



**Department of the Environment**

# Air Pollution and Marcellus Shale Gas Drilling



*Current Thinking on Regulatory Requirements*

**Tad Aburn, Air Director, MDE**

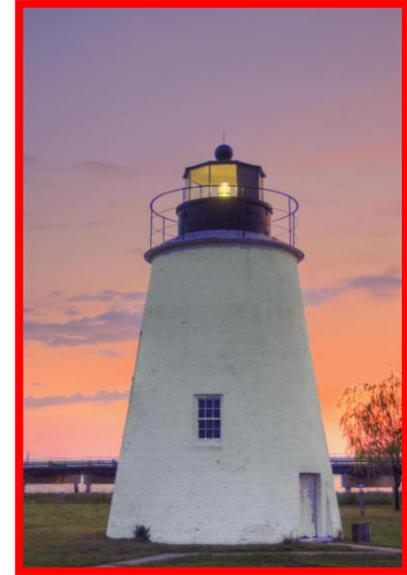
**Maryland Marcellus Shale Advisory Group**

**May 16, 2014**



# Topics Covered

- Background and Overview
- Key Regulatory Concepts
  - Top-Down Best Available Technology (BAT)
  - Zero Methane
  - Site specific air monitoring
  - Air toxics
  - Fees
- Next Steps



# Background

- June 2011- Executive Order signed by Governor O'Malley
- E.O. emphasizes the need to determine whether and how Marcellus Shale gas production can be accomplished without unacceptable risks
- Requires MDE and other State agencies to develop “Best Management Practices” (BMPs)
- Next steps include finalizing the BMP report in light of comments and preparing a final report



# Technical Support

- MDE has contracted with an expert firm to evaluate state-of-the-art air pollution control practices for Marcellus shale gas drilling operations
  - Leidos (formerly SAIC)
- Study covered or will cover:
  - Control technologies
  - Emissions
  - Monitoring
  - Fee systems
- Looked at experiences in many other states



# Air Emissions from Drilling Operations

- Contributors to ground level ozone formation
  - Maryland has the worst ozone problem anywhere east of the Mississippi
    - Nitrogen oxides (NO<sub>x</sub>)
    - Volatile Organic Compounds (VOCs)
- Greenhouse gases
  - Methane from wells and process lines
  - CO<sub>2</sub> from production/operating equipment
- Air toxics
  - A bigger issue for wet gas
  - N-hexane, benzene, toluene, ethyl benzene, xylene
  - Diesel particulate, etc.
- Other pollutants
  - Carbon monoxide (CO)
  - Sulfur dioxide (SO<sub>2</sub>)
  - Particulate matter



# Sources of Air Emissions

Hydraulic Fracturing and Flowback Emissions

Production Equipment Emissions

- Combustion Sources
- Fugitive emissions (equipment leaks)
- Process venting and flaring
- Storage tanks
- Dehydrators

Mobile source emissions

Nuisance odors and dust

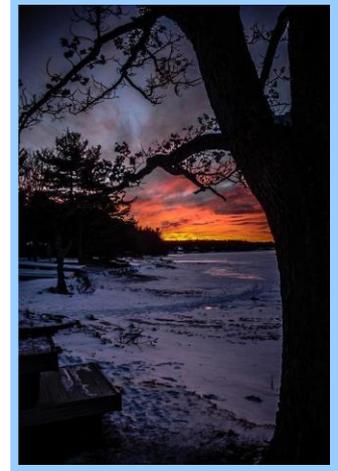
Releases from accidents and equipment failures





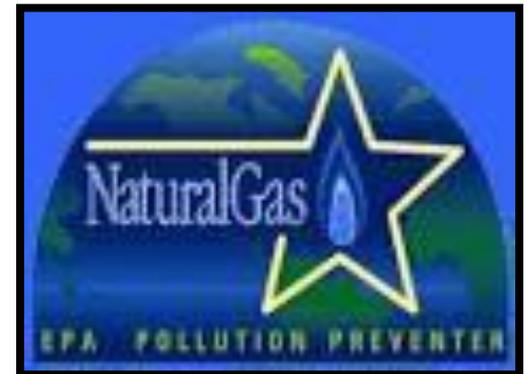
# Minimum Federal Requirements

- Existing Federal regulations are mandatory baseline requirements
  - New Source Performance Standards for criteria pollutants and
  - National Emission Standards for Hazardous Air Pollutants (NESHAPs)
  - Federal regulations do not cover all emission sources at a Marcellus Shale drilling site
- Maryland requirements will go beyond federal minimums
  - Top-Down, Best Available Technology (BAT) requirement



