

Sequence Stratigraphic Reconstruction of the Late Middle Devonian Geneseo Formation of New York, USA: Developing a Genetic Model for “Upper Devonian” Unconventional Targets in the Northern Appalachian Basin, New York

Ryan Wilson¹, Juergen Schieber², Kevin Bohacs³

¹Chevron; ²Indiana University; ³KMBohacs Geoconsulting

9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

Abstract

The late Middle Devonian Geneseo Formation and its lateral equivalents in the northern Appalachian Basin are significant secondary targets to the extensively explored Marcellus Sub-group. This framework combines detailed observations of facies, facies associations, stratal architecture, stratal geometry, and stratal terminations, in combination with geochemical proxies for depositional environments and provenance to construct a high-resolution sequence stratigraphic framework to enable prediction of hydrocarbon play element quality and distribution.

Correlations within this mudstone-rich succession were conducted at the parasequence-scale, and based on detailed descriptions of four drill cores, >100 outcrops, and mapping of >500 wireline logs. Isopach maps were constructed within a high-resolution sequence-stratigraphic framework to identify thickness trends and lateral variations of mudstone properties. The Geneseo Formation herein has been subdivided into two depositional comprising three lithostratigraphic units (i.e., Lower Geneseo, Fir Tree, and Upper Geneseo members respectively). The Lower and Upper Geneseo members show systematic aggradational to progradational parasequence stacking patterns, as well as downlap–

onlap stratal terminations with underlying strata; these members represent highstand systems tracts. The Fir Tree Member occurs between the Lower and Upper Genesee members, truncates the underlying Lower Genesee, shows progradational–aggradational–retrogradational parasequence stacking patterns, and spans two systems tracts: lowstand and transgressive. Thickness variation across the basin suggests reactivation of basement structures and syn depositional faulting strongly influenced accommodation. Specifically, the N-S trending Clarendon-Linden Fault System appears to have been a western sediment barrier during Genesee time and the primary depocenter of fine-grained clastics occurs in south-central NY in a structural low. As the Genesee system advanced, the succession sequentially filled topographic lows from east to west (proximal to distal). Understanding the controls on reservoir quality and distribution of secondary and tertiary targets to the Marcellus can facilitate ranking and prioritization of landing zone targets, as well as optimization of well placement for completion design.