

Shale Gas Glossary

Acquifer – A single underground geological formation, or group of formations, containing water.

Antrim Shale – A shale deposit located in the northern Michigan basin that is a Devonian age rock formation lying at a relatively shallow depth of 1,000 feet. Gas has been produced from this formation for several decades primarily via vertical, rather than horizontal, wells. The Energy Information Administration (EIA) estimates the technically recoverable Antrim shale resource at 20 trillion cubic feet (tcf).

Appalachian Basin – The geological formations that roughly follow the Appalachian Mountain range and contain potentially exploitable shale gas resources. The U.S. Department of Energy (DOE) associates the Appalachian Basin with the Marcellus Shale, the Devonian Shale and the Utica Shale.

Barnett Shale – A newly developed major play within the Fort Worth Basin in Northeast Texas. Wells are in the 6,000-to-8,000 foot depth range and the EIA estimated technically recoverable resource is 43 tcf.

Borehole – The hole or shaft in the earth made by a well drill; also, the uncased drill hole from the surface to the bottom of the well.

Caney Shale – Located in Arkoma Basin of Northeastern Oklahoma; has only recently been developed following the success of the Barnett Shale in Texas.

Casing – Pipe cemented in an oil or gas well to seal off formation fluids and to keep the borehole from caving in. Smaller diameter “strings” of casing are cemented inside larger diameter strings as a well is deepened.

Clean Water Act – The federal law that regulates discharges into waterways.

Coal Bed Methane (CBM) – A form of natural gas extracted from coal beds. Along with tight and shale gas, CBM is considered an unconventional natural gas resource.

Conasauga Shale – Cambrian Age shale deposits located in north central Alabama currently being evaluated for development.

Conventional Natural Gas Reservoir – A geological formation in which the natural gas is in interconnected pore spaces, much like a kitchen sponge, that allows easier flow to a well.

Department of Energy – The federal agency whose Office of Fossil Energy (FE) and National Energy Technology Laboratory (NETL) have played a significant role in advancing research and development related to hydraulic fracturing, horizontal drilling, and improved environmental practices.

Devonian Shale – The general term used to describe the thick sequence of shales in the Appalachian Basin that has been produced for more than a century. Development was greatest in the 1930s-through-1980s, using vertical wells and explosive fracturing. However, any shale deposited during the Devonian geologic period (360 million to 406 million years ago) is considered Devonian shale.

Drilling Rig – Usually a large-standing structure employing a drill that creates holes or shafts in the ground for purposes of accessing and producing natural gas or oil from subsurface deposits.

Eagle Ford Shale – A newly discovered (2009) shale play located in several counties in south Texas. The average gross thickness of the shale is 350 feet and it produces from depths varying from 4,000 to 14,000 feet. Eagle Ford is the most active shale play in the world, with about 250 rigs operating at any single time and the technically recoverable resource is estimated by EIA to be 21 tcf.

Eastern Gas Shales Project – A program initiated by the U.S. Department of Energy in the late-1970s to evaluate the gas potential of – and to enhance gas production from – the extensive Devonian and Mississippian black shales located in the Appalachian, Illinois and Michigan basins of the eastern United States. The program not only identified and classified shales throughout the three basins, but also focused on developing and implementing new drilling, stimulation and recovery technologies to increase production potential. Between 1978 and 1992, DOE spent about \$137 million on the program, which helped develop and demonstrate directional and horizontal drilling technology.

Fayetteville Shale – Newly developed shale deposit located in the Arkoma Basin of Arkansas, lying at a depth of 1,500-to-6,500 feet. Previously produced from vertical wells but all current wells are horizontal. Technically recoverable resource is estimated by EIA to be 32 tcf.

Flaring – The controlled burning of natural gas that can't be processed for sale or used because of technical or economic reasons.

Flowback – Water used as a pressurized fluid during hydraulic fracturing that returns to the surface via the well. This occurs after the fracturing procedure is completed and pressure is released.

Floyd Shale – A shale deposit from the Mississippian geologic age located in the resource-rich Black Warrior Basin of Mississippi and Alabama.

Fossil Energy – Energy derived from crude oil, natural gas or coal. Shale gas is a form of fossil energy.

Fracturing Fluid – The primarily water-based fluid used to fracture shale. It is basically composed of 99 percent water, with the remainder consisting of sand and various chemical additives. Fracturing fluid is pumped into wells at very high pressure to break up and hold open underground rock formations, which in turn releases natural gas.

FracFocus – A joint effort by the Ground Water Protection Council (GWPC) and the Interstate Oil and Gas Compact Commission (IOGCC) that is an online registry for companies to publicly disclose the chemicals used in their hydraulic fracturing operations. As of November 2012, more than 30,000 well sites and 200 companies were registered on the site (<http://fracfocus.org/>).

Fugitive Emissions – According to a study by DOE’s Argonne National Laboratory, a primary air quality concern from natural gas production (including shale gas) is leaking and venting throughout the supply chain (see Hydraulic Fracturing and Shale Gas Production: Technology, Impacts, and Policy, September 10, 2012, page 5). These fugitive emissions can potentially result in releases of methane, the primary constituent of natural gas and a potent greenhouse gas (GHG). In addition, fugitive emissions of natural gas can release volatile organic compounds (VOCs) and hazardous air pollutants (HAPs), according to the study.

Geological Formation – A body of earth material with distinctive and characteristic properties and a degree of homogeneity in its physical properties.

Gothic Shale – A newly exploited shale formation located in the Paradox Basin of Colorado. Only a few wells have been drilled, one testing to 5,700 mcf (million cubic feet) per day.

Groundwater – The supply of usually fresh water found beneath the surface usually in aquifers, which are a body of permeable rock containing water and supplying wells and springs with drinking water.