# Top-Down BAT

- Applicant will be required to consider all available technology and implement what is found to be reasonable
  - Builds from EPA's Natural Gas Star Program
  - Must demonstrate that control technologies are not feasible, are cost-prohibitive or will not meaningfully reduce emissions from that component before that technology can be avoided
  - MDE will analyze top-down BAT demonstrations from applicants and approve the applicants BAT determination before a permit is issued



# Elements of Top-Down BAT

- Development Phase
  - Reduced Emission Completions (“REC”) or “Green Completions” required for well completions and recompletions



- Production Phase

- Best available controls on compressors and pneumatic controllers
- Rigorous Leak Detection and Repair (LDAR) program
- Zero emission or desiccant well gas dehydration
- Use flares when critical to safety. Flares must meet 98% destruction efficiency
- Engines must meet latest federal standards
- Best available controls on storage tanks
- Pipeline inspection, maintenance and repair program
- Use plunger lift systems when natural gas liquids (NGLs) are present
- Use electric power instead of engines wherever possible



# Elements of Top-Down BAT (3)

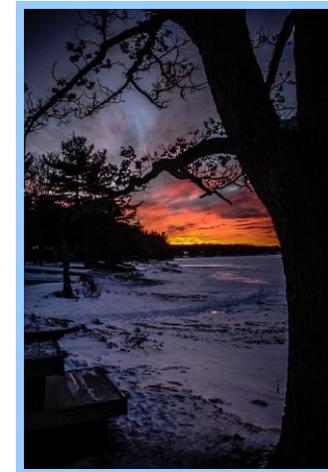
- Mobile Equipment

- Looking at both State and federal authorities
- Because of Maryland’s “worst-in-the-East” ozone problem ...
  - We are looking for authorities to allow us to only permit the use of the cleanest “mobile” generators and other equipment currently on the books
  - Emissions from this emission category can be significant
  - Minimizing NOx emissions, a major emission from mobile generators, is critical to Maryland’s ozone efforts



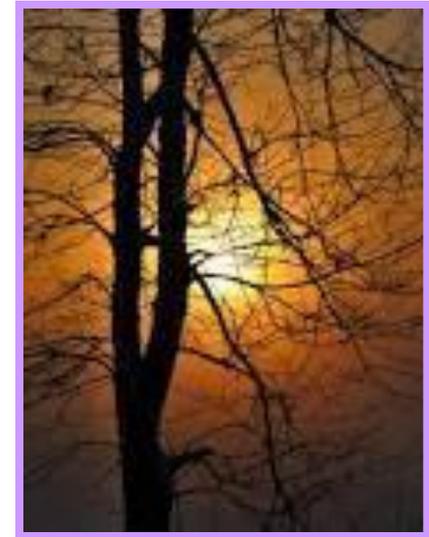
# Zero Methane Requirement

- Maryland has one of the Country's most aggressive greenhouse gas emission reduction programs
- The Greenhouse Gas Emission Reduction Act was adopted by the Maryland General Assembly in 2009
  - Requires a 25% reduction in greenhouse gases by 2020
  - Maryland's GGRA Plan was published summer of 2013
  - Showed that it was possible to reduce Maryland's GHG emissions by 25% with positive economic benefit to MD



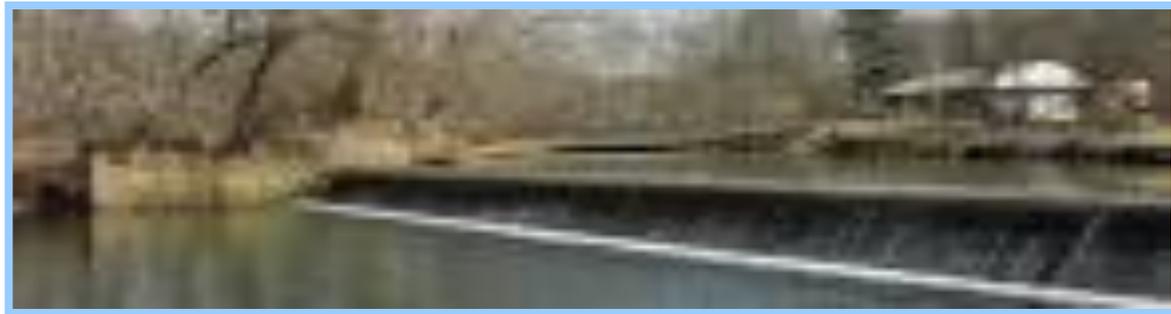
# Zero Methane Requirement (2)

