

RESOURCE TECHNOLOGIES OUTLOOK

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New York Lifts Drilling Moratorium

A moratorium on hydraulic fracturing in New York state appears to be coming to an end. Yet, if a proposed recommendation by the agency that governs New York's oil and gas industry is adopted, the current stranglehold on fracturing operations would yield to what the state classifies as "rigorous and effective" standards that operators would be required to follow.

The state's Department of Environmental Conservation (DEC) on July 1 released the proposal, which has the support of Gov. Andrew Cuomo. The plan, if adopted, would establish recommendations for managing, but not abolishing, hydraulic fracturing. New York placed a moratorium on high-volume fracturing in late 2010, and the policy is still in effect.

See *Moratorium*, page 4

West Virginia Sees Marcellus Shale Activity, Benefits

West Virginia, which collected less than \$55 million in severance taxes from natural gas operations last year, could see that number jump to nearly \$120 million by 2016, thanks in large part to the state's growing Marcellus Shale industry, according to Deputy Revenue Secretary Mark Muchow.

Revenue from the state's natural gas severance tax peaked at about \$81 million in 2008, but it declined in 2009 and 2010 as gas prices fell, Muchow said during a recent presentation to the West Virginia legislature's Joint Select Committee on Marcellus Shale.

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The number of Marcellus Shale wells in the state has increased (from 242 in 2008 to 622 in 2009), and the play's share of natural gas property taxes levied in the state is also on the upswing, increasing from less than 2% of the total in 2010 to 8% this year, Muchow said.

Recent reserves estimates show about 25 Tcf to be underlying the Marcellus in West Virginia (see *Shale Daily*, Jan. 24). According to Department of Environmental Protection (DEP) figures, the number of horizontal well permits skyrocketed from 50 in

Please see *West Virginia Marcellus* on page 2

West Virginia Marcellus, from page 1

2007 to a high of 500 in 2009, with more than 400 permits sought in the state last year.

But the state's legislature during its recently concluded regular session and an extended budget session failed to approve increased funding for additional DEP oil and gas inspectors, despite requests from DEP and Gov. Earl Ray Tomblin. DEP had proposed increasing horizontal drilling permit fees to \$10,000 from the current \$650 paid by all drillers to fund the additional inspectors.

Lawmakers need to come to an agreement on a statewide regulatory framework for Marcellus drilling if West Virginia's Marcellus output is to reach its full potential, Muchow recently told the

MetroNews Talkline radio program, which is broadcast throughout the state.

"It's always nice to know what the rules are. And as those rules are being developed and put in place, that'll help ensure that the industry continues to grow," Muchow said.

A recent study by West Virginia University's Bureau of Business and Economic Research (BBER) found that gas drilling in West Virginia's Marcellus Shale has enriched the state through new jobs and more revenue and is on track to create up to 20,000 jobs by 2015. While Pennsylvania is considered the hotbed of activity, "in fact, West Virginia Marcellus Shale permits issued through 2008 exceeded those of other Marcellus Shale states," the BBER researchers said.

Marcellus PA Impact May Be Exaggerated, Says PBPC

Pennsylvania think tank Pennsylvania Budget and Policy Center (PBPC) believes a recent study inflates the economic importance of the Marcellus Shale.

"Overall, we welcome the gas industry's contribution to Pennsylvania's economy, but with this study, the industry continues to overstate the economic benefits and underestimate the costs of increased drilling in the Marcellus Shale," Sharon Ward, director of the Pennsylvania Budget and Policy Center (PBPC), said Wednesday.

The Pennsylvania State University study, the third

in a series commissioned by the Marcellus Shale Coalition, found that the Marcellus industry increased economic activity in Pennsylvania by \$11.2 billion in 2010, generating \$1.1 billion in state and local taxes and supporting nearly 140,000 jobs.

The PBPC pointed to Pennsylvania Department of Labor and Industry statistics counting fewer than 19,000 direct employees in core Marcellus industries last year. Those "core" industries refer to six job categories crucial for development, but the state also considers 21 "ancillary" industries.

