

## A BRIEF OVERVIEW OF UPPER DEVONIAN BLACK SHALE NATURAL GAS WELL DEVELOPMENT IN PENNSYLVANIA YEAR ENDING 2013

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### POSTER PRESENTATION

Much attention has been given to the Ordovician-age Utica shale as the next big natural gas shale play in Pennsylvania, following the success of the Marcellus shale development. In most of Pennsylvania, however, the Utica shale lies several thousand feet deeper than the Marcellus shale. This greater depth could be cost-prohibitive for Utica natural gas development across much of Pennsylvania except in those westernmost counties of the state where the Utica is located at much shallower depths.

Upper Devonian-age black shales (in particular, the Burket and Geneseo shales) lying immediately above the Tully limestone have been tested by some natural gas operators as the units are penetrated by drilling targeting the deeper Middle Devonian-age Marcellus shale. Favorable results have subsequently led to the development of and production from nearly forty such wells within Pennsylvania at the end of 2013; several of these have also produced natural gas liquids from wells within western and southwestern Pennsylvania counties. Another 150 wells associated with the Burket and Geneseo shales were in various stages of permitting, drilling, completion, and being connected to pipeline at the end of 2013.

Some Burket and Geneseo wells are being completed on the same well pads as those from which Marcellus wells have been drilled. This stacked production is economically beneficial through the shared use of infrastructure.

The Burket shale was first described by Charles Butts in 1918, and was named after a small community located southwest of the city of Altoona in Blair County, PA. The Burket's parent formation is the Harrell Formation, named for a small railroad station east of Altoona. The Burket shale is that basal black shale lying above the Tully limestone where there is no other black shale lying above it.

The Geneseo shale was described shortly thereafter, by G.H. Chadwick, in 1920. Its parent formation is the Genesee Formation of New York State. In Pennsylvania, it is the basal black shale lying above the Tully limestone if the Middlesex shale lies above it.

The use of these black shale unit names by current natural gas drilling operators in PA may be more a function of a company's simple preference for one name over another, rather than based on the actual stratigraphic relationship of these units relative to any one particular completed gas well.

There are several older vertical natural gas wells within the state which produce gas from the Burket/Geneseo, in combination with one or more other Upper and Middle Devonian black shales; one of these was completed as early as 1949 in Clearfield County.

## 19TH CENTURY RUSSIAN PETROLEUM: THE AMERICAN PERSPECTIVE

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Following the Drake well discovery in 1859, the United States dominated the world petroleum markets for most of the 19th century, with production coming largely from Pennsylvania and other Appalachian states but with significant contributions from the Midwest (Lima-Indiana Field) beginning in the mid-1880s. The only major competitor was Russia (now Azerbaijan), where production from hand-dug wells at Baku, along the western shore of the Caspian Sea, had supplied regional markets for centuries. After commercialization of the oil fields was authorized in the 1870s, the Nobel family and other operators expanded Russian production to a level that surpassed the United States by the end of the century, highlighted by some of the most spectacular flowing wells of all time.

Although Americans were well aware of the growing competition from Russia, information about the Russian oil fields was not widely available. With few exceptions, American publications either ignored the Russian activity or acknowledged it with brief comments. United States governmental sources (Census Bureau, Geological Survey, and State Department) contributed significant coverage related to international trade, but these publications appear to have had limited circulation within the upstream oil industry. Most of the English-language publications with detailed coverage of Russian petroleum were from European authors and dated from the mid-1880s or later.

Information regarding crude oil quality, refining efficiencies, transportation, and worldwide marketing efforts was available, but there were very few sources addressing Russian drilling and production procedures and technology