

Mapping and Reservoir Characterization of Geologic Intervals for NGL Storage Applications

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ABSTRACT

The Appalachian Oil & Natural Gas Research Consortium recently completed the Appalachian Storage Hub for Liquid Ethane Study to identify potential storage reservoirs for natural gas liquids (NGLs) derived from the liquid-rich Marcellus and Utica shale plays. The project objective was to identify the best options for storage proximal to a proposed pipeline from areas of shale production in southwestern Pennsylvania to end users in southern West Virginia and northeastern Kentucky. The study's Area of Interest (AOI) included 50 counties centered along the Ohio River Valley corridor in the tri-state region of Ohio, Pennsylvania and West Virginia. Survey geologists from each of these states collaborated to complete the study within a year's time, assessing three types of storage opportunities (mined-rock caverns, salt caverns and depleted siliciclastic gas reservoirs) through their desktop evaluation of 10 discreet geologic intervals: the Mississippian Greenbrier Limestone for subsurface mining; the Upper Silurian Salina F4 salt for the creation of cavities through brine extraction; and depleted gas fields in sandstone reservoirs in the Lower Mississippian (Keener to Berea interval); Upper Devonian (Venango, Bradford and/or Elk intervals), Lower Devonian (Oriskany Sandstone); Upper Silurian (Newburg Sandstone); Lower Silurian (Clinton/Medina and Tuscarora sandstones); Lower Ordovician (Rose Run sandstone); and Upper Cambrian (Gatesburg Formation and Upper Sandy member). The research team prepared maps of depth, thickness and extent for each interval; compiled existing siliclastic reservoir data at the field level using multiple regional data sources; and conducted new qualitative petrographic analyses to support reservoir characterization activities. This information was used to identify a short list of the most promising NGL storage reservoirs, to which geology-based ranking criteria developed specifically for this study by the research team were applied. As a result of these efforts, we identified multiple prospects in the AOI where stacked NGL storage opportunities (i.e., a combination of mined-rock caverns, salt caverns and/or depleted gas reservoirs at different depths within a given geographic area) are recommended for further investigation at the site level.