

# Kentucky Geological Survey

**Coalbed Methane Resource:** Coalbed methane is a gas that occurs in association with coal. During the coalification process, large amounts of gas (mainly methane) are produced—more gas than the coal can hold. Some of this gas escapes into other rocks or into the atmosphere, but some of it remains in the coal. In many areas, coal is an excellent reservoir for gas (Fig. 1). Generally, the gas content of coal increases with depth (below drainage) and rank of the coal.

Permeability in coals is created by naturally occurring fractures referred to as cleats. Coal is commonly an aquifer because the cleats are generally saturated with water. Methane is locked in coal by the water in cleats and is usually undetected by conventional gas-well drilling technology. To release gas from the coal beds, large quantities of water must be pumped out. Environmentally acceptable methods to dispose of this water must be determined for each specific operation, because conditions will vary at different sites.

Coalbed methane is produced in association with mining in many states, but little has been done to date in Kentucky to explore this energy option. The potential for producing coalbed methane exists in some areas of the Eastern and Western Kentucky Coal Fields. Analyses of drilling records suggest that coalbed methane was produced in the Eastern Kentucky Coal Field from wells drilled in the 1950's that were mistakenly identified as conventional gas wells. Recently, a gas company working in cooperation with several coal companies produced coalbed methane from wells in eastern Kentucky.

In the Eastern Kentucky Coal Field, past coal mining has been in beds that were situated largely above drainage (at a higher elevation than major streams in the area). Most of the gas in these coals has escaped to the atmosphere over periods of thousands of years as the water content of the coals decreased. Accordingly, most of the drift mines in coals above valley bottoms have not had a persistent methane problem. However, there have been some mine-gas problems with the Lower and Upper Elkhorn coals in eastern Kentucky and with several seams in shaft mines in western Kentucky where the coals are generally situated in valley bottoms or below drainage.

As the above-drainage coal resources of Kentucky are depleted through time, future coal production may come from mines situated below drainage, and these mines may have methane-control problems. One possible solution to methane control is commercial production of the gas before coal mining takes place. Capturing methane as a marketable resource has the potential to benefit the coal industry in Kentucky. This gas could be accumulated locally and used to generate power or be transported by pipeline to serve other markets, depending upon the quantity and quality of the gas.

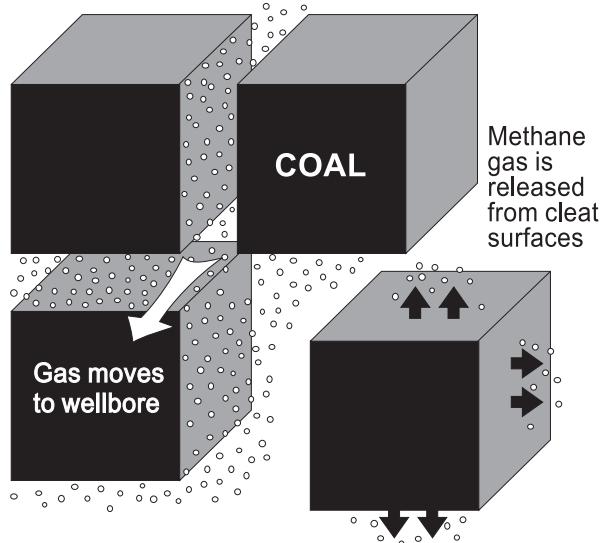


Figure 1.

**Production Technology:** Many ways exist to develop coalbed methane gas (Fig. 2). Production technologies include conventional drilling, drilling before mining, and horizontal drilling. One method is to simply drill a well to the coal seam, fracture the coal, pump out the water, and connect the well to a gas pipeline. Some success has been achieved when the drilling is coordinated with mining of the coal. Wells are drilled down to the coal bed (or just above it) where some gas is produced upon drilling. The coal is then mined out and the roof collapses, creating a large void of collapsed rock (called “gob”) that may intersect coal beds above the main bed. Gas accumulates in the gob and is pumped out by the existing gas wells. Another variation of this post-mining gas extraction is the drilling of gas wells into abandoned underground mines. Many of these old underground mines fill with methane and other gases that blend with the air already in the mine. This gas can be produced, but is generally of lower quality because it is mixed with other gases.

**Future Prospects:** The potential of coalbed methane from the coals in both the Appalachian and Illinois Basins of Kentucky is poorly known, but preliminary studies show that this resource could be economic in both eastern and western Kentucky. The Kentucky Geological Survey has expertise on both natural gas and coal resources that would be pertinent for future development.

