Tight-Gas Sandstone Reservoirs: the 200-year path from unconventional to conventional gas resource and beyond*

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The evolution of tight-gas sandstones from unconventional to conventional gas reservoirs in the United States began with hydrocarbon exploration and production from the Appalachian Basin during the first half of the 19th century, when brines were the preferred product, and petroleum was the unconventional and generally undesired product. During the next 100 years, rapid development of petroleum extraction and delivery technology fed an increase in petroleum demand, such that low flow-rate reservoirs were uneconomic and unable to meet the national need. These low-flow rate reservoirs were rejected in favor of high flow-rate reservoirs in California, the Midcontinent, and the Gulf Coast. Even then, vast amounts of natural gas were flared off or vented, because no market existed for much of this produced gas.

With each successful discovery from these areas, the U.S. natural gas supply progressively exceeded demand and pipeline deliverability throughout the first half of the 20th century. In response to the "energy crisis" of the 1970's, the Federal government removed price controls on interstate natural gas in 1978 and created new tax incentives in 1980 to help offset the cost of drilling and producing unconventional gas reservoirs, including tight-gas sandstones. These decisions helped spawn a new industry and prompted geoscientists to examine the geological conditions that created and preserved large volumes of natural gas in low-permeability reservoirs.

Tight-gas sandstone reservoirs exist in a wide variety of settings, ranging from simple one-well accumulations to complex montages of multilayered sand bodies requiring thousands of wells to develop. They may have a reasonably well-defined geologic limit or appear to have no spatial association with any easily discernible mappable geologic phenomena. Understanding the true nature and future potential of yet-to-be-developed, tight-gas sandstone reservoirs is essential for the nation to supply its annual need for gas for the 21st century.