Haynesville Shale – Along with the Marcellus and Barnett, this is one of the major shale plays. Located in Northwestern Louisiana, Haynesville is a Jurassic Age formation where vertical wells were drilled as far back as 1905; but it was not considered a major natural gas source until the advent of directional drilling.

Horizontal Drilling – The process of drilling the deeper portion of a well horizontally to enable access to more of the target formation. Horizontal drilling can be oriented in a direction that maximizes the number of natural fractures present in the shale, which provide pathways for natural gas to escape once the hydraulic fracturing operation takes place. The more generic term, “directional drilling,” refers to any non-vertical well.

Hydraulic Fracturing – The use of water, sand and chemical additives pumped under high pressure to fracture subsurface non-porous rock formations such as shale to improve the flow of natural gas into the well. Hydraulic fracturing is a mature technology that has been used for 60 years and today accounts for 95 percent of all new wells drilled.

Marcellus Shale – A large play that underlies most of the U.S. Northeast, the Marcellus is a Devonian-age shale that is estimated by the Energy Information Administration to contain at least 410 tcf of unproved, technically recoverable gas. Most of the play is at the 5,000-to-8,000 foot level below the surface and was long considered too expensive to access until advances in drilling and fracturing technology.

Natural gas – A naturally occurring mixture of hydrocarbon and non-hydrocarbon gases beneath the surface, the principal component of which (50-to-90 percent) is methane.

New Albany Shale – This Devonian to Mississippian age shale deposit is located in the Illinois Basin and has been a producer of natural gas for over 100 years. Most wells are shallow, between 120 and 2,100 feet; new drilling and completion technologies and competitive prices have resulted in energy companies revisiting old leases and drilling new wells. Estimated by EIA to contain 11 tcf of technically recoverable resources.

On-Site Water Treatment – A practice employed by many shale gas producers to facilitate reuse of flowback fluids. In this instance, mobile and fixed treatment units are employed using processes such as evaporation, distillation, oxidation, and membrane filtration for recycling and reuse. On-site treatment technologies may be capable of returning 70-80 percent of the initial water to potable water standards, making it immediately available for reuse.

Pearsall Shale – Located in the Maverick Basin of southwestern Texas. Located about 2,500 feet below the Eagle Ford Shale and is approximately 500-600 feet in thickness.

Permeability – The measure of the ability of a material, such as rock, to allow fluids to pass through it.

Produced Water – Naturally occurring water found in shale formations; it generally flows to the surface during the entire lifespan of a well, often along with natural gas. Produced water and flowback from natural gas extraction may be reused in hydraulic fracturing operations; disposed of through underground injection (see definition); discharged to surface waters as long as it doesn't degrade water quality standards; or transferred to a treatment facility if necessary, processed and discharged into a receiving water body in compliance with effluent limits.

Proppant – A granular substance, often sand, that is mixed with and carried by fracturing fluid pumped into a shale well. Its purpose is to keep cracks and fractures that occur during the hydraulic fracturing process open so trapped natural gas can escape.

Reclamation – The clean up or restoring a well site to its pre-existing condition after drilling operations cease. Reclamation activities, which are governed by state, federal and local laws and regulations, can include soil replacement, compacting and re-seeding of natural vegetation.

Royalty – A payment received by a lessor or property owner from an oil, gas or minerals-producing company, based on the production of a well or other extraction process and market prices.

Safe Water Drinking Act – A federal law whose provisions also apply to shale production activities related to wastewater disposal through underground injection and discharge to surface waters.

Shale – A fine-grained sedimentary rock composed mostly of consolidated clay or mud. Some large shale gas formations were formed more than 300 million years ago during the Devonian period of Earth’s history, where conditions were particularly favorable for the preservation of organic material within the sediment. Methane that remained locked in the shale layers is the source of today’s shale gas.

Shale Gas – Natural gas produced from shale formations. Shale gas is widely distributed in the United States and is currently being produced in 16 states. Although data are being constantly revised, the Energy Information Administration currently estimates the recoverable U.S. shale gas resource is 482 trillion cubic feet; domestic shale gas production has increased 12-fold over the past decade and led to a new abundance of natural gas supply in the United States.

Shale Gas Play – A set of discovered, undiscovered or possible natural gas accumulations that exhibit similar geological characteristics. Shale plays are located within basins, which are large-scale geologic depressions, often hundreds of miles across, which also may contain other oil and natural gas resources. For a map detailing the location of major shale gas plays in the lower 48 states, see: http://www.eia.gov/oil_gas/rpd/shale_gas.pdf.

Surface Water – Water that is open to the atmosphere, such as rivers, lakes, ponds, reservoirs, streams, impoundments, seas and estuaries.

Tcf – Trillion cubic feet.



NATURAL GAS FROM SHALE: Questions and Answers

Tight Gas – Natural gas found in low-permeability sandstones and carbonate reservoirs. The rock layers that hold the gas are very dense, preventing easy flow.

Unconventional Natural Gas Reservoir – Coal bed methane, shale or tight gas, where the natural gas does not flow naturally to the well, but instead requires some form of extensive stimulation to generate economic flow rates.

Underground Injection Well – A steel and concrete-encased shaft into which hazardous waste is deposited by force and under pressure. The Environmental Protection Agency's (EPA's) Underground Injection Control Program (UIC) is responsible for regulating the construction, operation, permitting and closure of injection wells that place fluids underground for storage or disposal.

Utica Shale – An Ordovician age natural gas-containing rock formation located below the Marcellus Shale. The formation (also called the Utica-Point Pleasant in some areas) extends from eastern Ohio through much of Pennsylvania to western New York. It is currently being actively developed in eastern Ohio.
