

What's the big FRACKING deal?

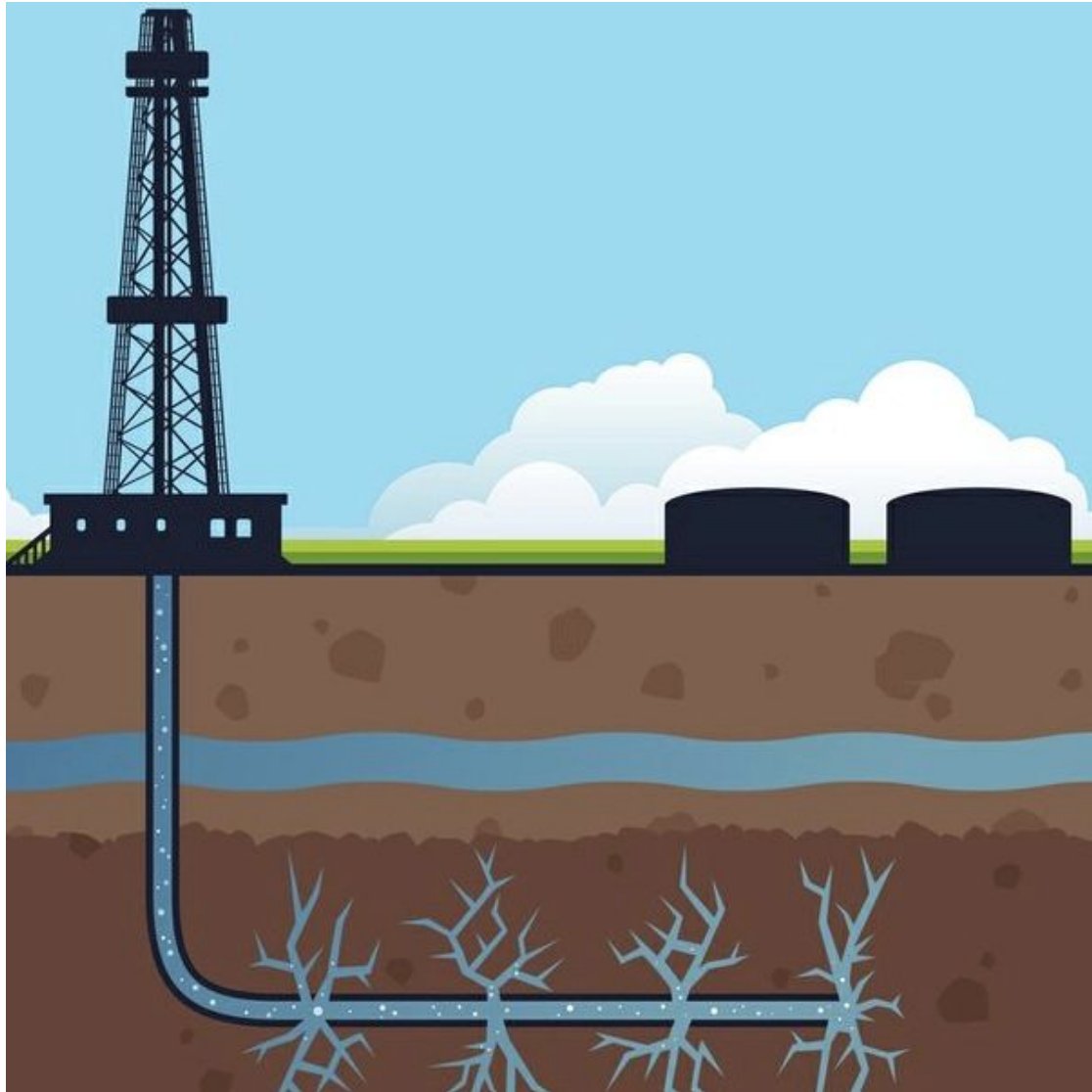
A Plan for a New New York

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EXECUTIVE SUMMARY

Objective

To provide a path forward for counties and municipalities that want to allow hydraulic fracturing to be used in energy development while respecting the wishes of those who do not.

Goals

1. Reduce the cost of energy in New York.
2. Protect land values and encourage local development of existing oil and gas resources.
3. Provide jobs and economic development in the Southern Tier region of New York.
4. Minimize a “gold rush” in areas that elect allow hydraulic fracturing.

