

## Renewable Natural Gas from Unconventional Biogas Reservoirs; The Next Energy Boom?

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*Unconventional reservoirs*, such as coal and shale deposits were once thought to have formed millions of years ago when the fossil fuels themselves were being formed. Recent scientific discoveries, however, suggest that much of the natural gas recovered from these formations is biogenic in origin. This discovery has led to the realization that economically depleted biogas fields can be brought back into economic production through the introduction of biostimulants (i.e, micro and macronutrients, electron donors and acceptors, and/or alternative carbon sources). Research performed at the University of Wyoming has shown that when a robust microbial community and sufficient nutrients are present, the rate of *energy conversion* from coal to natural gas is controlled by the available substrate (i.e., terrestrial sources of natural organic matter including oil and coal). Microcosm studies were used to evaluate plant-derived carbohydrates as an alternative carbon source for a microbial consortia derived from a Wyoming coal sample collected from the Powder River Basin, located in Wyoming, USA. The plant-derived carbohydrates included five- (Xylose and Arabinose) and six-carbon (Glucose, Galactose and Mannose) monosaccharides and the disaccharide Cellobiose. The rate and extent of methane and carbon dioxide production were assessed. Organic acid intermediates were also monitored to provide a better understanding of the metabolic pathways involved. Methane yields for the five- and six-carbon monosaccharides were significant (~50%), much higher than the yield from Cellobiose (~2%). The Cellobiose was also shown to have an inhibitory effect when combined with the monosaccharides.