- Reducing Methane is a critical piece of Maryland's GGRA Plan
- Even with Top-Down BAT, there will be remaining emissions of methane, a potent greenhouse gas
- Maryland is considering a "Zero Methane" requirement that would require operators to "offset" any leaking methane emissions that will occur after use of BAT
- Residual methane emissions are offset by purchasing allowances or credits from existing systems



# Why Are Early Reductions in Methane Critical?

- Early action is an important part of Maryland's approach for addressing climate change
  - The longer you wait, the more difficult the problem becomes
- Methane is a very potent greenhouse gas (GHG)
  - Methane emissions are second largest GHG source after carbon dioxide (CO<sub>2</sub>)
  - Over 80 times more potent in the short term than CO<sub>2</sub> ... the most common GHG
  - Over 30 times more potent over a 100-year span



# Methane and the Natural Gas Industry

- The natural gas industry is the largest industrial source of methane emissions at 23 percent of the total methane, and emissions are projected to increase as a result of the hydraulic fracturing boom
- Given its potency, reducing methane emissions early is critical to making early progress to slow global warming
- Reducing CO<sub>2</sub> is also critical, but it will take much longer for CO<sub>2</sub> reductions to have an impact



# President's Methane Strategy

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- On March 28, 2014, the White House released its Methane Strategy to reduce methane emissions in the oil and natural gas industry and other sectors (landfills, coal mining and agriculture)
- Strategy is part of President Obama's goal to reduce U.S. greenhouse gas emissions by 17 percent below 2005 levels by 2020



# How Would the Zero Methane Policy Work?

- Facility would quantify methane emissions ... taking into account controls at site
- Facility would secure either methane or other GHG offsets, allowances or credits equal to methane emissions remaining
  - From existing programs like the RGGI
- Adds extra incentive to minimize fugitive methane emissions
  - Recognizes that capturing fugitives mean more product available for sale
- MDE is still developing the details of how to implement these offset requirements
  - Cost to affected operator will not be unreasonable



# Air Monitoring

- Two factors suggest that air emissions from operations following BMPs will likely not endanger public health
  - Technological and regulatory advances have significantly reduced pollutant emissions in recent years
  - Maryland's underlying shale will produce dry gas and therefore air toxics emissions will be negligible
- Data from recent air monitoring studies of well controlled Marcellus operations using the most sensitive monitoring techniques show concentrations well below health effects levels at 1000 feet
- To ensure protection of public health, monitoring for regulatory compliance (possibly with infrared cameras beyond fencelines) would likely be more effective than ambient monitoring for air toxics and VOCs



# Air Monitoring

- MDE considering a requirement – in certain situations - to require owner/operator to monitor, at fenceline or off property, to ensure that exposures to the public are acceptable
- This requirement will be minimal for situations where drilling site property is large and surrounding areas are unpopulated
  - Maryland already has a 1,000 foot setback requirement from well to property boundary or occupied dwelling
  - Other setbacks being considered
- For operations where there is a potential for public exposure, this requirement would use less expensive screening techniques to trigger more sophisticated monitoring
  - This monitoring could be especially useful during well pad development and in early production months.