Background

1. The Marcellus Shale Formation, which underlies southern New York and much of Pennsylvania and West Virginia, contains largely untapped natural gas reserves and is the source rock for much of the oil and gas developed in within these states.
(Geology.com)



2. To tap this formation, the first gas well in New York was drilled in 1821 in Chautauqua County specifically for lighting local businesses. New York's gas industry was able to keep up with demand for lighting and industrial uses in Western New York for the next 80 years, but after the year 1900 demand outpaced supply despite high output. Natural gas production had several production peaks in the 20th and 21st centuries. New York currently produces 36 million cubic feet per

day of natural gas. In comparison, Pennsylvania produces 14.5 *billion* cubic feet per day, nearly 400 times as much as New York. (*Energy Information Agency, 2018*)

3. By 1914, a total of 60 million barrels of oil had been produced in New York and a peak in oil production was reached in 1942 when 5.4 million barrels were produced in that year. (*NYS Energy Research and Development Authority website (NYSERDA)*). Oil production declined after World War II and, in 2016, only 222,000 barrels were produced, just 4% of the 1942 peak.
4. Without hydraulic fracturing (“fracking”), natural gas remains trapped within the tight shale rock formation. With fracking, gas and oil can be produced by using water (hydraulic) to fracture the shale and create small fissures that are held open by sand to allow the hydrocarbons to enter the well. (Gandossi, Von Estorff, 2015)
5. In 2014, Governor Cuomo banned hydraulic fracturing in New York State. This was after an exhaustive 4-year study of the process and 2-year delay in releasing findings. The health study does not specify how fracking harms nearby residents but concludes that the industry cannot prove the practice to be safe either. (*New York Times, 12/18/14*)
6. In 2017, Governor Cuomo also signed on to an interstate agreement to ban the practice in the Delaware River basin. The upstate counties included in this ban are among the most rural and impoverished counties in New York. These counties received no economic compensation for this ban. (*Gov. Cuomo Press Release, 9/13/17*)
7. To address the various environmental concerns from landowners, environmental groups and the general public, a great deal of ongoing research aims to advance hydraulic fracturing technology. One example of this is Haliburton and Schlumberger’s 2012 efforts to recycle fracking water to curb the wasteful common processes that may use up to 4 million gallons for a single well which is later disposed of in deep saltwater disposal wells. (*Wall Street Journal, 11/20/12*)
8. The previously mentioned recycling efforts, also known as “flowback”, have slowed as some formations are more negatively responsive than others, but it is worth noting that in nearby Pennsylvania over 98% of fracking water is recycled; 86% of

the produced water from the well is recycled as well. Produced water is water that is withdrawn from the well after completion. (*Pennsylvania Dept. of Environmental Protection*)

9. New fracking processes are being developed as well. In 2014, a well cost 1.3 million dollars with a lateral 7,000 feet long. The industry is now drilling wells with 15,000 feet long laterals for 2.2 million. This reduces the number of well pads and lowers costs for the producer. This means more gas can be profitably produced below \$3.00 per million BTU. (*Journal of Petroleum technology.*)
10. The New York Supreme Court found that local municipalities, townships and counties may ban hydraulic fracturing using their local zoning authority. (*NY Supreme Court, Norse Energy Corp. USA v. Town of Dryden, Cooperstown Holstein Corp. v. Town of Middlefield; 2014*)
11. During the early days of the fracking boom, hydraulic fracturing was done with expensive gels high in carcinogenic hydrocarbons. A well drilled by Mitchell Oil in 2002 proved that more gas was produced using half of gel in the fracturing water. (NPR, 9/27/16) Today's hydraulically fractured well uses trace amounts of these chemicals. Energy information sites report that current mixtures contain less than 0.5% of chemicals to fracture shale rock. (NPR, 9/27/16)

Solution

New technologies are being developed in the energy industry to resolve issues around hydraulic fracturing. Many issues surrounding hydraulic fracturing are being researched at Texas A&M and other universities. While legislation can drive some change in the industry, many of the issues also drive up expenses for drilling and completing a fracked well. The fewer chemicals and less water that are used, the lower the cost to bring the well into production. Lower costs will generate higher profits for energy production companies.

New York's state moratorium on fracking was implemented after an exhaustive study and a 2 year delay in releasing the findings. Governor Cuomo has stated that the decision to ban fracking hinged on the opinion of Howard Zucker, the study author. Dr. Zucker asked himself 'Would he want his family to live in a community where fracking was taking place? His answer was no.' Dr. Zucker stated, "We cannot afford to make a mistake. The potential risks are too great. In fact, they are not even fully known." While he could not point to specific environmental harm, he also found insufficient evidence to affirm the safety of the process.

As fields are developed, most landowners do not own enough land for a well that would economically produce. Each state has field rules that dictate how much acreage an oil or gas well can draw from. This is known as **well spacing**. Well spacing in New York is set by the depth of the well with shallow wells having 80 acres, deep wells like Marcellus have a spacing of 640 acres or 1 square mile. Property owners are grouped together to have their minerals taken by a well in a **force pooling** hearing. This hearing will establish the agreement for a specific well to take oil and gas from a specific geographic area. This policy was developed so the royalty fee each landowner will receive from the well based in proportion to the amount of land they own.