The study gave the Marcellus industries credit for directly creating 67,000 jobs through "purchases of goods and services, their royalties to landowners and tax payments," and it reached the 140,000 figure by including the "indirect and induced" impacts on businesses ranging from hotels to health care to recreation.

Please see *Impact* on page 3

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Information Age"*

Impact from page 2

"The study also inflates the amount of tax dollars generated by the industry," Ward said. The study attributes \$1.1 billion in state and local taxes to industry activity in 2010. This is much higher than a recent Department of Revenue report that attributed \$219 million in 2010 state tax payments to the gas industry and its affiliates.

That state report found that natural gas development companies in Pennsylvania paid more than \$1.1 billion in state taxes since 2006.

"The study also suggests that a drilling tax or fee will deter investment in the Marcellus Shale," Ward said. "That has not been the case in places like West Virginia, Texas and Arkansas. All three states have drilling taxes and led the nation in new gas wells in 2010, well ahead of Pennsylvania, without a drilling tax."

The study found that Texas, Arkansas, Oklahoma and Louisiana offer tax breaks during the early years of production, when shale wells typically produce at high rates before sharply declining to lower rates that some believe could last decades. Some lawmakers have challenged that break in Texas.

The study also concluded that the lack of a severance tax in Pennsylvania offset higher costs in the state.

Marcellus Shale Coalition President Kathryn Klaber said member companies confidentially report information directly "from their books" to Penn State researchers, allowing the authors of the study to get access to actual contracting information and work plans as they compile employment, taxation and spending figures.

It is worth noting that recent New York Times articles dealing with Marcellus Shale drilling activity – from fiscal impact to environmental considerations – have come under fire from industry executives as biased and misleading. Only as more wells are drilled and more information is gathered will there be any statistical certainty about the impact – environmental, employment, or otherwise – of drilling for Marcellus Shale.

Pricing Indexes

The most recent price index information for the raw materials that Resource Technologies Corporation frequently appraises, as of the date of this publication, is printed below.

COAL PRICING

\$78.43/Ton (Central Appalachian Basin)

NATURAL GAS

\$4.72/Mcf

OIL

\$118.35/Bbl

AGGREGATE

\$10.02/ton (East Coast)

DIMENSION STONE

\$16.41/cubic foot

BLUESTONE

Flagstone – \$1.75/ton

Pavers – \$3.00/square foot (1" thick)

Consulting Company Projects Increase in Gas Use For Electricity Generation

As shale gas becomes the dominant domestic supply source for natural gas and prices steer away from the highs experienced only a few years ago, gas demand for power generation is expected to soar, a new report from Deloitte LLP said.

The report laid out three likely scenarios for the natural gas markets. Under the reference case, natural gas prices would rise by about 50% between 2011 and 2020, or about 4% per year. See *Gas Use*, page 8

Moratorium from page 1

However, the major components of the plan spell out some distinct regulations that operators would have to follow. The major components of the DEC plan include:

- Prohibiting high-volume hydraulic fracturing in the New York City and Syracuse watersheds, including a buffer zone. The recommendation reverses the DEC's 2009 draft law that would have allowed drilling in the two watersheds.
- Banning drilling within primary aquifers and within 500 feet of their boundaries.
- Prohibiting surface drilling on state-owned land, including parks, forest areas and wildlife-management areas.
- Enforcing controls for fracing operations on private land.
- Rules for acquiring permits under the plan would mean more specific and stricter standards for operators. Some of the proposed compliance areas include:

- **Identifying chemicals used in fracing:**

Applicants must disclose to the DEC all products used in high-volume fracturing. Applicants must agree to publicly disclose the names of additives, subject to protections for proprietary information.

- **Protecting drinking water:** In most cases, an additional third cemented well casing would be required. The three required casings would be a surface casing, a new intermediate casing and a production casing. For flow-back water, water-tight tanks within a secondary containment would be necessary. No open containers could be used. Secondary containers would be required for all fracturing additive containers, additive staging areas and flow-back tanks. In addition, a new

permit process would require strict stormwater-control measures.

