



**Department of the Environment**

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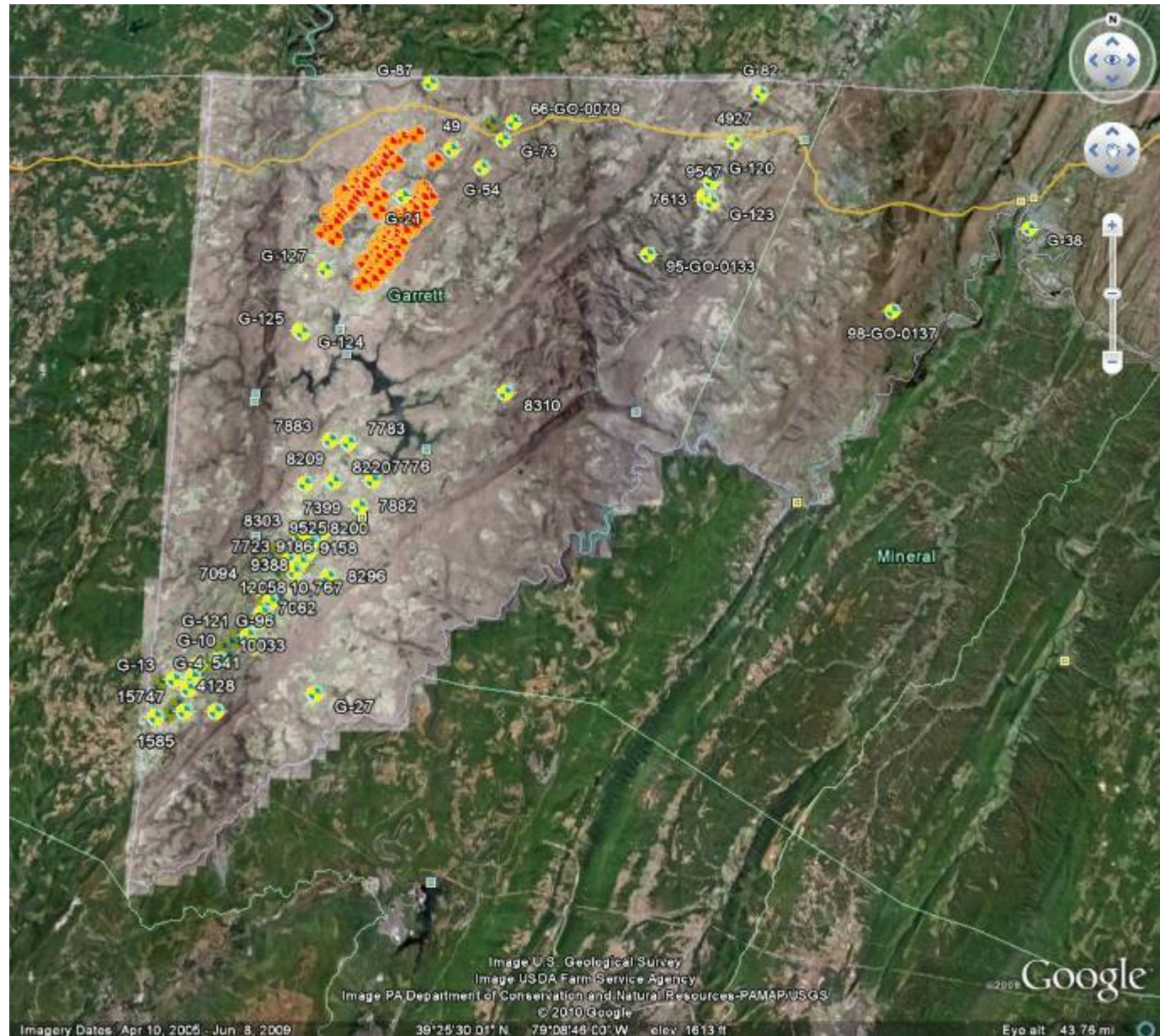
# **Natural Gas in Maryland and The ABCs of Marcellus Shale**

