

# EPA's National Enforcement Initiative for Energy Extraction Sector Compliance with Environmental Laws

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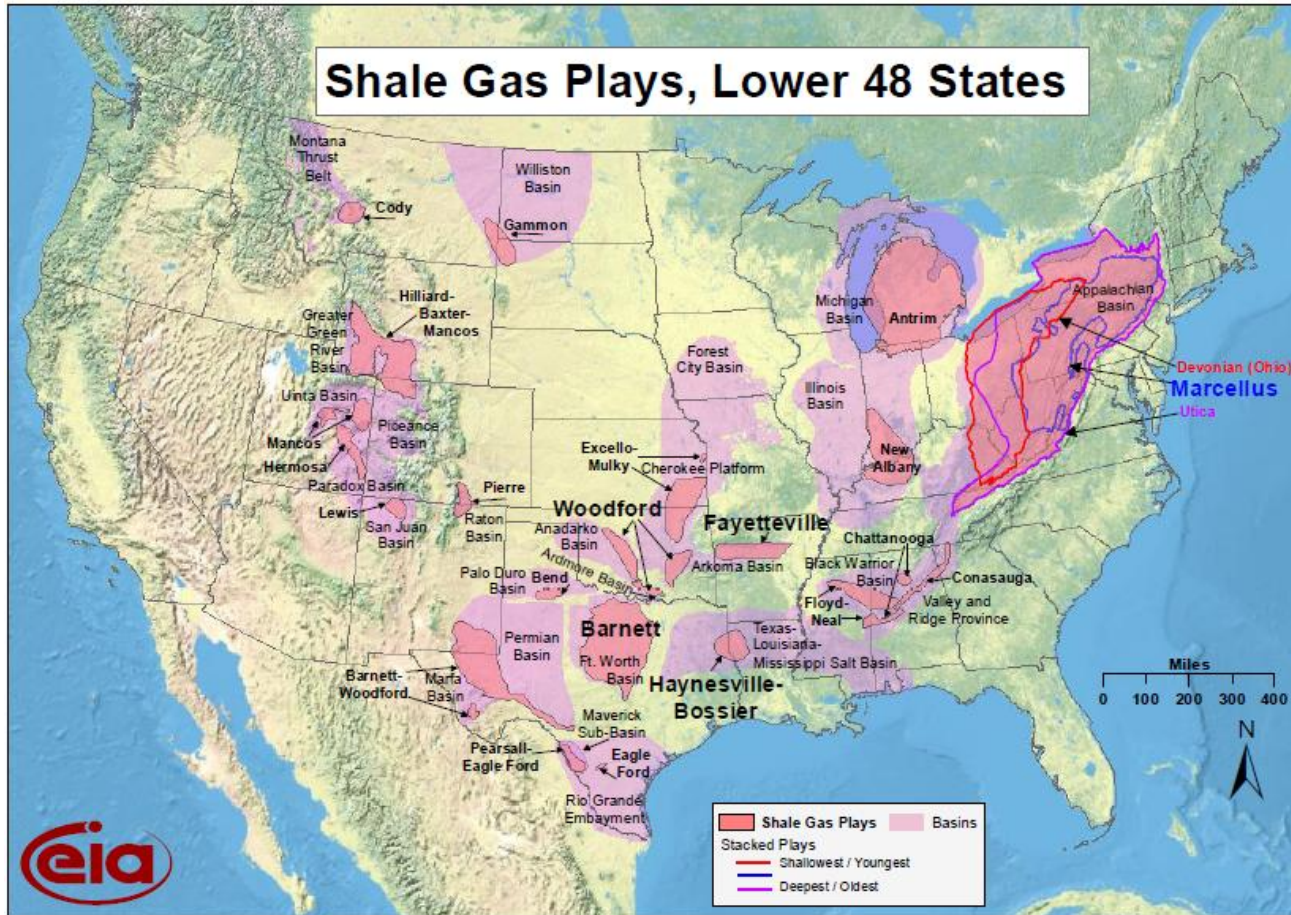
# Overview

