Reservoir Characterization for Development of Mesaverde Group Sandstones of the Piceance Basin, Colorado

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ABSTRACT

Improved technology for reservoir characterization and completion has revived the tight, basin-centered gas play in the southern Piceance Basin of Colorado. The target gas resource is in the massively stacked lenticular sandstones in the Upper Cretaceous Williams Fork Formation of the Mesaverde Group. This naturally fractured, low-permeability formation holds an impressive resource in place of 100-300 TCFG, as estimated by the National Petroleum Council and the USGS. Rulison Field, operated by Barrett Resources, is in the heart of this rich gas play and holds 130 to 190 BCFG per section. Detailed data collection and resource assessment by Advanced Resources International, Inc. and Barrett Resources have helped define the size, richness and nature of this gas resource.

This paper presents applications of advanced methods of aeromagnetic acquisition and interpretation, log analysis, and reservoir simulation, along with improved well completions, re-completions, and stimulations at Rulison Field. These techniques have almost doubled per-well EUR's, transforming this gas resource into an economically attractive play.

INTRODUCTION

The Gas Research Institute (GRI) and Advanced Resources International, Inc. (ARI) selected the Piceance Basin gas play, the Mesaverde Formation, and the Rulison, Grand Valley, and Parachute fields for detailed study. Our purpose was to assess the value of advanced reservoir characterization and improved well completion/stimulation technology in more efficiently developing this challenging gas play. Application of these technologies at Rulison Field, plus improved well completion, stimulation and recompletion of older wells, increased estimated ultimate recoveries (EUR's) from less than 1 BCFG per well to about 1.9 BCFG per well. This has converted this previously bypassed gas resource into an economically attractive gas play.

GEOLOGIC SETTING

The Piceance Basin is a complex basin formed by Laramide tectonism (Fig. 1). It is bounded on the north by the Axial Basin Anticline, on the east by the White River Uplift, and on the south by the San Juan volcanic field and Uncompahgre Uplift. It is separated from the Uinta Basin to the west by the Douglas Creek Arch. The Piceance Basin is asymmetrical, with a gently dipping western flank and a steeply dipping eastern flank known as the Grand Hogback Monocline.

Deposition of Mesaverde Group sandstones and shales mostly predated Laramide tectonism. The Mesaverde Group is divided into the regressive marine deposits of the Iles Formation (Corcoran, Cozzette, and Rollins sandstones) and the overlying massively stacked lenticular nonmarine Williams Fork Formation (Fig. 2). A series of