**Marcellus Shale Advisory Commission  
August 20, 2012  
Brigid Kenney, MDE Sr. Policy Advisor,  
Staff to Commission**



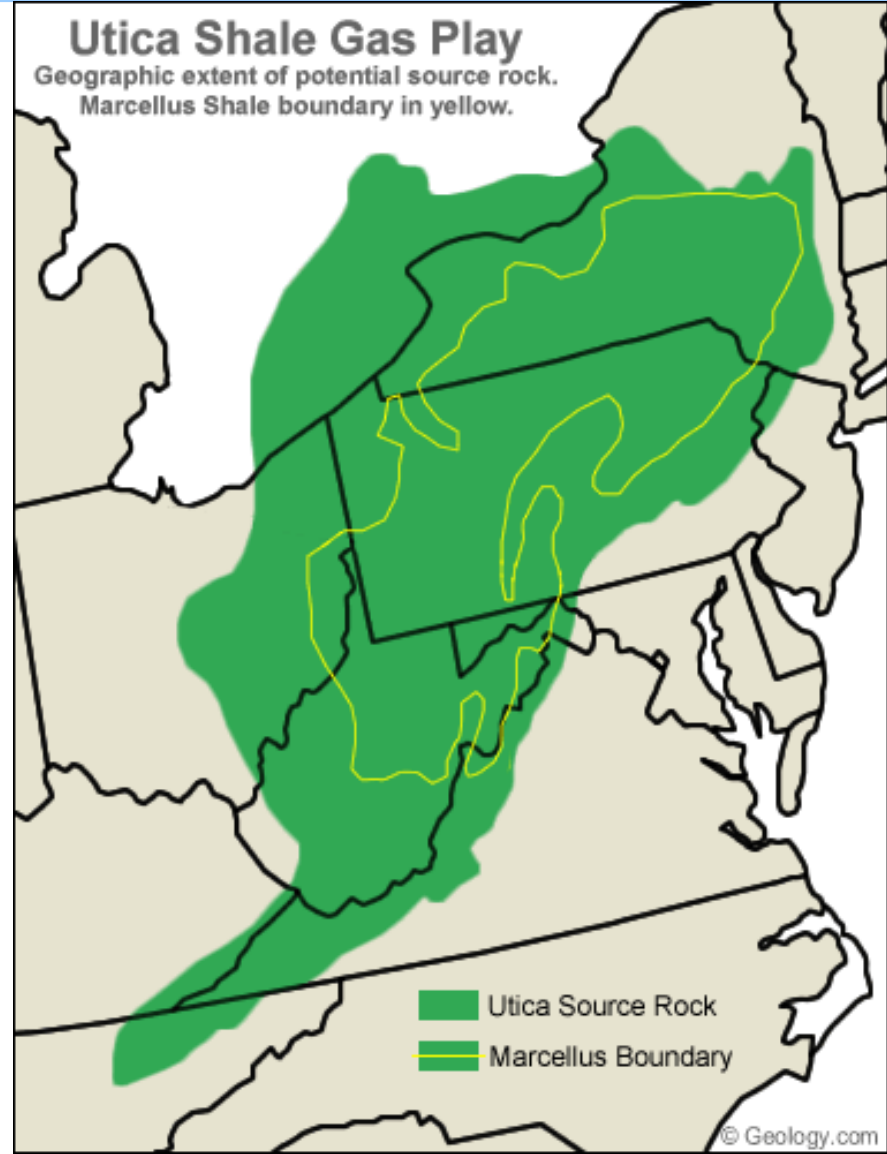
# Drilling Activity in Maryland

- Gas drilling in Maryland is not a new activity
- Several hundred producing wells were drilled in Western Maryland in the 1950's and 60's (yellow)
- 10 Gas production wells are currently permitted
- Approximately 90 permitted sites are being used for gas storage (orange)