- Shale gas and the environment
- Energy Extraction Enforcement Initiative
- Other aspects of EPA's approach
  - Scientific study
  - Regulation and policy development
  - Best design and management practices
- Marcellus Shale Activities



# US Shale Gas Extraction

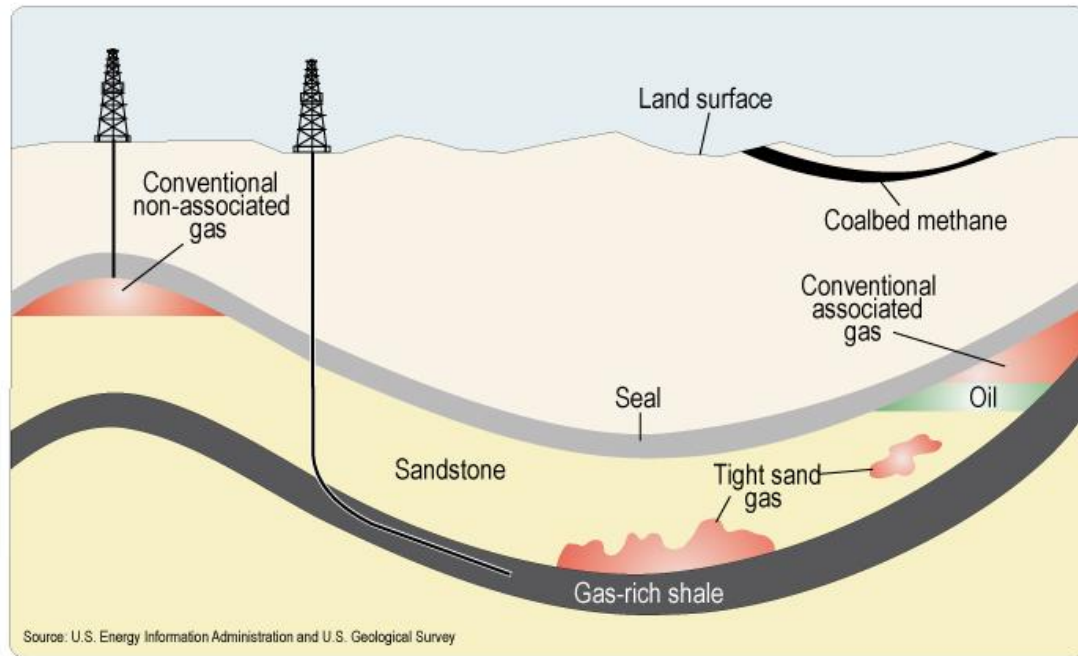
Advances in hydraulic fracturing and horizontal drilling have opened new areas for oil and gas development.



Source: Energy Information Administration based on data from various published studies.  
Updated: March 10, 2010

# US Shale Gas Extraction

- According to 2009 US Dept of Energy data:
  - US natural gas **proved** reserves: 8.045 Tm<sup>3</sup>
  - US **“technically recoverable” shale gas**: 23.43 Tm<sup>3</sup>



# Shale Gas and the Environment

- Natural gas is *relatively clean burning*

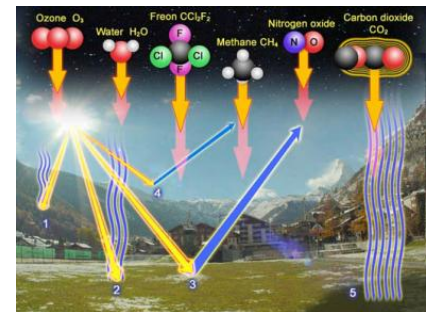
- About 53 kg of CO<sub>2</sub> for every million Btu equivalent of natural gas

