

The Science and Engineering of Shale Gas

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Unconventional gas occurs in tight rocks, such as shales and low permeability sandstones. The low permeability means that extraction via radial flow to vertical boreholes is too slow. Given that tight gas occurs in bedded formations, the development of horizontal drilling with multiple parallel wells was the key technological advance allowing exploitation, because the borehole sees more of the reservoir formation. This is not enough, however, and multiple stages of hydraulic fracture are generally required in each well to increase area to which gas can flow, allowing the whole formation to be 'mined' for gas.

Natural gas is a clean fuel, but it is also a vital raw material for the chemical and fertiliser industry (without which 2.3 billion people presently cannot live on this planet). High pressure steam reforming from natural gas is likely to be the main way that industrial quantities of hydrogen can be produced, for electricity generation, transport and domestic heating. The downside is the production of carbon dioxide, hence it is essential that CO₂ capture and storage be part of the future use of gas. Gas should be seen as potentially having a long-term emissions-free future. The only difficulties should be in finding engineering solutions.