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New Deep Basin Gas Plays at Hooker, Alberta – Extending Deep Basin Prospectivity Southward

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Introduction

The Deep Basin of western Canada was originally described as a huge, crescent-shaped wedge of hydrocarbon-saturated reservoirs flanking the Rocky Mountain Foothills. Although early workers recognized it stretching from the Montana border to northeastern British Columbia, initial exploration work focused in the north, stepping out from giant discoveries at Elmworth. To the south, many Deep Basin plays in west-central Alberta were pursued as conventional targets, as operators did not recognize the characteristics of pervasive hydrocarbon saturation and anomalous reservoir pressures. In southern Alberta, Deep Basin plays were essentially ignored.

Recently, however, exploration momentum has moved southward with the establishment of a new Deep Basin play in the Lower Cretaceous Basal Quartz sandstone at Hooker, in southern Alberta.

Hooker Play History

Hooker's exploration history began in the 1960's, when the first discoveries of gas were made in Basal Quartz valley-fill sandstones at Crossfield, more than 70 kilometres to the north (Fig. 1). Stepout and development drilling over the next 20 years established more than 200 BCF of reserves in conventional stratigraphic traps. Current production and infill drilling suggest that up to 350 BCF may be recovered. Spence (1997) mapped the Basal Quartz valley system southward from Crossfield, into an area with little well control. Although this trend was open-ended, reservoir quality appeared to deteriorate downdip, and conventional traps were difficult to define.

Following Spence's work, Compton Petroleum identified an extensive Basal Quartz reservoir fairway in the Hooker area, and began to assemble a regional land position. In July 1999, they participated in the discovery well, which demonstrated that gas was present and producible.

Hooker Development

Today, the Hooker development area covers about three townships, out of a prospective area of up to nine townships (Fig. 1). Compton and others have drilled 83 wells, of which 61 are producing gas wells, 10 are awaiting tie-in, and 7 are suspended on facilities constraints. Compton has booked 161 BCF of gas reserves (as of year-end 2001), which probably represents about 70% of the total for all operators established to date. The Basal Quartz produces 45 MMCF/D, which is scheduled to increase with the removal of infrastructure constraints.

The Hooker Basal Quartz reservoir is a complex, multi-generational valley fill, dominated by medium- to coarse-grained sandstones. Deep burial (2800 to 3200 metres) has reduced reservoir quality substantially from that at Crossfield, but reservoir pressures are relatively high, and only irreducible water is present. Compton has identified reserve potential of 6 BCF/section through the main development area, and has attained an average initial deliverability of 1.2 MMCF/D, with associated liquids of about 20 Bbl/MMCF, in its drilling program. Detailed 3D seismic interpretation is used to highgrade locations, and has allowed downspacing to two wells per section in some areas. Compton's success in developing this reservoir is the result of close teamwork among geologists, geophysicists and engineers in identifying reservoir performance characteristics and discontinuities.

The Deep Basin at Hooker

Although Hooker occurs within the same Basal Quartz valley trend as Crossfield, the entire development area lies within the subnormally-pressured, hydrocarbon-saturated Deep Basin.

Twenty-five kilometres north of the main Hooker development, Compton is testing the updip boundary of the Deep Basin with wells in Townships 19 and 20 (Fig. 1). There are no unique structural or stratigraphic features to define the boundary, although northward erosion of underlying Jurassic marine shales exposes the Basal Quartz to the regional Mississippian aquifer (and thus makes it difficult to fracture stimulate the Basal Quartz without also accessing Mississippian waters). Depending upon the erosional configuration, the Deep Basin edge may occur several kilometres further to the north. Analogous Deep Basin limits in northern Alberta have been interpreted to result from a dynamic balance of gas generation from downdip, and water encroachment from updip, within stratigraphically continuous fairways.

Downdip, the first and deepest well in the play (10-10-14-1W5) flowed 500 MCF/D after frac, with no water production, from a depth of 3490 metres. As is typically the case for Deep Basin plays, the downdip limit will be economic permeability values, not water.