Recommendation: Allow local municipalities and county governments to determine if hydraulic fracturing should be allowed in their jurisdictions. If there are any problems associated with fracking, these will be felt at the local level -- certainly fracking in Chautauqua County will not affect the quality of life for NYC residents. Therefore, the decision to allow fracking should be made at the local level. Counties and local governments are allowed to enforce zoning laws and restrictions on producers without separate action from state government or agencies. Large population centers will not see, hear or smell well operations in Chautauqua County or other counties on the Southern Tier.

Recommendation: When lifting the moratorium, the ban will be lifted 90 days later. Local governments are encouraged to implement 18 to 24 month holds on drilling if they want to allow hydraulic fracturing. This will allow local zoning regulations to be written and a local workforce to be trained in jobs in the industry. If Recommendations 1 and 2 are followed, this will prevent a "gold rush" mentality from setting in as it often does with mineral production.

Recommendation: Relocate force pooling proceedings to the county courthouse where the unit is located. This will make it easier for all landowners to attend the hearing. Currently, all force pooling proceedings occur in Albany at the Dept. of Environmental Conservation office. The required acreage percentage for bringing a force pooling motion in New York is 60%. If successful, landowners that are force pooled will be paid according to the highest paid contract covering the existing acreage. Owners of large acreage holdings may not have the interests of small holders in mind. If small acreage holders wish to object to the motion, they must travel to Albany on a day that can be inconvenient or burdensome.

Recommendation: Request full drilling plans of well spacing *before* force pooling hearings but are held in confidentiality to parties to the pooling hearing. The plan is disclosed to the public at the hearing. A full drilling plan will encourage producers to sign multiple units rather than piecemeal. It could also encourage smaller groups of producers to sign up for 3rd party midstream firms for this process. New York State has few truly rural areas and oil, gas and water lines need to be laid out to minimize disturbance to the land. Drilling plans are becoming more public in recent years. There has been issues with new lines being placed in conflict with older unmapped lines or

existing utilities. These conflicts could be resolved by routing gathering lines in conjunction with utilities.

The prosecution of environmental laws has been largely unsuccessful in the United States. While offending corporations are held financially liable for environmental damage, individual employees that wilfully cause environmental damage through actions or inaction are rarely convicted. One well known case was the Deepwater Horizon catastrophe. Several economic and operational decisions were made by individuals on the drill rig ship that resulted in a major environmental spill and the deaths of 11 people. None of these individuals received significant prison time even as their corporate employers were found guilty, paid 7 billion dollars in fines and another 20 billion into restitution funds.

Recommendation

We propose a small office of 8 people staffed with headcount from the New York Attorney General, NYSDEC or the Governor's office to provide industrial expertise for the prosecution of environmental crimes. Named the Environmental Victims Unit (EVU), this office would provide forensic engineering evaluations of industrial processes that break environmental laws. While many environmental crimes are prosecuted by the Federal Government, NYSDEC issues the permits and provides the enforcement actions against offenders. New York State government often provides invaluable assistance in prosecuting these cases. A small state office would eliminate conflicts of interest for an engineering and technical staff that independent contractors have when testifying in court. The EVU could also provide technical insight for NYSDEC in permit evaluation and monitoring of firms under probation.

Potential Results:

Lower energy costs

Currently, New York imports a vast majority of its hydrocarbon energy through pipelines from energy-producing areas of the United States. The majority of these pipelines were installed prior to the 1980s. While the pipeline diameters remained the same, New York's economy continued to grow and demand for energy has increased. Recent retirements of nearly all of New York's coal fired power generation have also increased the demand for natural gas. However, it is difficult for gas from the Marcellus Formation in Pennsylvania to enter pipelines due to pipeline locations. As such, New York and New England often pay higher prices for natural gas than the rest of the country. During the "Bomb Cyclone" event in the winter of 2017-18, prices spiked in New York City at \$140 for 1 million BTU's (or roughly 1,000 cubic feet) of gas while the rest of the country continued to pay less than \$5 for the same amount energy that day. (EIA, 2018)

