

Where Does Natural Gas Come From?

Under the surface of the earth a complex structure of molten and solid rock is gradually, but continuously, shifting and changing. At the earth's surface, the organic remnants of plant and animal life eventually settle in dirt, streams, lakes and seabeds, and become buried under sediments. Over time, heat and pressure turn these organic deposits into hydrocarbons (fossil fuels).

Natural gas can originate from almost any ancient marine or terrestrial organic materials that have been gently heated for at least one million years at 120 to 300 degrees Fahrenheit. Gravity and pressure cause the gas to move to the surface unless trapped by a barrier of less permeable rock called a hydrocarbon trap.

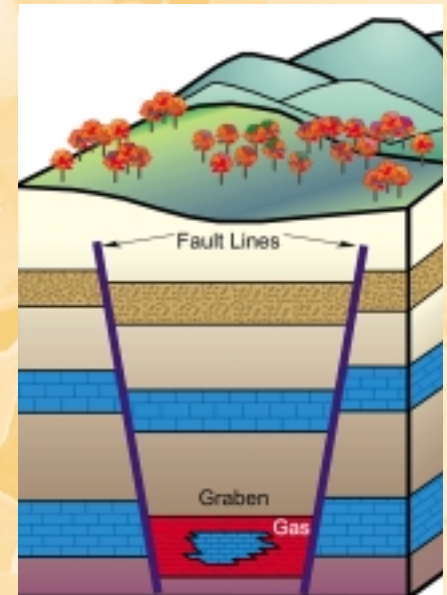
Geologists study rocks on and below the surface to identify hydrocarbon traps, such as grabens (troughs) and faults. Outcrop geology and surface features can point to the possible presence of potential reservoirs and hydrocarbon-bearing source rocks in a sedimentary basin.

Knowledge about subsurface geology is provided by seismic data and the analysis of well logs. Well logs are recorded using measuring devices that are lowered into the wellbore after drilling. As the device is raised to the surface, it takes readings of the rocks. Well logs inform the geologist about porosity (pore space within the rock) and whether there is natural gas or water present in those pore spaces.

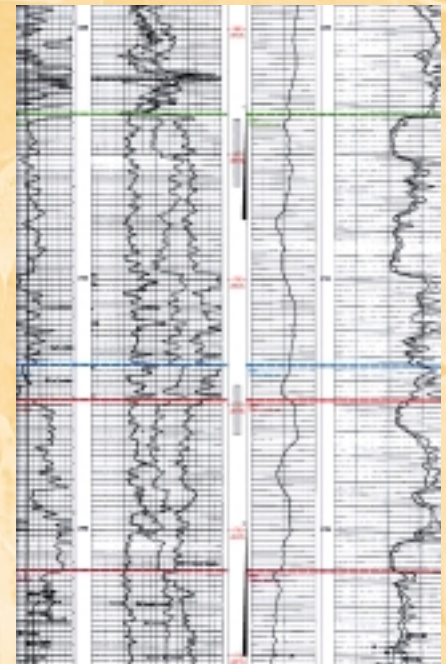
Conditions for Natural Gas Accumulations

The natural gas that Fortuna Energy is seeking is trapped in porous rock deep within the earth. In order for gas to accumulate in any location, several natural conditions must all occur together:

- **Hydrocarbon Traps:** natural gas generated deep in the earth will naturally migrate to the surface. Some of this gas will collect in traps on its way up.
- **Impermeable Seals:** the seal is the top part of the trap that prevents natural gas from passing through to the surface. The rock forming the seal must be highly impermeable.
- **Porous Rock Reservoir:** this is the space where the natural gas resides, but water may also be present.
- **Source of Hydrocarbons:** while there are many sources of hydrocarbons, ancient marine algae are the primary source.
- **Timing of Hydrocarbon Accumulation:** the hydrocarbon trap must have been formed before the migration of natural gas began, in order to capture the gas as it moved to the surface.



3D diagram of subsurface geology



Well logs

Before Drilling a Well

1. The geologist will study the surface geology of the area and subsurface data (well logs, rock cuttings) from nearby wells.
2. From this data, the geologist will determine locations that appear promising for tapping into natural-gas reserves.
3. Seismic data may be acquired to reveal subsurface details about the site.
4. Maps will be drawn to document the acquired understanding of the subsurface structures and layers.

During Drilling

The discovery and learning process continues during the drilling of the well. A geologist will remain on site to analyze the rock cuttings from the well bore. Drilling mud carries the cuttings to the surface, where they are collected and cleaned. By examining these cuttings, the geologist can determine if impermeable rock is present for the hydrocarbon trap. If a reservoir of natural gas has been penetrated, traces of the gas will be detected at the surface in the drilling mud.

In New York State, Fortuna Energy is developing the Trenton/Black River gas reservoirs. These reservoirs are very deep accumulations that are technically very difficult to locate and drill (see the Information Fact Sheet on Drilling).



3D diagram of subsurface geology



Geologist examining rock cuttings

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