*versus*

- About 91 kg of CO<sub>2</sub> for every million Btu of coal, and 73 kg of CO<sub>2</sub> for every million Btu of fuel oil

- But CH<sub>4</sub> is a **potent greenhouse gas**

- About 25 times more potent than CO<sub>2</sub>
- Some estimates suggest a factor of 72



# EPA Energy Extraction Enforcement Initiative

March 2010 EPA announced new **enforcement initiative** for energy extraction

First focus area is **onshore gas production**

Two major goals:

- Take action where violations cause **air or water impacts that threaten human health**
- **Secure company-wide relief**

**Many cases brought to date** (including air and drinking water cases), more under investigation



# Shale Gas and the Environment

- Natural gas exploration, drilling and production have many environmental impacts
  - Site selection and preparation
  - Staging, transport, water withdrawal and chemical storage
  - Drilling
  - Well completion
  - Air emissions
  - Wastewater handling
  - Well abandonment and plugging
- Advances in drilling and production technologies have positive and negative impacts
- Strict safety regulations and standards are required for natural gas

# Shale Gas and the Environment – Site Selection and Preparation



Gas well development in Marcellus Shale in western Pennsylvania.

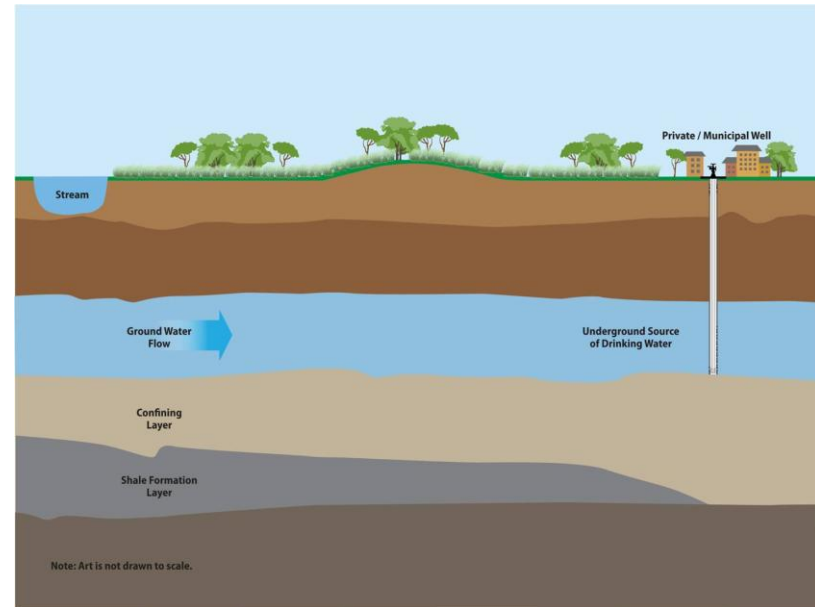


Gas well field in Green River Basin, near Pinedale, Wyoming.



# Shale Gas and the Environment – Site Selection and Preparation

- Impacts and considerations:
  - Avoid sensitive environments, such as surface waters, wetlands and source water protection areas
  - Install physical controls, such as silt fencing, sediment traps and basins, and expanded riparian areas. Use storm water management plan practices
  - Minimize surface water and air impacts from access roads, staging areas, pits, ponds, impoundments, tanks and other equipment
  - Ensure appropriate confining layer between target formation and aquifers



# Shale Gas and the Environment – Staging, Transport, H<sub>2</sub>O and Chemical Storage

## Impacts and considerations:

- Spill and runoff prevention
- Sample water wells in vicinity to determine baseline water quality
- Plan for proper wastewater disposal areas with adequate liners and freeboard
- Consider use of LNG versus diesel trucks and equipment
- Work with local agencies and citizens to determine appropriate water sources