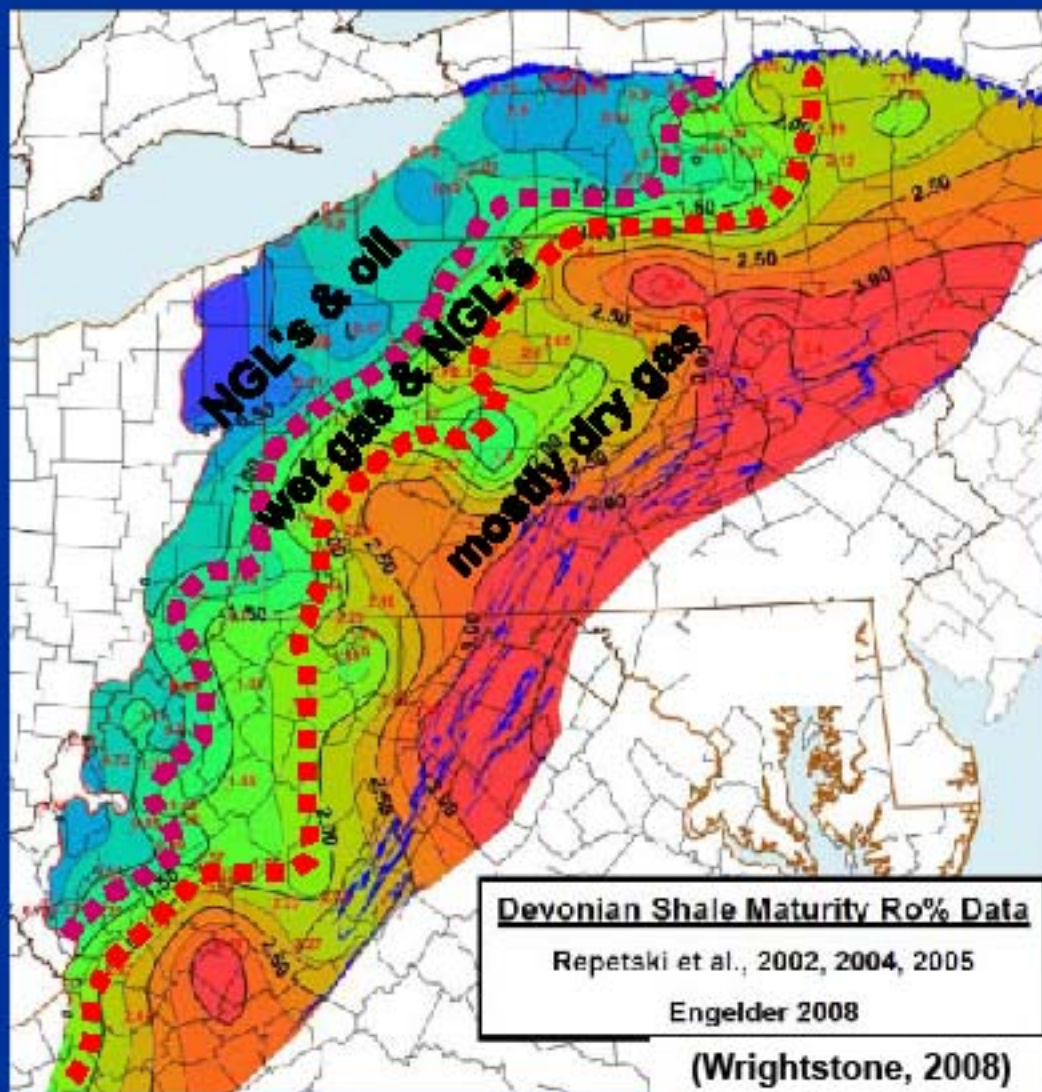
# The Marcellus Shale

- Found throughout the Allegheny Plateau region of the northern Appalachian Basin
- In Maryland, it is found in Garrett County and part of Allegany County
- Recovering gas from the Marcellus became economically feasible
  - Advances in horizontal drilling and hydraulic fracturing
  - Higher wellhead prices for gas, but prices have fallen