Future Potential

The Basal Quartz valley trend offers exploration and development opportunities updip and downdip of Hooker. Up to 1 TCF of gas resource may occur within this Basal Quartz valley alone, and regional paleogeography suggests that there are other analogous trends to be discovered.

In addition, operators are now beginning to identify uphole zones at Hooker which may add substantially to the gas resource base. It is only reasonable to speculate that there will be substantial Deep Basin gas in the 3000-metre clastic section overlying the Basal Quartz.

Hooker has put the Deep Basin back on the exploration map in southern Alberta.

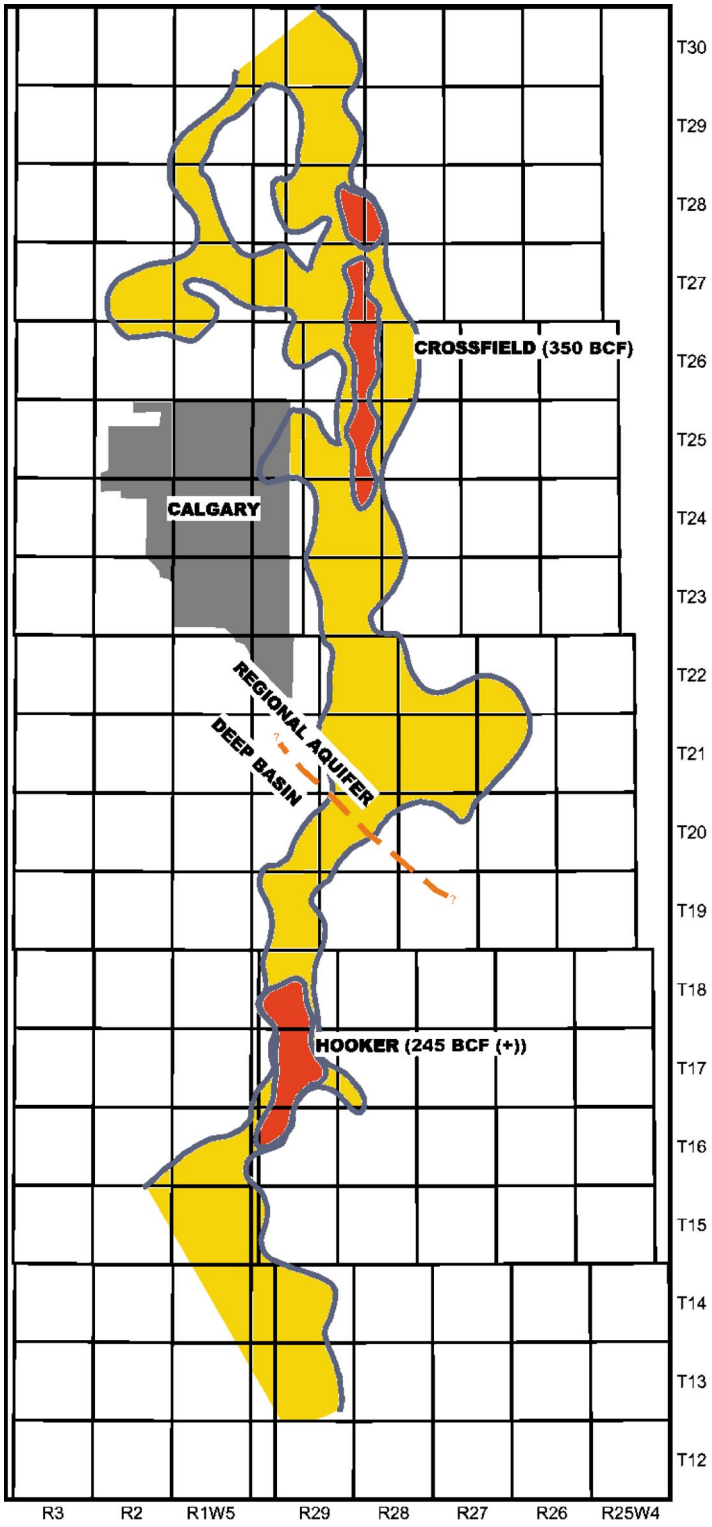

Fig. 1. Hooker – Crossfield Basal Quartz Valley Trend, Southern Alberta