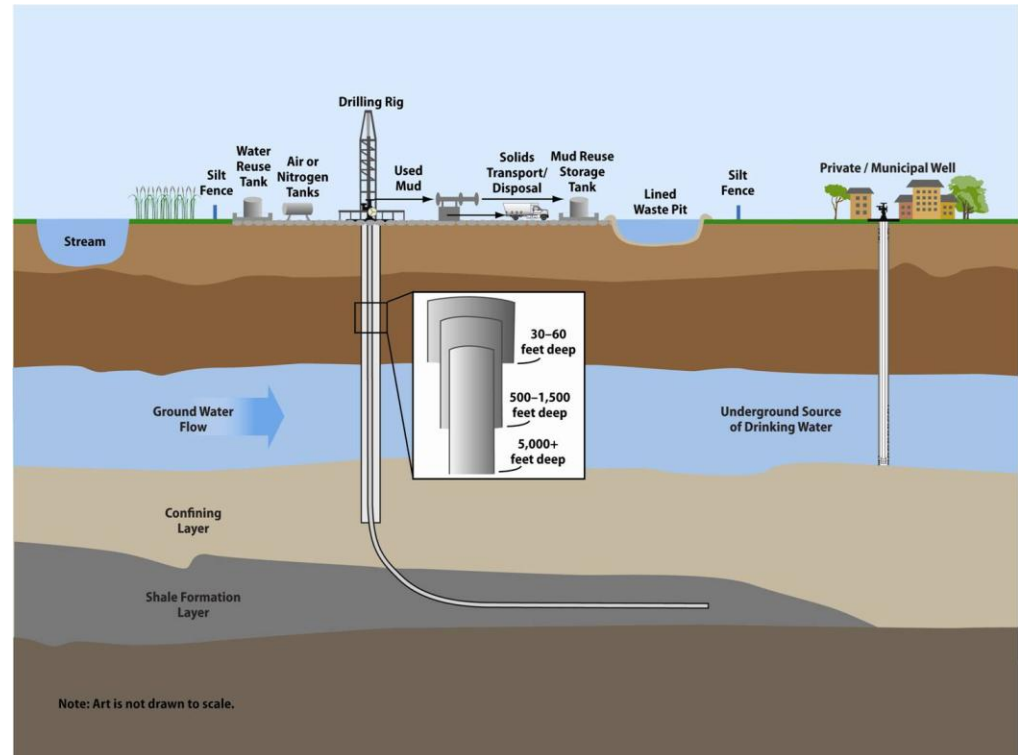


Hydraulic fracturing staging near Fort Worth, Texas.