- **Protecting the air:** Air-pollution controls on engines used at well pads would be subject to DEC monitoring.
- **Informing communities:** The DEC would notify local governments about each well-permit application. An applicant would be required to certify that a proposed activity is consistent with local land-use laws and zoning standards.
- **Handling flow-back water:** Applicants would need to have DEC-approved plans for the disposal of flow-back water and production brine. The DEC would monitor disposal of drilling waste in a manner akin to handling medical waste. An analysis and approval under state and federal laws would be required before a water-treatment facility could accept flow-back water.

According to the DEC's website, the plan -- if its original wording is maintained and its recommendations advance to become law -- would "protect the state's environmentally sensitive areas while realizing the economic development and energy benefits of the state's natural gas resources."

The DEC maintains that 85% of the Marcellus shale would be accessible to natural gas production under the plan's recommendations.

Beginning in August, the agency will have a 60-day public-comment period. By law, no permits will be issued until the DEC has enforcement capabilities in place. Upon final adoption of rules governing permitting standards, the DEC will implement procedures for oversight, monitoring and enforcement.

The complete version of the DEC's recommendations can be viewed on the agency's website beginning July 8.

Marcellus Shale Appraisals

By Jeffrey R. Kern

The development of the Marcellus Shale as a viable horizon for the production of natural gas is a recent development in parts of Maryland, New York, Pennsylvania, Ohio, and West Virginia. The dense shale – generally located four to six thousand feet below the surface – is a rich source of natural gas. Geologic maps show that the shale lies beneath roughly 60 million acres across the five states. Recent estimates by geologists at SUNY and at Penn State place the total volumes of gas that might be economically produced from the Marcellus between 49 trillion cubic feet and more than 1,300 trillion cubic feet.



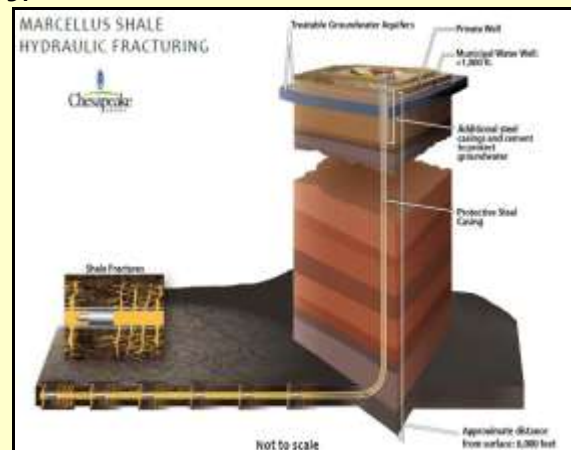
Marcellus Gas Map

Using the low-end estimate, the producible gas from the Marcellus represents about two years of U.S. gas consumption; at the high-end the horizon could contribute more than 50 years at current rates of consumption.

Why such variation? The Marcellus is still an "unknown" quantity, and estimates of the volume of gas that can be produced are not only

dependent on geologic and engineering knowledge, but also on predictions of the economics of oil and gas production and oil and gas markets. Estimates of how much of any mineral quantity may be produced are always delineated by the market as well as the geology.

Access to the Marcellus is through the application of directional drilling and advanced hydrofracturing. While neither technology is new, the combined application to deep, dense shale was only perfected in the late 1990's and early 2000's. The technology, developed in Texas and Oklahoma, was first used to commercially produce gas in Pennsylvania around 2005.