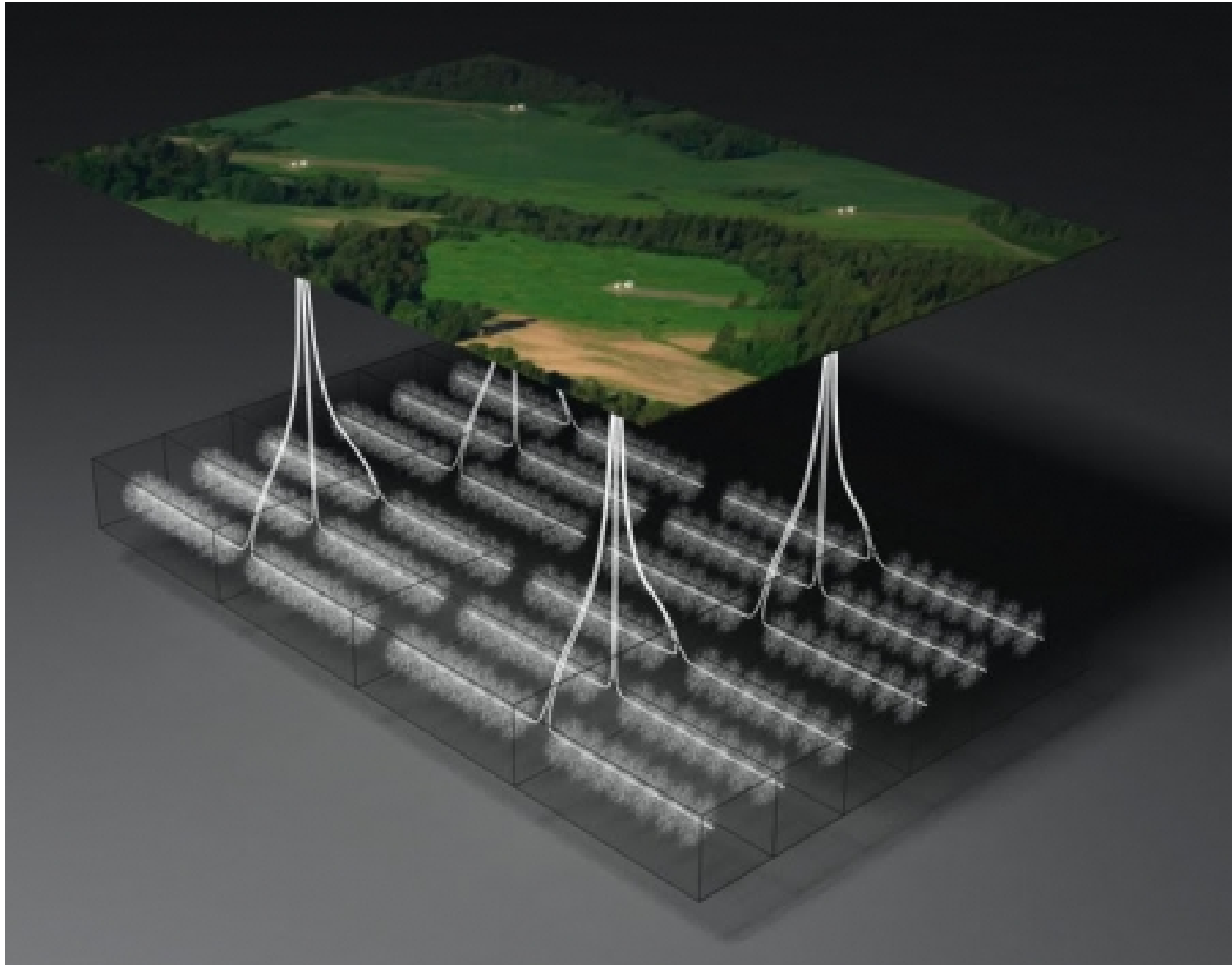


# Devonian Shale Thermal Maturity





# Conceptual Development Plan





# Artist's Drawing of Landscape

Source, Chief Oil & Gas, LLC website







# Artist's Drawing of Landscape

Source, Chief Oil & Gas, LLC website