# Shale Gas and the Environment – Drilling and Well Completion

## Impacts and considerations:

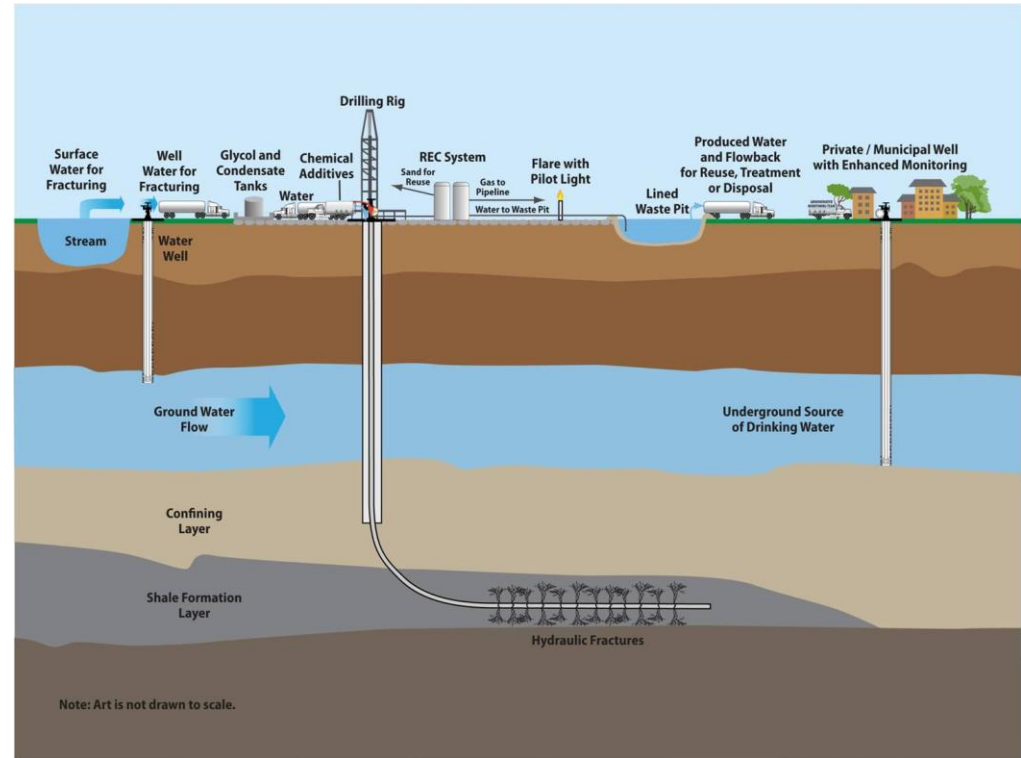
- Prevention of methane and other contaminant migration
- Adequate well construction and pressure control to prevent explosions
- Limit chemical use to only those required by specific geology



# Shale Gas and the Environment – Drilling and Well Completion

## Impacts and considerations:

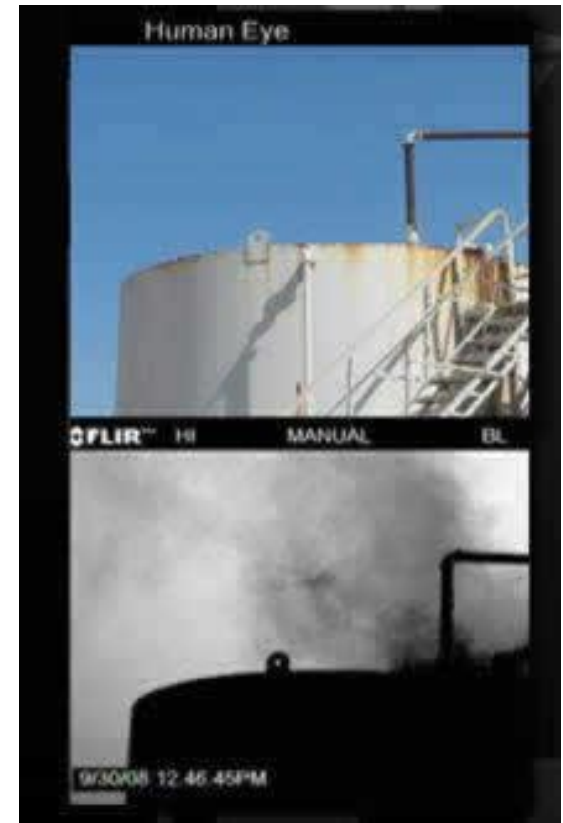
- Loss of methane and VOCs to atmosphere
  - “Green completions” capture product, while reducing air emissions
  - Use of flares where “green completions” not possible
- Well integrity, monitoring and modeling critical to ensuring fracture in target zone
- Spill prevention
- Occupational hazards



# Shale Gas and the Environment – Air Emissions

## Impacts and considerations:

- Occur throughout lifecycle of well development and production
  - Poses environmental and occupational risks
- Use of flares, no-bleed pneumatics and other control technology to limit emissions
  - Some technologies have rapid return on investment
- Use of remote monitoring to determine and react quickly if something amiss



Forward Looking Infrared (FLIR) image of condensate tank.