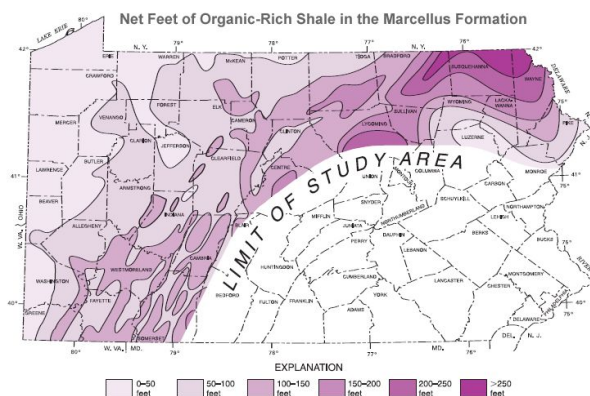
Developing additional natural gas resources in New York will lower energy costs for New Yorkers since it will increase the natural gas supply in a state that is currently importing the majority of - that fuel. It will also provide New York utilities the flexibility to increase withdrawal from wells located in the state. During winter months, gas wells in Texas open a choke valve wider to allow more gas to flow out of the well. This gas enters the system and can be burned in New York or other locations in the country. Currently, it takes 4 days for a gas molecule to move from wellheads in Texas to the New York City. While the pipeline systems can accommodate weather events, extreme scenarios like the Bomb Cyclone test the system and could cause shortages since current gas pipeline routes from Pennsylvania are not geographically efficient for the city.

Protect existing land values and encourage local development of existing resources.

Hydraulic fracturing can be performed on existing oil and gas wells as well as new ones. Currently, New York has over 900 vertical production wells producing oil and gas in the state. Hydraulic fracturing, if allowed, could be used to “rework” some of these wells and stimulate production again. This would not hinder existing land values while providing some moderate increase in production.

Provide jobs and economic development in the Southern Tier region.

New York’s Southern Tier region is nestled between the Niagara Escarpment and the Pennsylvania border. A good portion of Pennsylvania’s Marcellus wells have been drilled and completed on the other side of the border. According to the map below, some geologists believe the “sweet spot” of the multi-state formation to be in Broome and Delaware Counties of New York. Thickness of the shale corresponds to the likely production of the well. The thicker the shale layer, the more gas that can be produced by the well.



Energy production is a labor and capital-intensive business. Most gas production companies report that Marcellus wells cost between 5 to 7 million dollars each and require roughly 20 person crews to drill and fracture the well. Gathering systems will need to be installed as well as gas processing facilities to separate methane and ethane, the components of natural gas, from other hydrocarbons. New delivery pipelines may also need to be installed as well as an expanded electrical grid, roadways and other infrastructure to support the activity.

The majority of jobs in energy production pay over \$60,000 per year and some can easily pay over \$100,000 per year. Energy producers prefer to hire locally as they suffered from public relations in the early days of Marcellus production by using crews from Texas and Oklahoma. They are accustomed to training new hires as many energy firms are still reporting over 40% of their workforce will retire within the 10 years.

Minimize the “Gold Rush” by phasing in production.

Prior to the formal moratorium, Governor Cuomo implemented a temporary moratorium during the study. Several energy production firms were busy during this time acquiring mineral leases and generating production plans. Some of these plans are still very viable due to surface geography and the locations of existing infrastructure. Governor Cuomo finalized the moratorium in 2014 causing several production companies to declare bankruptcy. When Governor Sharpe repeals the moratorium, the ban will be lifted 90 days later and local governments will be encouraged to implement their own temporary hold on drilling activities for 18 to 24 months. This hold on new drilling allows counties, townships and municipalities that decide to allow fracturing time to update existing zoning regulations to account for the economic development. It also allows the energy producer time to reaffirm old leases or acquire new ones for their production plan. Existing wells can be fracked 90 days after the ban is lifted where local regulations allow. This is permitted as the oil and gas gathering systems currently exist to service these wells.

Energy firms, in the past, have been hesitant to share their development plans with local officials. This has changed in some instances due to incidents where real estate developers or governments build plans that are in conflict with the energy development.

While well technologies and timelines may still hold trade secrets, gathering line and surface facility locations and surface facilities are not. The hold can allow counties to better coordinate long range plans so that energy production can be facilitated by infrastructure developments rather than being in conflict.

Summary

The Southern Tier of New York is economically depressed. The Marcellus Shale and Utica Shales sit underneath these counties. Many landowners in Southern Tier counties would like to develop their natural gas by fracking the shale deposits. This would provide economic development and jobs for well construction, gas gathering and processing and pipeline operations. The economic benefits would invigorate the area at

a cost of water and infrastructure. New York's zoning laws do allow local counties and cities to regulate well pad locations and operating hours. This has been preempted by Governor Cuomo's ban on fracking statewide. Our solution is to remove the ban and allow well drilling to commence 18 to 24 months from that date. This allows cities and counties time to write and implement zoning laws to regulate development in their jurisdictions. We want to minimize "gold rush" mentality. The creation of the Environmental Victims Unit (EVU) to assist district attorneys with prosecution of environmental crimes will strengthen existing laws in New York and hold individuals and firms liable for bad actions. Allowing job creation while strengthening environmental law enforcement will create better outcomes for all of New York.

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