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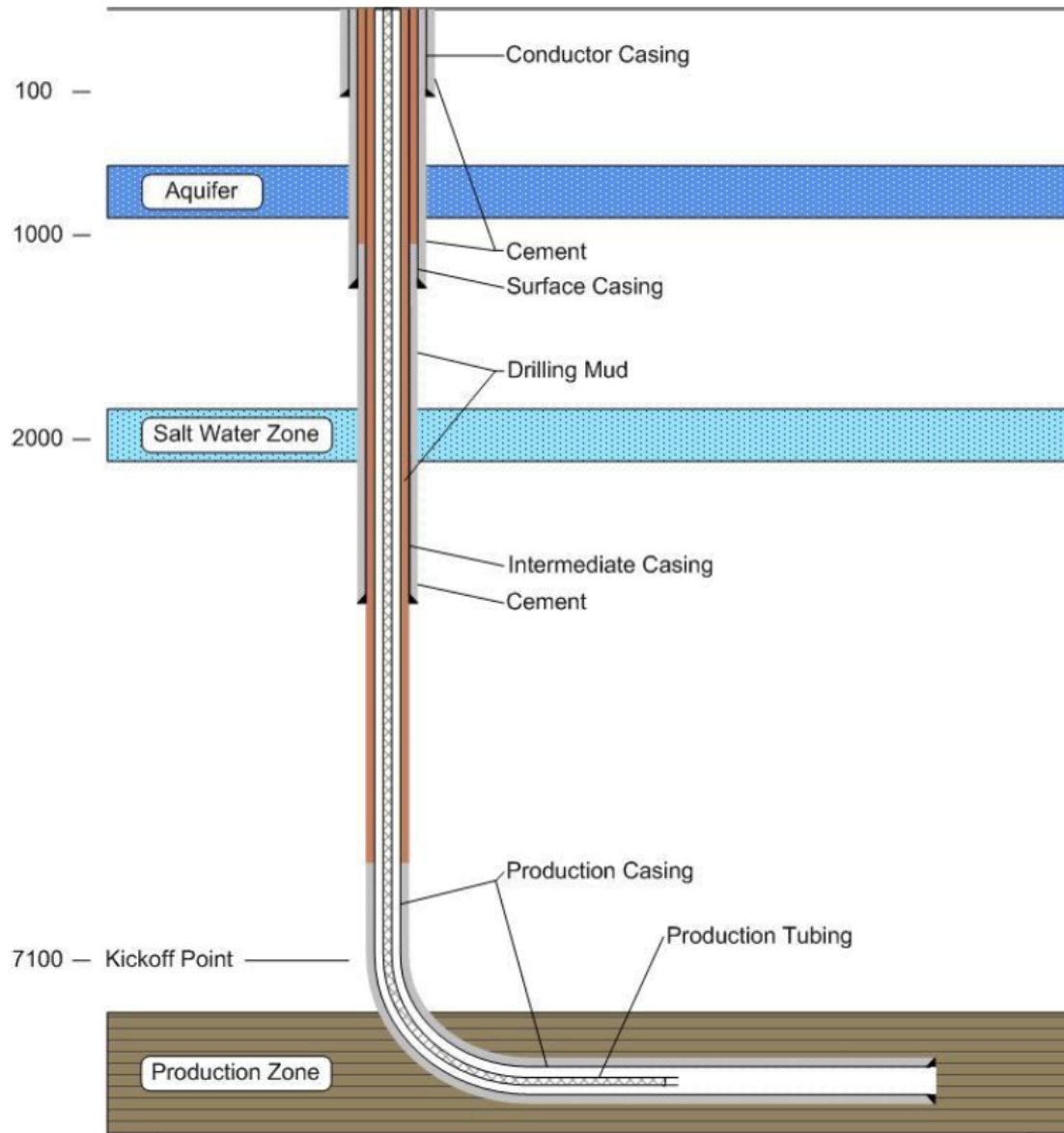
# Actual Landscape

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# Typical Well

## EXHIBIT 30: CASING ZONES AND CEMENT PROGRAMS





Well casing is steel pipe that is inserted into a drilled section of a borehole and cemented in place.