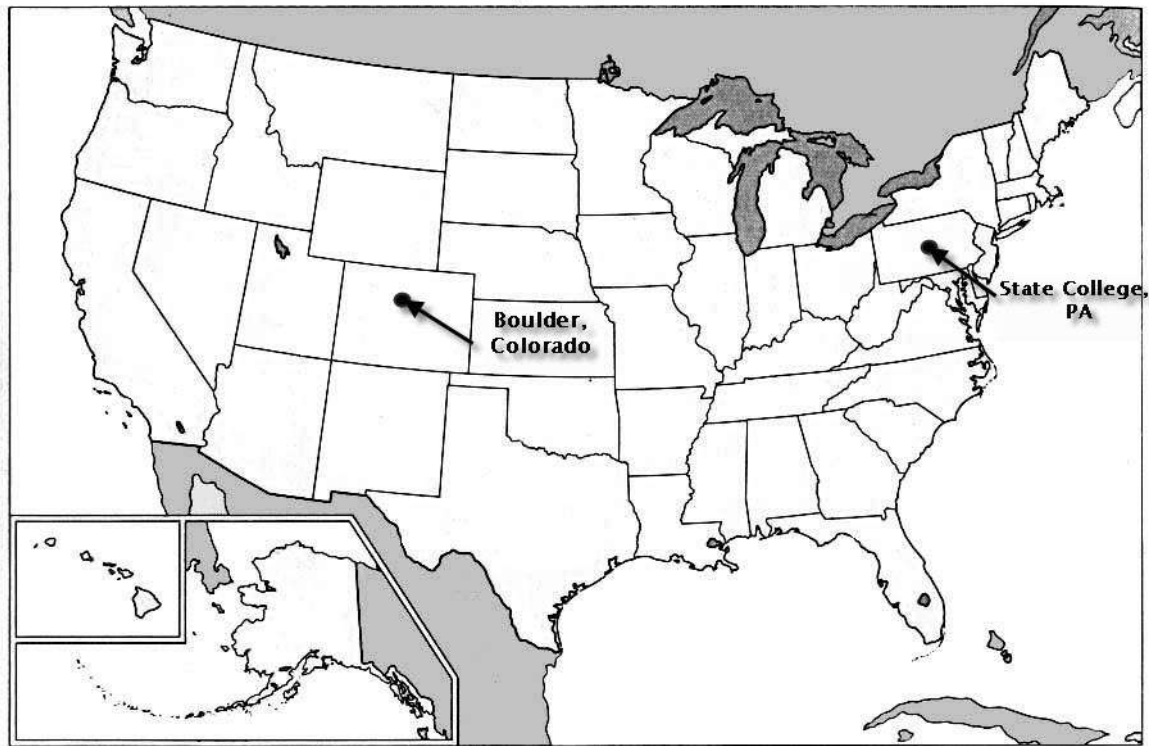


Marcellus Gas Well

The process allows the driller to liberate significant quantities of gas – between three and eight billion cubic feet – from one well bore. The well bore is usually drilled to a depth of four to six thousand feet and then is turned to drill horizontally through the Marcellus for a length of four to six thousand feet. A vast quantity of high pressure water carrying sand and various chemicals is then used to prop open fissures created in the shale – allowing the gas to escape into the well. The total cost of the site development, well drilling, hydrofracturing, and connecting to the gas transmission system varies from \$3.5 to more than \$5 million per well. The typical well exploits between 80 and 120 acres along the length of the horizontal well bore.

Please see *Marcellus Appraisal* on page 7

Resource Technologies Office Locations



PA Superior Court Rejects Indefinite Marcellus Gas Lease Clauses

The Pennsylvania Superior Court ruled, on January 11, 2011, that an oil and gas exploration's indefinite lease clause was invalid. The case, *Hite v. Falcon*, dealt with the following excerpt from a 2007 Falcon Partners lease:

"Lessee has the right to enter upon the Property to drill for oil and gas at any time [within one] year from the date hereof and as long thereafter as oil or gas or either of them is produced from the Property, or as operations continue for the production of oil or gas, or as Lessee shall continue to pay Lessors two (\$2.00) dollars per acre as delay rentals, or until all oil and gas has been removed from the Property, whichever shall last occur."

Generally, oil and gas leases consist of two terms: a primary term and a secondary term. The primary term is typically fixed, and ranges from one to three years in most cases. The secondary term is generally indefinite, as long as gas is being produced "in paying quantities." Unlike the secondary term, during the primary term a gas company has no obligation to

produce gas from the property. Instead, "delay rentals" have been used to extend the length of the primary term indefinitely – effectively extending the period of time that a company can hold a lease without actually producing gas.

