Upper Ordovician Trenton and Black River Carbonate Reservoirs in New York State

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The Ordovician Trenton and Black River carbonates have produced significant quantities of gas in New York State. The Trenton Limestone immediately overlies the Black River, but the style of reservoir is very different. The Black River has produced gas from hydrothermal dolomite reservoirs in an area south and west of the Finger Lakes while the Trenton has produced gas from overpressured organic-rich shale interbeds in an area to the west and southwest of Lake Ontario.

Black River hydrothermal dolomite reservoirs of New York formed when hydrothermal fluids (100-170° C) flowed up active transtensional faults and dolomitized the formations within the first 500 meters of burial. The reservoirs produce from unconventional traps that are structurally low *en echelon* grabens or "sags." These e*n echelon* sags are negative flower structures associated with an underlying transtensional fault. Not all of the dolomitized sags are gas-bearing. In an area to the north and east of the producing area, several wells have been drilled that produced primarily water from these features. It may be that the gas is sourced from the aforementioned organic-rich shale beds in the Trenton Limestone or from the overlying Utica Shale and that the reservoirs only get charged when faults die out in the Utica and do not extend upward into potential reservoirs in the Queenston, Herkimer or Oneida Formations or higher.

Gas has been produced from the overlying Trenton Limestone near Lake Ontario for more than 120 years. The gas mainly comes from intervals that consist of interbedded organic-rich shale and limestone. Gas encountered during drilling of these wells is commonly highly overpressured but rates typically fall dramatically to a few mcf per day after a few hours or days. Our interpretation of the reservoir is that the gas is stored in horizontal bedding planes that are propped open by the high-pressure of the gas. The near lithostatic pressures encountered during drilling suggest that the gas may be hydraulically lifting the overburden. During drilling the gas flows at near lithostatic pressure out of the horizontal partings until they close, thereby dropping the rate of production from millions of cubic feet per day to a few thousand cubic feet per day. The gas may be self sourced from very thin organic rich shale beds interbedded with the limestones.

The likely limits of the overpressured play are the 2500 or 3000 foot burial depth contour to the south, the pinchout of the capping Steuben Limestone to the east, the outcrop belt to the north and the likely pinchout of organic rich shale interbeds to the west. At a depth of 2500-3000 feet, the principal compressive stress changes from horizontal to vertical and the bedding planes are no longer likely to be open. There may be greater potential in the Trenton limestone where there are abundant vertical natural fractures or possibly if the formation is subjected to large scale frac jobs like those being performed on shale gas reservoirs.