As the borehole gets drilled deeper, smaller diameter casing sections are inserted within the previous casing.

### Maryland

regulations indicate that casing must be cemented with an ASTM-approved cement to a minimum of **100 ft.** deeper than the deepest fresh groundwater.

The cement is intended to isolate the casing from groundwater and prevent natural gas from leaking up around the outside of the pipe, a condition that can potentially allow gas to enter the groundwater supply or cause gas to escape at the surface.



# STAGE 1 - PERFORATION

An electric current is sent by wire to a perforating (perf) gun. The charge shoots small holes through the casing, cement, and a short distance into the shale.

+ How did the Marcellus Shale form?

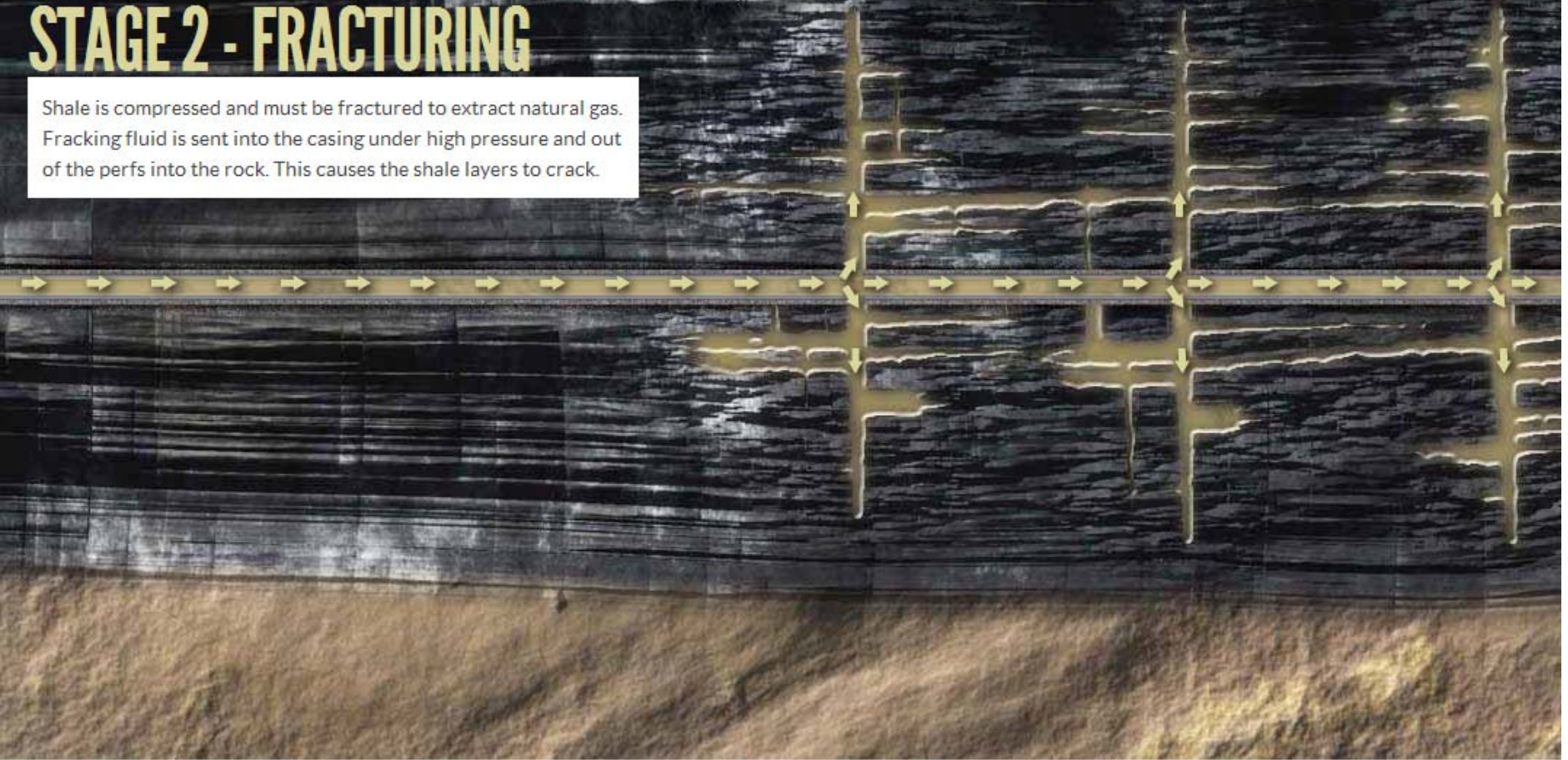
<http://exploreshale.org/>





## STAGE 2 - FRACTURING

Shale is compressed and must be fractured to extract natural gas. Fracking fluid is sent into the casing under high pressure and out of the perfs into the rock. This causes the shale layers to crack.