This "delay rental" technique of holding a lease was employed due to the application of the "automatic termination rule." Said rule mandates that if, at the end of a primary term, a property is still undeveloped/not producing, a lease is automatically terminated. See *Brown v. Haight*, 255 A.2d 508 (Pa. 1969) ("...when oil and gas were not produced in paying quantities, the grantee's fee interest terminated automatically..."); *White v. Young*, 186 A.2d 919 (Pa. 1963).

From a landowner's perspective, the sooner a company begins producing gas from their lease, the better: landowners and lessors are paid royalty payments based on gas production. Hence, if there is no production, the lessor has no income.

Please see *Indefinite Lease* on page 9

Marcellus Appraisal from page 5

Typically, a well is drilled into a gas horizon that is not owned by the developer. The developer instead has a lease. The lease can be viewed as an option which, for a fee, gives the developer a set number of years to drill and produce. If a well is not drilled and produced during this time period, control of the gas reverts to the land owner. If the well is drilled and produced, the lease becomes perpetual, thus transferring the ownership of the gas (working interest) to the developer. The land owner is then paid a royalty, usually a percentage of the income (royalty interest) produced from a well (typically between 15 and 20% of adjusted gross income).

There is an obvious incentive for the developer to develop at least some gas from each lease. This may be accomplished with a well on a lease or a well that addresses a collection (unit or pool) of leases. Because of size, some properties can only support a portion of a well's production; large properties may be able to host multiple wells. The driller decides how, when, and to what extent to exploit each property based on lease requirements as well as technical, investment, capital, and other factors.

Well production is not stable – it decreases over time. When the well area is first drilled and stimulated, gas rushes to the well. Some wells produce more than one billion cubic feet (one million mcf) of gas in the first year. Production rapidly declines each year thereafter – by 35 to 55% by the second year, 20 to 30% in the third year, and at declining rates in subsequent years.

The well remains in production until the annual production no longer covers the operating and selling costs. For the Marcellus, production statistics and predictions (including total volume in place, ultimate producible amounts, and rates of probable production) are difficult to estimate. This is because, when compared to the extent of the field (60 million acres), only a few wells have

been completed and none of them have produced for more than a few years.

Simple math shows that a well into the Marcellus can be a highly profitable endeavor, with gross incomes and royalty payments potentially exceeding \$25,000,000 and \$3,750,000, respectively. Of course, these incomes occur only when the well is producing. Most importantly, these gross incomes are the summation of payments that are predicted to occur over time. Because of the uncertainty of the market and of lack of certainty in the production and income flow, the income stream must be discounted significantly to estimate a present worth.

The Security and Exchange Commission requires that hydrocarbon reserves be reported as Proven Producing and Proven Non-Producing. Other classifications included Probable, Possible, and Speculative. These classifications are based on the quantity and quality of the geologic and engineering data available to describe the site. The commission requires that a different level of reserves be discounted by each classification. The IRS uses a similar approach to define the levels of probability of reserves to be brought on line.

Most importantly, not all leases (proven or otherwise) will be drilled today and not all properties will be fully developed. Given the number of drill rigs available in Pennsylvania (Figure 4, from Baker Hughes Rig Count¹) and the length of time needed to obtain and prepare a site, drill a well, stimulate production, and tie the well into a transmission system, there is enough undrilled land to sustain drilling into the Marcellus for at least 50 years. Statistically, each property has a 2% chance of being drilled. The question to be addressed is: which site will be drilled when?

In estimating when a property is likely to be drilled, it is useful to look to the market:

- Are there capital investments nearby that can be amortized through local production (compressor stations, processing facilities, etc)? *(continued on next page)*

- Are there transmission pipelines or gathering systems available to ship the gas to market?
- Has production proven to be higher or lower than average in this geographic area?
- Is the lease about to expire? In other words, if drilling is delayed will the option revert to the land owner exposing the lease to competitive renegotiation? Many drilling companies are frantically in the process of attempting to hold as many leases as possible by drilling and producing throughout the state.

In short, not all properties are the same. Because of the recent nature of the effort, the appraiser must look to other shales that have been developed (Texas and Oklahoma). Because of the sheer size of the Marcellus area, the appraiser must emphasize time in developing cash flows and related discounts. Because of the uncertain nature of the unseen resources, the appraiser must rely upon geologic and engineering tests as referenced by the SEC and the IRS. Finally, given the vast quantity of Marcellus and the vast quantity of other shales below the Marcellus and located in other regions of the U.S. the appraiser must recognize that this new technology has resulted in a flood of natural gas that is likely to hold down prices for the foreseeable future.

