What are the resource plays and why they are important?

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Due to the fact that shale is a fine-grained sedimentary rock composed of muds that are a common mixture of clay, quartz and calcite minerals, it is normally characterized by insufficient permeability, so that most shales have been commonly considered as being not commercial sources of natural gas. For this reason, the realm of shale gas has been often defined as resource plays that are opposed to conventional exploration plays with a high porosity and permeability system. Unlike conventional plays, shale resource play would represent the low geological risk of not finding gas, concomitant with the low-success rate for the potential profits per well. Due to low-matrix permeability, commercial quantities of shale-gas production strongly require fracture networks to enhance permeability. Recently applied horizontal drilling and multistage hydraulic fracturing during the past many years has, however, resulted in shale-gas reservoirs that become one of new promising unconventional resource plays.

The essential properties of a shale formation that make it a good shale gas play are highlighted from the North American experience. These include adequate thickness (> 20 m thick), sufficient depth (> 1.5 km deep) and pore pressure (> 0.43 psi), porosity (> 3%), permeability (though this is often in the nano-darcy range) and mineralogy. Other properties that are unique to source rocks, capable of producing shale gas are quantity of an type of organic matter measured as total organic carbon (% TOC) and kerogen type, thermal maturity of the organic matter measured as vitrinite reflectance (% Ro) and gas type. This information must be collected from previous wells drilled through the shale formation and by drilling test wells. In fact, there have been no standard criteria for the shale-gas evaluation, but there is a general consensus on the basis of the earlier studies. The best shales are organic-rich black shales in the gas (wet/dry) window but with some important exceptions. Most productive gas shales contain oil-generative organic matter, Type II kerogen in quantities, measured as TOC, high enough to generate commercial quantities of gas. The uniqueness of each shale play cannot be, however, over-emphasized. Due to the fact that there are significant lateral and vertical variations within shale formations that are best understood by examining the geology of the play, in particular the depositional environment, and integrating this information with the rock and log data.