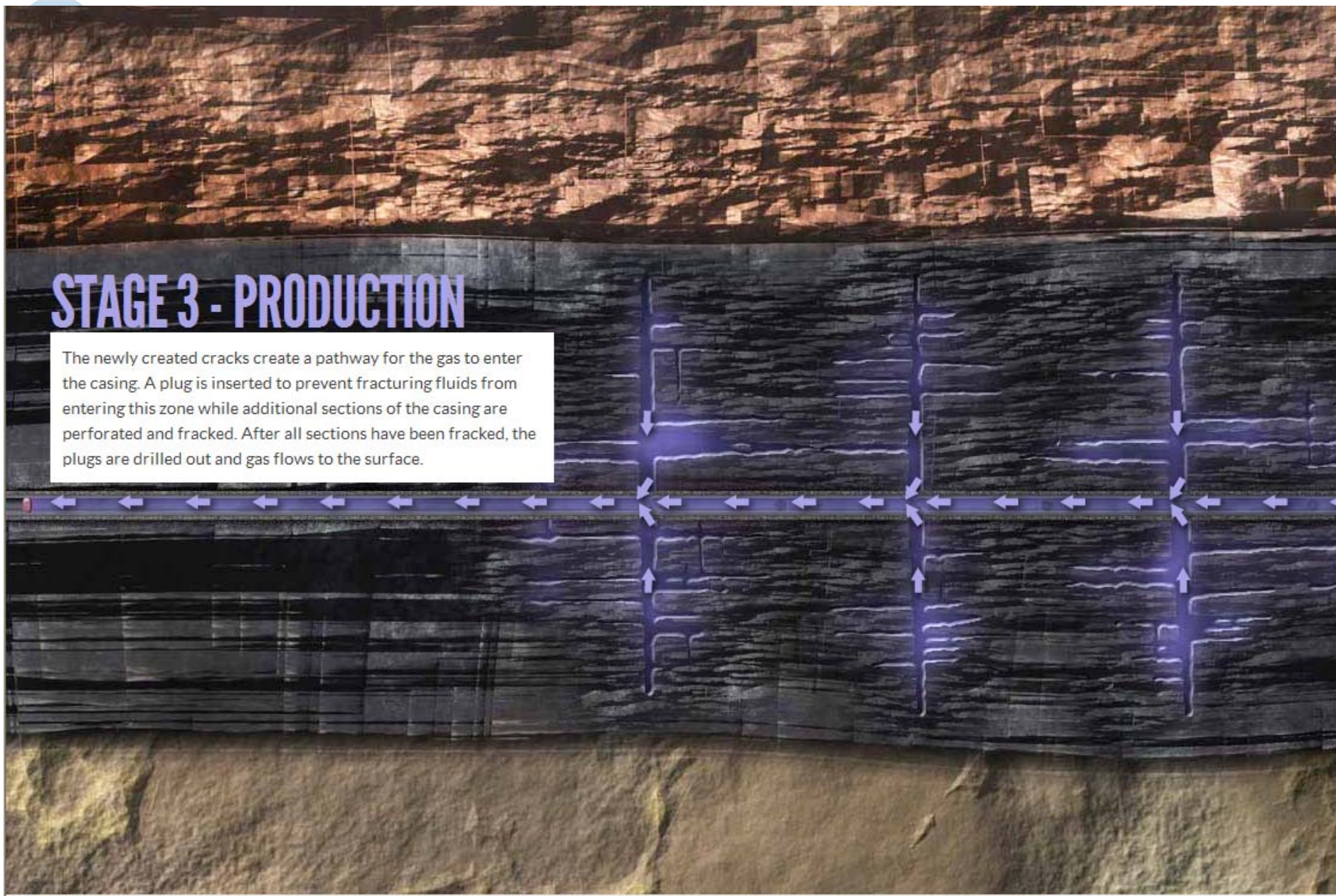
<http://exploreshale.org/>





## STAGE 3 - PRODUCTION

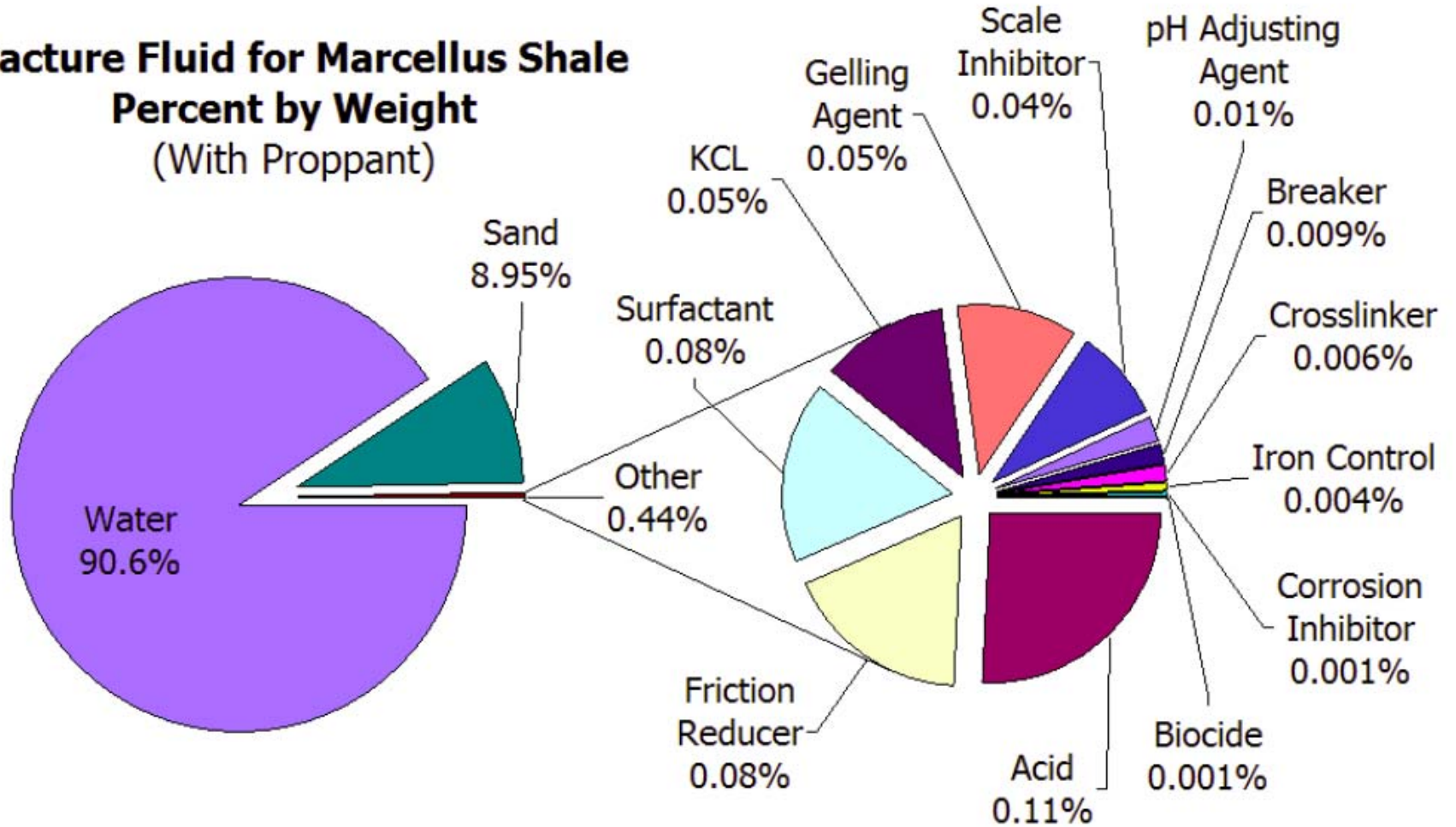
The newly created cracks create a pathway for the gas to enter the casing. A plug is inserted to prevent fracturing fluids from entering this zone while additional sections of the casing are perforated and fracked. After all sections have been fracked, the plugs are drilled out and gas flows to the surface.