[Further installments of this article will appear in subsequent issues of the newsletter.]

Staff Corner:

Each month a different key member of our staff will be featured, detailing their education, expertise, and interests. To start off, we'll introduce you to the founder, owner, and chief appraiser of Resource Technologies Corporation, Jeffrey R. Kern.

Jeffrey R. Kern received his bachelor's degree in Political Science and Geology from Dickinson College in 1973. He went on to receive a Graduate degree from the Pennsylvania State University in Regional Planning, with an emphasis on Resource Economics and Public Administration.

Mr. Kern founded Resource Technologies Corporation over 30 years ago after working for an appraisal firm and deciding that natural resource appraisals could be tackled a different and better way.

He currently holds several professional certifications, and is a Senior member of the American Society of Appraisers, a Certified General Appraiser in many states, a designated member of the American Institute of Mineral Appraisers, and has been on the Board of Directors of the International Mineral Economics and Management Society.

Mr. Kern lives in State College, Pennsylvania with his wife, Jerrilyn. He is also blessed with two children (Joshua and Lauren), two children-in-law (Tara and Michael), and one grandson - named Jeffrey, after his grandfather.

Gas Use, from page 3

Deloitte also modeled a scenario where worldwide gas demand explodes — the "Grand Slam for Gas" model — and a scenario where shale development costs are lower than currently assumed.

"One of the most significant insights that can be gleaned from modeling these scenarios is that prices rise to levels that are higher than current market expectations, as reflected in recent NYMEX futures prices," Deloitte said. "However, despite burgeoning U.S. demand for gas-fired power generation, natural gas prices are not projected to reach the peak prices seen several years ago."

Those rising prices will incentivize producers to ramp up activity, Deloitte said. "Increasing U.S. shale gas output bolsters domestic gas production, which grows from about 66 Bcfd in 2011 to almost 79 Bcfd in 2018 before tapering off," according to the report.

The ramp up in supply will come from diverse regions, likely overhauling the historical basis relationships over the next two decades.

"Most notably, gas prices in the Eastern U.S., historically the highest priced region in North America, could be dampened by incremental shale gas production within the region," according to Deloitte. "Meanwhile, Western U.S. prices are projected to rise faster than those in other parts of the nation due to the region's comparatively small supply, absence of LNG import terminals, and declining gas production in Western Canada. Over the long term, California prices are projected to be higher than Mid-Atlantic prices, a dramatic reversal from historical relationships."

Indefinite Lease from page 6

The disputed issue between Hite and Falcon was whether the plaintiffs were permitted to terminate the leases, despite a provision in the leases that allowed Falcon to continue to pay \$2 per acre, per year, as delay rental.

The court determined that it was the parties' original intention to accomplish certain drilling operations on the land owners' properties within the first year of the lease — not for the properties to sit idle for six to seven years. The court reasoned that if the parties originally intended for a lease to extend indefinitely for \$2 per acre per year, there would be little need for the parties to agree to the initial one-year lease term in addition to the delay rental. Furthermore, the Superior Court stated that since the intention of a delay rental is to "spur the lessee toward development," it would be contradictory to the opinion of the courts of Pennsylvania to allow Falcon to pay delay rental indefinitely.

Hite v. Falcon Partners may have a significant impact on present and future oil and gas leases for Marcellus Shale drillers and land owners alike. Lessees who have not initiated exploratory or



drilling operations, and who are beyond an initial lease term, may be in jeopardy of losing their property rights if owners are successful in terminating leases before production commences. Lessors and lessees that intend to use a delay rental provision to extend their lease term must take this ruling into account when drafting their new agreements, explaining clearly their intentions, to avoid an unintended termination. Lessees may also consider drilling sooner, rather than later, to preserve their gas rights. The case may be subject to appeal to the Pennsylvania Supreme Court.

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