Potential Natural Gas Drilling in the Taylorsville Basin: Geology, Regulations, and Resource Protection

DAVID SPEARS
STATE GEOLOGIST
VIRGINIA DEPARTMENT OF MINES, MINERALS AND ENERGY
Mission of the Department of Mines, Minerals and Energy

We enhance the development and conservation of energy and mineral resources in a safe and environmentally sound manner to support a more productive economy.
Goal 1:
- Provide for safe and environmentally sound mineral and fossil fuel extraction.

Goal 2:
- Encourage economic development through our customers’ wise management of Virginia’s resources.

Goal 3:
- Enable DMME personnel to perform at their full potential.
DMME’s Organization

- Division of Mines – coal mine worker safety
- Division of Mined Land Reclamation – coal mining environmental protection
- Division of Mineral Mining – hard minerals worker safety and environmental protection
- Division of Gas and Oil – gas and oil worker safety and environmental protection
- Division of Energy – energy procurement, management, and efficiency
- Division of Geology and Mineral Resources – mineral and energy resource studies and mapping
DMME PERFORMANCE MEASURES

Percentage of sites with no adverse off-site environmental damage or public safety hazards
What is Hydraulic Fracturing?

- The process in which fluid pressure is applied to exposed reservoir rock until fracturing occurs.

- The fluid sometimes carries a proppant (usually sand) into the fracture. The fracture closes on the sand, which generally has a higher porosity than the reservoir rock.

- Hydrocarbons (oil and natural gas) flow more freely to the wellbore (increases conductivity).

From API
Technique has been utilized in the Commonwealth since the 1960s.

Over 8,000 wells have been hydraulically fractured in Southwest Virginia.

There have been no documented instances of surface or groundwater degradation from hydraulic fracturing in Virginia.
Hydraulically fractured wells in Virginia typically require 0-300,000 gallons of water.

Increasingly, operators are utilizing nitrogen-based foam to fracture wells.

By contrast, fractured wells in the Marcellus shale typically use 4-5 million gallons of water.
Some Potential Future Energy Resources

- Marcellus Shale
- Southwest VA Coalfield
- Coles Hill Uranium Deposit
- Mesozoic Basins
- OCS Lease Sale 220
- Virginia Wind Energy Area
- TAYLORSVILLE BASIN
Generalized Geologic Cross-section and Partial Seismic Profile across the Taylorsville Mesozoic Basin
King George, Caroline, and Essex Counties, Virginia

NW

Texaco Butler #1
Texaco Payne #1
Texaco Ellis #1

Coastal Plain Aquifers
(sand and clay)

Taylorsville Basin
(sandstone and shale)

Crystalline Basement Rocks
(granite and gneiss)

HYLAS FAULT

0 2 4
MILES

VDGMR/Virginia Tech Seismic Line NAB 11A

Virginia Department of Mines and Energy
The Taylorsville Basin was part of a recent study by the U.S. Geological Survey on the undiscovered oil and gas resources in east coast Mesozoic Basins.
USGS assigned 1.06 trillion cubic feet of gas to the Taylorsville Basin. That’s about 2 ½ times Virginia’s total annual consumption of natural gas.

For comparison, the USGS assigned 410 Tcf to the Marcellus Shale in Pennsylvania, New York, and West Virginia.
USGS and VA DEQ recently completed a study of the Potomac Aquifer, the deepest aquifer in the Northern Neck and Middle Peninsula.
The Potomac Aquifer is the source for large groundwater withdrawals such as paper mills that withdraw 20 – 30 million gallons per day.

Hydraulically fractured wells in Virginia typically use 0 – 300,000 gallons of water.
Rock Formations containing natural gas are several thousand feet deep. Multiple casings are cemented to surface to protect water resources.
All oil and gas operators must comply with:

- The Virginia Gas and Oil Act of 1990
- Virginia Gas and Oil Regulation
- Virginia Gas and Oil Board Regulations
- State Water Control Law
- Virginia Pollution Discharge Elimination System Regulations
- Additional requirements for the Tidewater Region
Applicants are required to notify parties who may be directly affected by the proposed operation, including surface and mineral owners.

These parties have the right to object to permits on specific grounds that are outlined in the law.
PERMIT REQUIREMENTS

- Applicants also must inform localities and publish notices in at least one newspaper of general circulation which is published in the locality where the well is proposed.

- Applications must contain operations plans that detail necessary construction, erosion and sediment control, drilling and stimulation plans, etc.
The Gas and Oil Act allows operators access to private water wells within 750 feet of a gas well operation for sampling purposes.

The law requires operators to replace water supplies if water wells are contaminated or their supply is interrupted by a gas well operation within 750 feet.
ADDITIONAL REQUIREMENTS FOR DRILLING IN TIDEWATER REGION

• Found in 62.1-195.1 of the Code of Virginia
  
  ○ Prohibits drilling in the Chesapeake Bay or its tributaries.

  ○ This prohibition also extends to the greater distance of:
    ▪ Bay Resource Protection Areas
    ▪ 500 feet from the shoreline of the waters of the Bay.
Before drilling can occur, an environmental impact assessment must be submitted to DMME and reviewed by DEQ.

EIA must be submitted to all appropriate state agencies for their review.

DMME must consider DEQ’s findings before a permit can be issued.
For directional drilling, the operator must obtain the permission of all affected surface owners.

Casing is set and pressure grouted from the surface to a point at least 2500 feet below the surface or 300 feet below the deepest known ground water, whichever is deeper.

Multiple blowout preventers must be employed.
An oil discharge contingency plan must be submitted to and approved by the State Water Control Board.

Operator must also demonstrate financial responsibility to implement plan.
Before an oil well can be placed into production:
- DMME must find that production is likely and imminent.
- DMME must then notify the Secretaries of Commerce and Trade and Natural Resources.
- The Secretaries shall produce a report to the Governor and General Assembly.
Before an oil well can be placed into production:

- The Governor may recommend legislative and regulatory changes.
- The General Assembly may accept those legislative changes or implement its own.
- DMME cannot issue a permit for an oil production well until all of the above steps are completed.
• 4 VAC 25-150
  ○ Sets out requirements for:
    ▪ Permit applications
    ▪ Hearing process for objections
    ▪ Technical requirements
    ▪ Reporting requirements
    ▪ Enforcement procedures
Last fall, DMME initiated a regulatory action to review its requirements for drilling.

- Chemical disclosure requirements
- Review of current industry best practices
- Review to determine if additional requirements are necessary for different regions of the Commonwealth
DMME will utilize a Regulatory Advisory Panel to assist in reviewing regulations.

These meetings will be open to the public.

At least one public hearing will be held after proposed regulations are published in the Virginia Register of Regulations.
Thank you

David Spears, State Geologist
434-951-6350
David.Spears@dmme.virginia.gov

www.dmme.virginia.gov