structures and areas of dense population.



After the pipeline is installed and topsoil is restored, the area is reseeded to return the site to its original condition.

### Compressor Stations

Compressor stations are important for the movement of natural gas to market. Chesapeake's compressor stations are



monitored 24 hours a day, seven days a week through the use of remote equipment and routinely inspected

to ensure safe operations.

### Regulation and Oversight

Pipeline regulation agencies include:

- **Federal and state permitting agencies**, which are responsible for protecting wetlands, wildlife habitat, ecosystems and drinking water resources
- **Federal Energy Regulatory Commission (FERC)**, which oversees the rates and services offered by interstate pipeline companies, as well as the certification and permitting of pipeline construction
- **Occupational Safety and Health Administration (OSHA)**, which regulates and oversees worker safety
- **Office of Pipeline Safety (OPS)**, which inspects safety aspects of pipeline operations in cooperation with the state
- **State statutes** which regulate pipeline terminals and tank farms
- **U.S. Department of Transportation Pipeline and Hazardous Material Safety Administration (PHMSA)**, which is responsible for regulating the safe design, construction, testing, operation, maintenance and emergency response of natural gas and oil pipeline facilities

### Pipeline Safety

Pipeline safety begins as soon as construction starts and pipe sections are welded together. All welding procedures are controlled to strict specifications. Each welder on a project is required to pass qualification tests and each weld procedure must be in accordance with federally adopted welding standards. In addition, a second

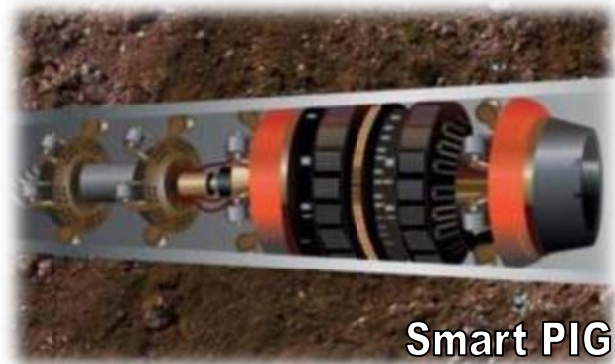
**Did you know?**

To move the volumes of natural gas and petroleum that are currently transported by pipeline, it would take a constant line of 750 tanker trucks loading and rolling every two minutes, 24 hours a day, seven days a week.

level of quality assurance guarantees the quality of the ongoing welding process by using X-rays to see that the completed welds meet the federally prescribed standards. A third precautionary measure involves adding a protective coating to the welds to prevent corrosion.

Once the pipeline is assembled, it is then tested with pressurized water based on the pipeline's intended operating pressure.

Constant monitoring and maintenance ensure that the pipeline's integrity is sound. A chemical odorant is added to natural gas in distribution pipelines (lines that go to homes or businesses) so that in the rare event of a gas leak it can be easily detected. The gathering and transmission lines have monitors that signal the rise or fall of pressure and can, through the use of manually or remotely operated valves, be isolated to a specific section until repairs can be made. The industry also uses a device called a smart PIG to travel sections of



the pipeline to detect and locate any pipeline anomalies.

Chesapeake also participates in 811, the national one-call system to ensure lines are properly located and marked prior to construction near our pipelines.

**Conclusion**

The environmental and safety records of natural gas and oil pipelines are excellent. Pipeline systems are recognized as the safest and most economical way of distributing the vast quantities of resources from producing fields to refineries and consumers. Valve sites provide the ability to isolate pipeline sections in the event of a leak or breach. With the ability to remotely monitor

and control, pipelines can be shut down in a matter of moments if an event occurs and a specialized team can be on-site soon after.

Natural gas and oil pipelines are the only viable way to transport significant volumes over long distances on land. Without pipelines, our streets and highways would be overwhelmed with trucks trying to keep up with the nation's demand for petroleum products.

**Information Sources**

- [Geology.com](http://Geology.com)
- [National Transportation Safety Board](http://NationalTransportationSafetyBoard.gov)
- [Pipeline101.com](http://Pipeline101.com)
- [U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration](http://U.S.DepartmentofTransportation.gov)

**About Chesapeake**

Chesapeake Energy Corporation is the second-largest producer of natural gas, a Top 15 producer of oil and natural gas liquids and the most active driller of new wells in the U.S. Headquartered in Oklahoma City, the company's operations are focused on discovering and developing unconventional natural gas and oil fields onshore in the U.S. Chesapeake owns leading positions in the Barnett, Haynesville, Bossier and Marcellus natural gas shale plays and in the Granite Wash, Cleveland, Tonkawa, Mississippi Lime, Bone Spring, Avalon, Wolfcamp, Wolfberry, Eagle Ford, Niobrara, Three Forks/Bakken and Utica unconventional liquids plays. The company has also vertically integrated its operations and owns substantial midstream, compression, drilling, trucking, pressure pumping and other oilfield service assets. For more information on Chesapeake environment initiatives, visit the environment section of [CHK.com](http://CHK.com), [HydraulicFracturing.com](http://HydraulicFracturing.com), [NaturalGasAirEmissions.com](http://NaturalGasAirEmissions.com), [NaturalGasWaterUsage.com](http://NaturalGasWaterUsage.com), [AskChesapeake.com](http://AskChesapeake.com) or [FracFocus.com](http://FracFocus.com).