Introduction

The U.S. Geological Survey (USGS) completed an assessment of undiscovered, technically recoverable tight-gas resources within the Grand Erg/Ahnet Province of Algeria (fig. 1). For this assessment, a tight-gas reservoir is defined as a gas-bearing siliciclastic reservoir that generally exhibits less than 0.1 millidarcy permeability and requires stimulation of vertical wells for production. During the early Paleozoic, much of North Africa was a north-facing passive margin with siliciclastic systems prograding northwards into the paleo-Tethys Ocean (Boote and others, 1998; Dixon and others, 2010). Regressive clastics of the Ordovician Period formed a thin sedimentary cover across much of the passive margin. Demise of the Ordovician ice cap and associated meltwaters led to the formation of large, northward-flowing channels that incised into Ordovician clastics. A major transgression in the early Silurian resulted in the deposition of organic-rich petroleum source rocks within the paleochannels; the channel deposits were overlain by regressive clastics of the late Silurian. A major transgression in the Devonian also led to the deposition of organic-rich source rocks, and these were subsequently buried by regressive clastics of the Devonian and early Carboniferous. In the middle of the Carboniferous period, Hercynian compressional deformation segmented the passive margin into a mosaic of uplifts and basins (Eschard and others, 2010). The tight-gas assessment units (AUs) defined in this study are restricted to the post-Hercynian basinal areas, as the uplifts may have lost any hydrocarbons from exhumation and erosion.

Total Petroleum Systems and Assessment Units

The USGS defined the Silurian Total Petroleum System (TPS) with the Timimoun Basin Ordovician Tight Gas AU, the Sbaa Basin Ordovician Tight Gas AU, and the Ahnet Basin Ordovician Tight Gas AU. The Mouydir Basin Ordovician Tight Gas AU was defined but not quantitatively assessed. Shales of the Silurian TPS contain as much as 10 percent total organic carbon (TOC), have hydrogen index (HI) values as much as 380 milligrams of hydrocarbon per gram of total organic carbon (mg HC/g TOC), and have shale thickness as much as 100 meters (Logan and Duddy, 1998; El Diasty and others, 2017). The boundaries of the tight-gas reservoirs were largely drawn based on the thermal generation window for gas.

The Devonian TPS includes the Timimoun Basin Devonian Tight Gas AU, the Sbaa Basin Devonian Tight Gas AU, and the Ahnet Basin Devonian Tight Gas AU. Devonian shales contain as much as 14 percent TOC, have HI values as much as 580 mg HC/g TOC, and have shale thickness as much as 200 meters (Chaouche, 2013).

The geologic model for tight-gas systems is for hydrocarbons to have been generated from organic-rich Silurian and Devonian shales possibly as early as the lower Carboniferous (Lüning, and others, 2000). Oil would have cracked to gas in the Mesozoic (Logan and Duddy, 1998), and some of this gas was either retained within or migrated locally into Ordovician, Silurian, Devonian, and possibly early Carboniferous tight sandstones.

Key assessment input data are shown in table 1. Drainage areas, success ratios, and estimated ultimate recoveries are taken from U.S. tight-gas analogs.

Undiscovered Resources Summary

The USGS quantitatively assessed undiscovered, technically recoverable continuous tight-gas resources within six AUs in the Grand Erg/Ahnet Province (table 2) of Algeria. The estimated total mean resources are 30,474 billion cubic feet of gas (BCFG), or 30.5 trillion cubic feet of gas, with an F95–F5 range from 6,336 to 71,077 BCFG and 103 million barrels of natural gas liquids (MMBNGL) with an F95–F5 range from 18 to 262 MMBNGL.
Table 1. Key input data for six tight-gas assessment units (AUs) in the Grand Erg/Ahnet Province of Algeria.

Table 2. Results for six tight-gas assessment units in the Grand Erg/Ahnet Province of Algeria.

References Cited

For More Information

Grand Erg/Ahnet Province Assessment Team