# Shale Gas and the Environment – Wastewater Handling

## Impacts and considerations:

- Wastewater contains chlorides, heavy metals, frack chemicals and radioactive material
- Spills may be lethal to aquatic and terrestrial organisms
- Difficult to treat in typical wastewater plant – ultimate disposal in deep injection wells may be necessary
- Important to maximize recycling for additional fracking or other uses



Truck hauling gas wastewater from Marcellus Shale.

# Shale Gas and the Environment – Well Abandonment & Plugging

## Impacts and considerations:

- Abandoned wells can leak or provide conduits for migration of contaminants
- Utilize proper materials and techniques to ensure proper seal
- Consider institutional controls to prevent access and monitor seals



Leaking 75- year- old, abandoned gas well in NY state.

# EPA's Approach on Shale Gas – Scientific Study

- US Congress asked EPA to study relationship between hydraulic fracturing and drinking water resources
- Peer-reviewed study currently underway, with preliminary results due in late 2012
- Lifecycle approach, use of case studies, with preliminary focus on sources and pathways of potential impacts
- Stakeholder involvement throughout process





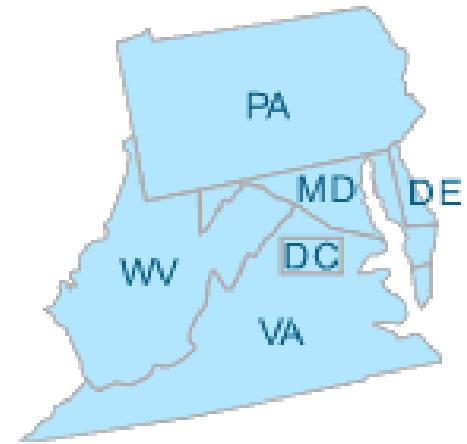
# EPA Approach on Shale Gas – Best Design and Management Practices

- EPA is developing **Best Design and Management Practices** (BDMPs) to minimize adverse impacts to public health and the environment from shale gas production
- Part of EPA's role to carry out President Obama's ***Blueprint for a Secure Energy Future*** (March 2011)
- Rely on widely-accepted federal, state and industry practices from across the United States
- Recognition that **certain BDMPs may not be applicable in every location**, while other BDMPs may be compulsory



# Shale Gas Development in Mid-Atlantic States

- Rapid increase in development activity in one of world's largest gas plays
- Densely populated areas
- Hydrologic conditions
- Formation containing uranium
- Produced water rich in total dissolved solids



# Flowback and Produced Water Treatment & Disposal

- Program Oversight
  - EPA requests for better characterization of discharges & impacts
  - PADEP requests to operators for monitoring at public drinking water systems and WWTP discharge points
  - Determine if discharge permit modifications are needed

# Flowback and Produced Water Treatment & Disposal

- Underground Injection Control permits for waste disposal
  - Issued by authorized states with EPA oversight & technical assistance
  - Issued by EPA in “direct implementation” states
  - Inspection of disposal of shale gas development waste via wells
- Emergency and Accident Prevention and Response



# Marcellus Shale Approaches

- Underground Injection Control
  - Unpermitted injection of wastes
  - Injection of wastes not in compliance with permit
- Reporting of releases
  - National Response Center 1-800-424-8802
- Clean Air Act general duty clause

# Marcellus Shale Approaches

- Unpermitted discharges (spills) to U.S. waters
- Discharge permits for treatment of oil & gas wastewater
- Pass-through or interference at POTWs
- Construction
  - Road crossings, pipeline crossings, well pads, compressor stations
  - Stream diversions

# Conclusion



***We must ensure that  
[energy] production  
is safe, responsible,  
and efficient.***

President Barack Obama, *Blueprint for a  
Secure Energy Future*, March 30, 2011  
([http://www.whitehouse.gov/sites/default/  
files/blueprint\\_secure\\_energy\\_future.pdf](http://www.whitehouse.gov/sites/default/files/blueprint_secure_energy_future.pdf))