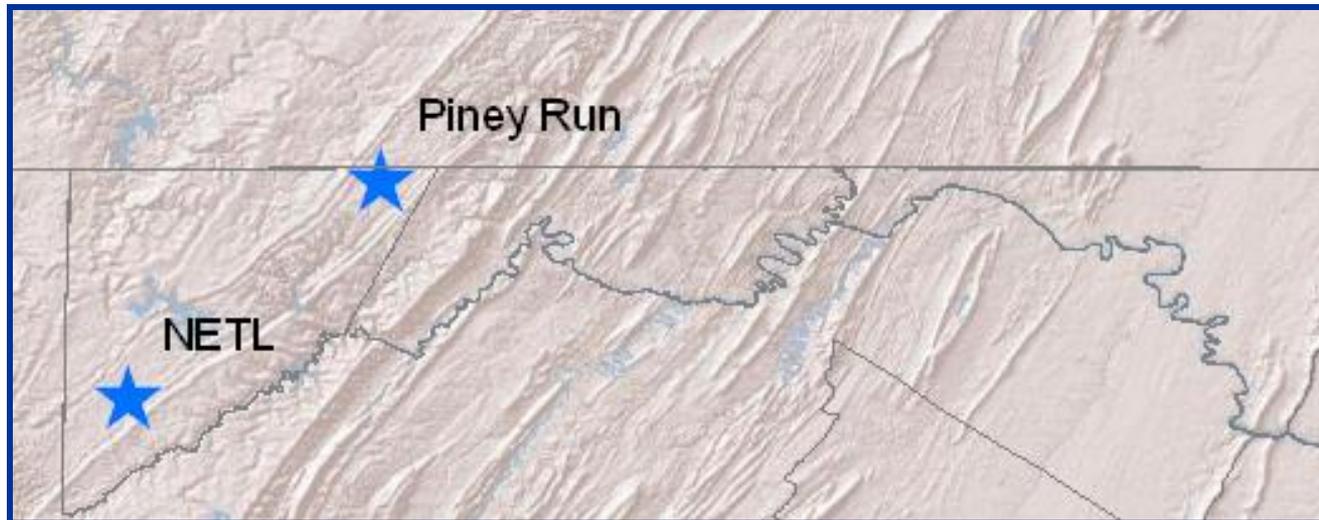
# Air Monitoring Screening Techniques

- Two examples of early detection/alarm/sentinel type monitoring systems include:
  - Infrared cameras to detect methane/VOC leaks and accidental releases
  - Odor detectors (methyl mercaptan monitors) to detect leaks or seal failures
- These can provide for neighborhood scale warnings of malfunctions



# Current MDE Monitoring Efforts

- Enhanced monitoring capabilities at the existing Piney Run station to measure regional background and evaluate presence of any impact from existing operations in Pennsylvania and West Virginia.
- MDE is also collaborating with DOE's National Energy Technology Laboratory (NETL) to conduct local background air monitoring in an area with potential for future activity.



# MDE Monitoring at Piney Run

- Monitoring began in August 2013 and is being extended through April 2015.
- Additional measurements include: Methane, TNMHC, Benzene, Toluene, Ethylbenzene and M/P& O-xylene, nitrogen dioxide.



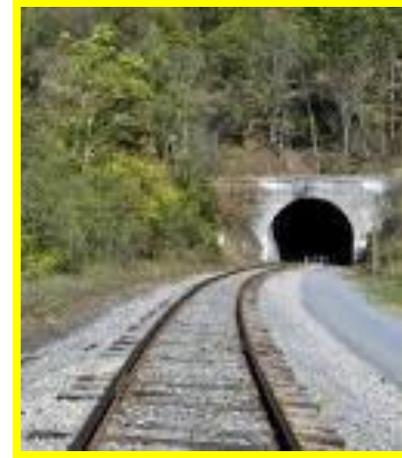
# MDE Collaboration with NETL

- The NETL mobile laboratory will conduct background monitoring of pollutants associated with hydraulic fracturing procedures near Oakland. One month in each season will be monitored through April 2015
- Pollutants include: Methane, Carbon Dioxide, Carbon Isotopes, PM10, PM2.5, VOCs, Nitrogen Dioxide, Ozone, Sulfur Dioxide, Ammonia, Organic and Elemental Carbon and meteorology



# Air Toxics Requirement

- MDE is considering requiring applicants – in certain situations where drilling is close to communities - to demonstrate compliance with State air toxics regulations - COMAR 26.11.15
  - Comments welcome
- Basic requirements
  - Estimate emissions
  - Use State-provided screening models or other modeling to estimate concentrations off of the property
  - Show that offsite concentrations of toxic air pollutants are below health protective benchmarks established in the regulations



# Permit Fees

- MDE is developing a permit fee to cover the Department's cost associated with implementing the new requirements
- These fees will cover the Department's costs for:
  - Technology review
  - Emissions analyses review
  - Approval of offsets
  - Approval and QA of air monitoring proposals and results
  - Permit processing
  - Inspections and monitoring



# Next Steps

- Next step in Maryland's overall process for Marcellus Shale is to finalize BMPs in 2014
- ARMA plans to begin a stakeholder process on regulations to implement the Air BMP this summer
- Please let Randy Mosier (MDE's lead on regulation development) know if you are interested in participating in this process
  - [randy.mosier@maryland.gov](mailto:randy.mosier@maryland.gov)
- Comments?
  - Please drop us a note

