Development of a Regional Model to Assess Marcellus Shale Resource and Reservoir Potential

Iain C. Scotchman[1], Celine Wise[2], and Nigel Bedrock[2]
[1]Statoil (UK) Ltd., 1 Kingdom Street, London, UK
[2]Statoil North America Inc., 2013 CityWest Boulevard, Suite 800, Houston, TX, USA

In the early days of shale-gas exploitation, all shales were seen as equal and the Barnett Shale was seen as the analogue. The recent boom in exploration and exploitation of gas-shales of varying geological ages and depositional settings has shown this simple view to be wide of the mark, as illustrated by the Marcellus Shale of north-eastern USA.

The middle Devonian-aged Marcellus shale has a large subcrop extending from north-western West Virginia through northern Pennsylvania into western New York State. Across this area, the shale-gas potential of this very productive unit varies greatly, particularly in respect of reservoir and resource potential. Depositional controls play a large part in these variations but subsequent over-printing by diagenesis and deep burial maturation also play major roles. These processes need to be delineated and defined to allow understanding of the variations in resource and reservoir potential and to allow prediction of "sweet-spots" ahead of the drill.

A regional study was set up to evaluate the Marcellus shale-gas potential utilising a series of profiles across the basin to correlate key wells with good quality log and core data. In each area the Marcellus section was subdivided into units based on the log characteristics which were correlated across each section, aided by available regional seismic data, enabling depositional variations and facies to be delineated and mapped. Burial diagenetic effects based on the depositional and structural settings were derived from the core mineralogy data, which when combined with geochemical data were used to study maturation controls. Selected results of the study are presented in this paper.