# “Typical” Fracing Fluid

**Fracture Fluid for Marcellus Shale**  
**Percent by Weight**  
 (With Proppant)





# Drilling Site in West Virginia

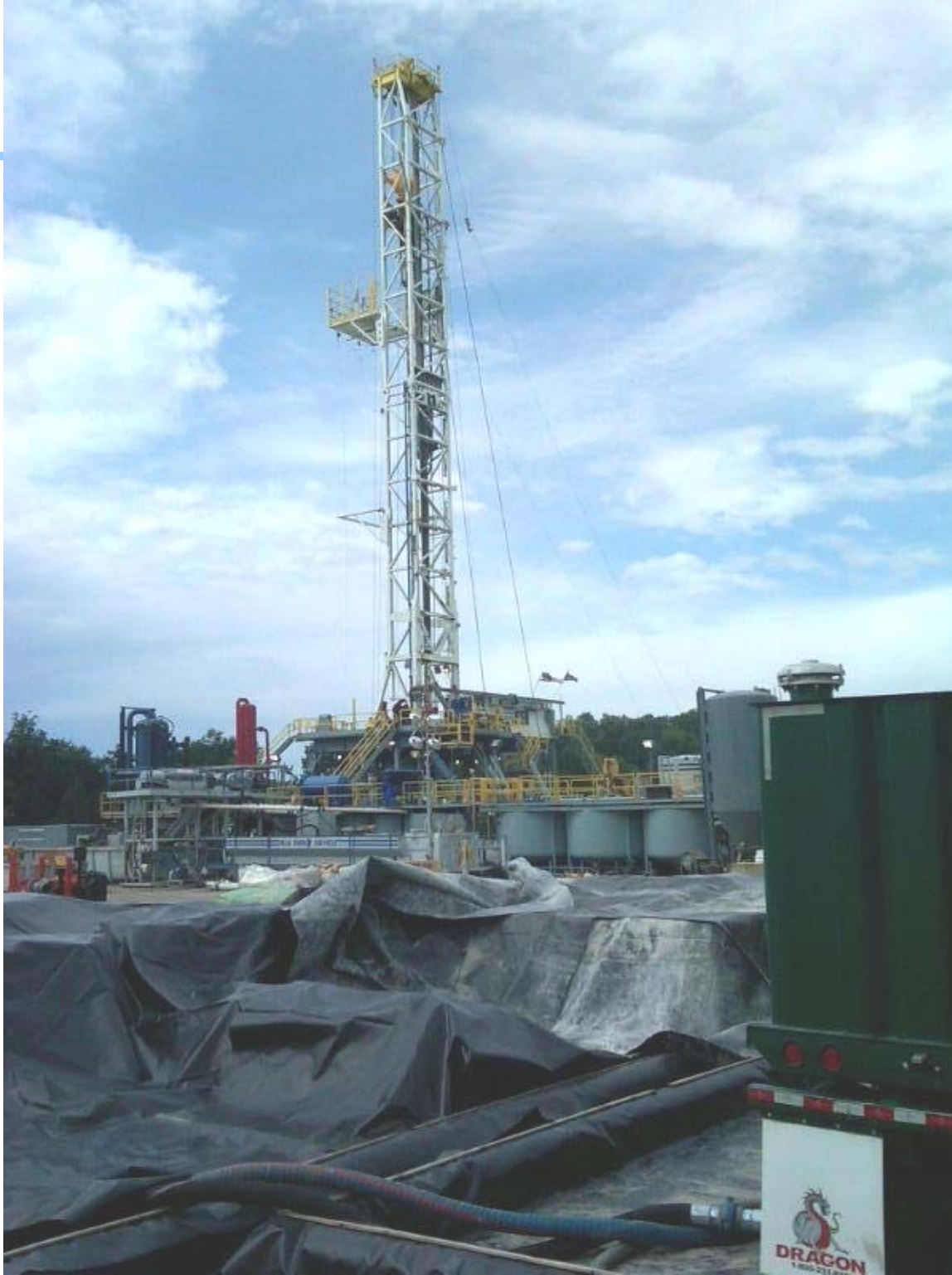




# Drilling Site in West Virginia









# Hydrofracturing Site



*Source: Chesapeake Energy Corporation, 2008  
Hydraulic Fracturing of a Marcellus Shale Well, West  
Virginia*







# Completed Well Site, PA









# Equipment at Production Well Site







# Tanks at Production Well Site







# Getting the Gas to Market

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- Gathering lines
- Pipelines
- Compressors
- Processing



# Pipeline Construction





# Completed Pipeline

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# Opportunities and Challenges

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- Opportunities
  - Improved energy security/Trade balance
  - Lower greenhouse gas emissions from production of electricity
  - Economic development in Garrett and Allegany Counties
- Challenges
  - Operations pose a potential risk of harm to public health and safety and the environment
  - Community and Social Impacts





# Not unregulated, but....

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- Subject to some regulations, *e.g.*
  - Clean Water Act regulations that forbid direct discharge of production wastes, even if treated, directly to surface waters
  - Pretreatment regulations (no Pass Through or Interference)
  - State and local regulations
- Exempt from some regulations, *e.g.*
  - Safe Drinking Water Act Underground Injection Control (unless diesel fuel is used for hydraulic fracturing)
  - Hazardous Waste





# Recent Federal Action

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- EPA issued updated, achievable air pollution standards for oil and natural gas
- EPA, DOI and DOE entered into MOU to align their research related to fracking
- Executive Order 13605 establishing a new interagency working group
- EPA Released Draft Permitting Guidance for Using Diesel Fuel in Oil and Gas Hydraulic Fracturing







# MDE Gas Well Permit

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- A permit is required before the drilling of any gas well
- MDE has broad statutory authority to impose reasonable and appropriate permit conditions to protect public safety and the State's natural resources
- Regulations establish application requirements and the criteria for constructing and operating gas wells
  - Have not been amended since 1993
  - Not specific to Marcellus Shale, horizontal drilling or high volume hydraulic fracturing





# Other Permits May Be Needed

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- **State**
  - Water Appropriation permit
  - Air Quality permit for drill and support equipment
  - Wetlands and Waterways permit
- **Local**
  - Planning and zoning requirements
  - Grading
  - Erosion and sediment control





# Gov. O'Malley's Executive Order

- June 2011
- Directs MDE and DNR, in consultation with Advisory Commission, to conduct a study and issue reports on:
  - the short-term, long-term and cumulative effects of natural gas exploration in the Marcellus Shale
  - Best practices
  - Appropriate changes, if any, to the laws and regulations concerning oil and gas







# Report

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- December 31, 2011
  - Revenue and Liability issues
- August 1, ~~2012~~ 2013
  - Best Practices
- August 1, 2014
  - Remaining issues





# Thank you