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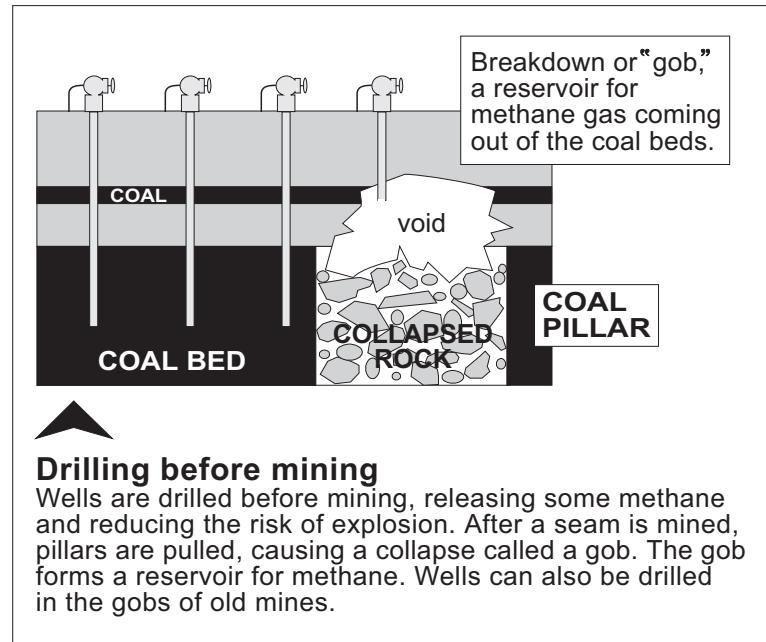
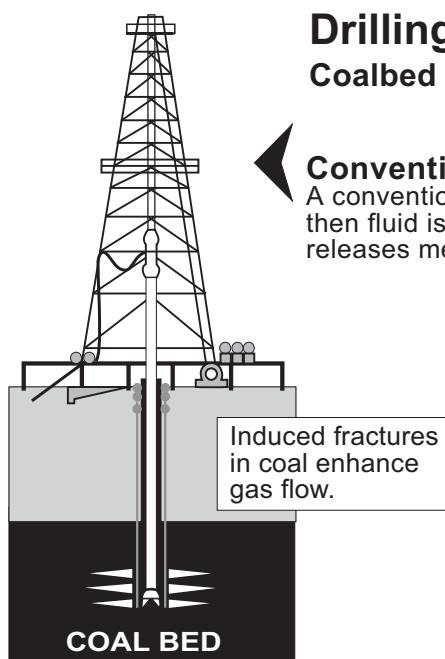
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## Drilling for methane gas in coal

Coalbed methane can be extracted from coal in several ways.

### Conventional drilling

A conventional well like those used for natural gas is drilled, then fluid is forced down the well to fracture the coal, which releases methane gas.



### Drilling before mining

Wells are drilled before mining, releasing some methane and reducing the risk of explosion. After a seam is mined, pillars are pulled, causing a collapse called a gob. The gob forms a reservoir for methane. Wells can also be drilled in the gobs of old mines.

### Horizontal drilling

A motor behind the drill bit can be twisted to drill horizontally into a coal seam, which is fractured to produce methane.

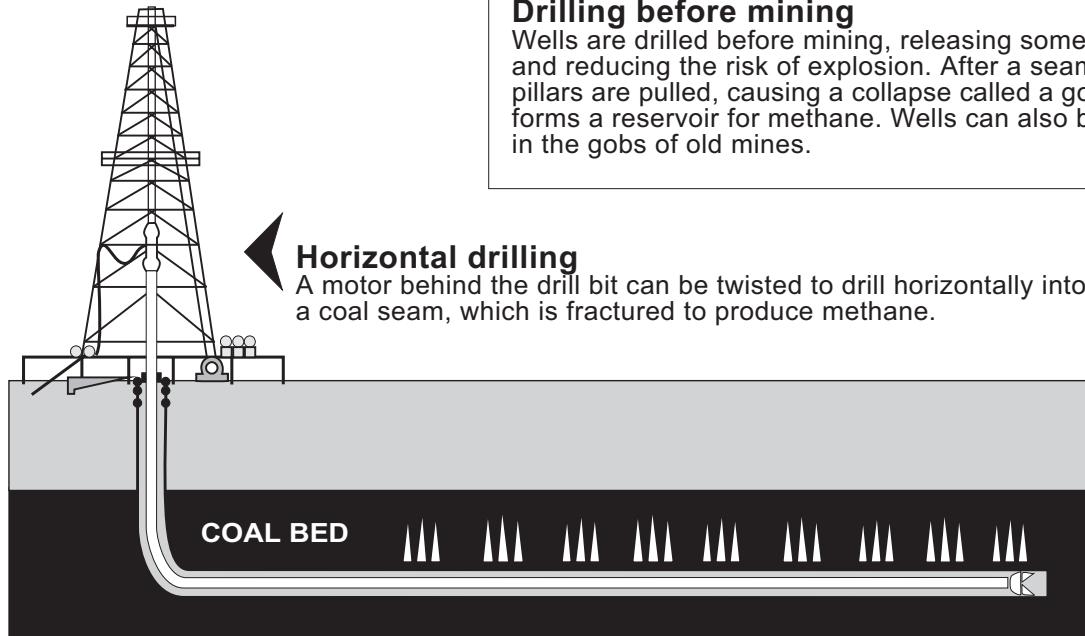


Figure 2.