

# Up-Coming Drilling Technology Revolution in CBM

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For a number of years, drilling technologies like gob wells, vertically drilled frac. wells and basic horizontal wells have been employed to produce methane gas trapped in low-permeability reservoirs like coal and shale. While these conventional drilling methods are well suited for very porous coal deposits, they haven't proven economically viable in low-permeability reservoirs because they don't drain uniformly and typically have low production and recovery rates. In addition, these conventional wells usher in numerous environmental concerns with regard to surface disturbance and water disposal. However, recent advances in drilling technologies and demands for natural gas have given operators reason to re-evaluate the feasibility of developing unconventional gas reserves.

Two primary technologies now exist: under-balanced horizontal and multi-lateral drilling methods, which are cost effective methods of drilling horizontal wells. Today horizontal and multi-lateral drilling capability can offer a great advantage for CBM development. Efficiently under-balanced drilled multilaterals can open the marginal permeability plays with minimal-to- no formation damage.

Coal permeability can be easily damaged by the plugging of cleats during overbalanced drilling operations. Gardes system employs a dual string method whereby water is circulated down the drillstring through the mud motor and guidance system. Air is then circulated down the concentric casing annulus allowing for the hydrostatic pressure in the wellbore to be reduced below the formation pressure eliminating the possibility of fluid invasion into the coal matrix and formation damage. The under-balanced multi-lateral multi-seams drilling, with specially designed re-usable, re-orientable Upstock™ can be used in as many as 10 coal seams in a single run, eliminates the cost of hydraulic fracturing as well as pulling out and running in of Whipstock. A single well can produce as much as 16 conventional vertical wells from two seams on 80 acre spacing, significantly reducing infrastructure, maintenance and environmental liability.