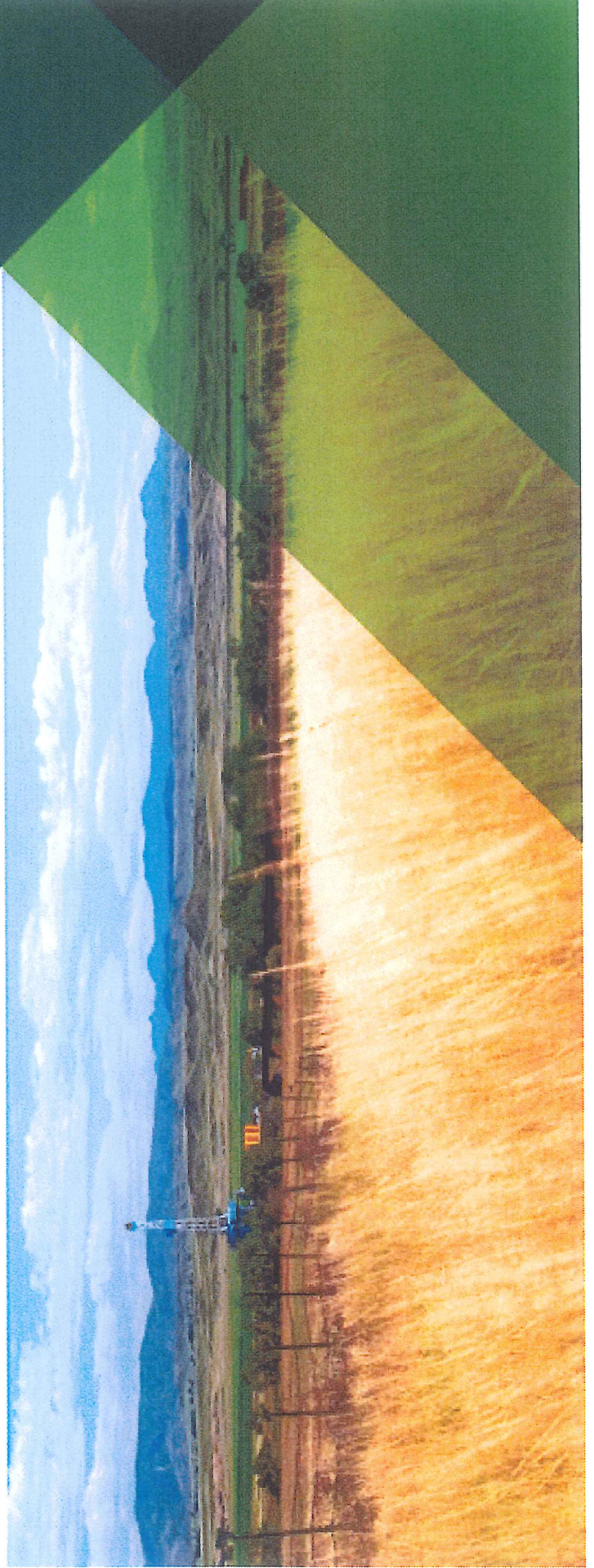




# Chesapeake Energy

## Shale Operations Overview



# Chesapeake Energy Overview



- » Founded in 1989
- » Headquartered in Oklahoma City, OK
  - ▶ Office regionally located in Canton, OH, Uniontown, OH, Charleston, WV, Jane Lew, WV, Mt. Morris, PA, Canonsburg, PA
- » Exclusive U.S. onshore focus
- » Second-largest producer of U.S. natural gas and a Top 15 producer of U.S. liquids
  - ▶ 3Q'11 gas production of ~2.8 bcf/d
  - ▶ Liquids production of ~94 mbbbls/d
- » Nation's most active horizontal driller 1993-2010
  - ▶ #1 in the world in horizontal shale drilling over past 10 years; > 4,100 wells
- » Exceptional drilling success rate – 99%



# Chesapeake Energy Overview



## » Most active driller in U.S. 1993-2011

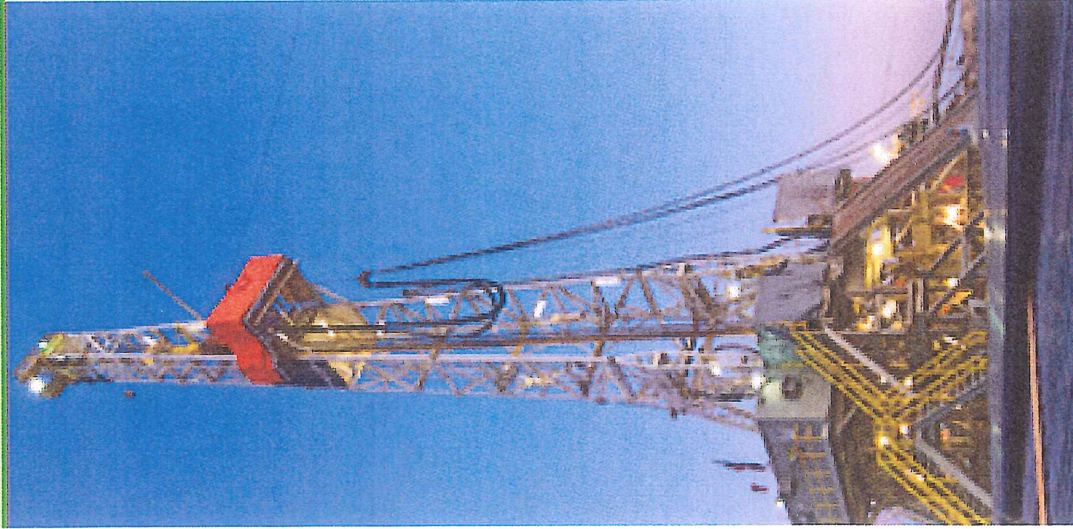
- ▶ 171 operated rigs currently
  - 7 rigs currently drilling in the Utica Shale area
  - ~30 rigs currently drilling in the Marcellus Shale area

## » Consistent production growth

- ▶ 21<sup>st</sup> consecutive year of sequential production growth

## » Unparalleled inventory of U.S. onshore leasehold and 3-D seismic

- ▶ 29 million acres of 3D seismic data
- ▶ Lower risk of suboptimal return on capital
- ▶ Higher production rates



# Chesapeake Energy Overview



## » ~ 15 mm net acres of U.S. onshore leasehold

- ▶ 1.36 million acres acquired in Ohio

## » Acreage position in gas shale plays:

- ▶ Barnett Shale 220,000
- ▶ Haynesville Shale 495,000
- ▶ Marcellus Shale 1,750,000

## » Acreage position in unconventional oil plays

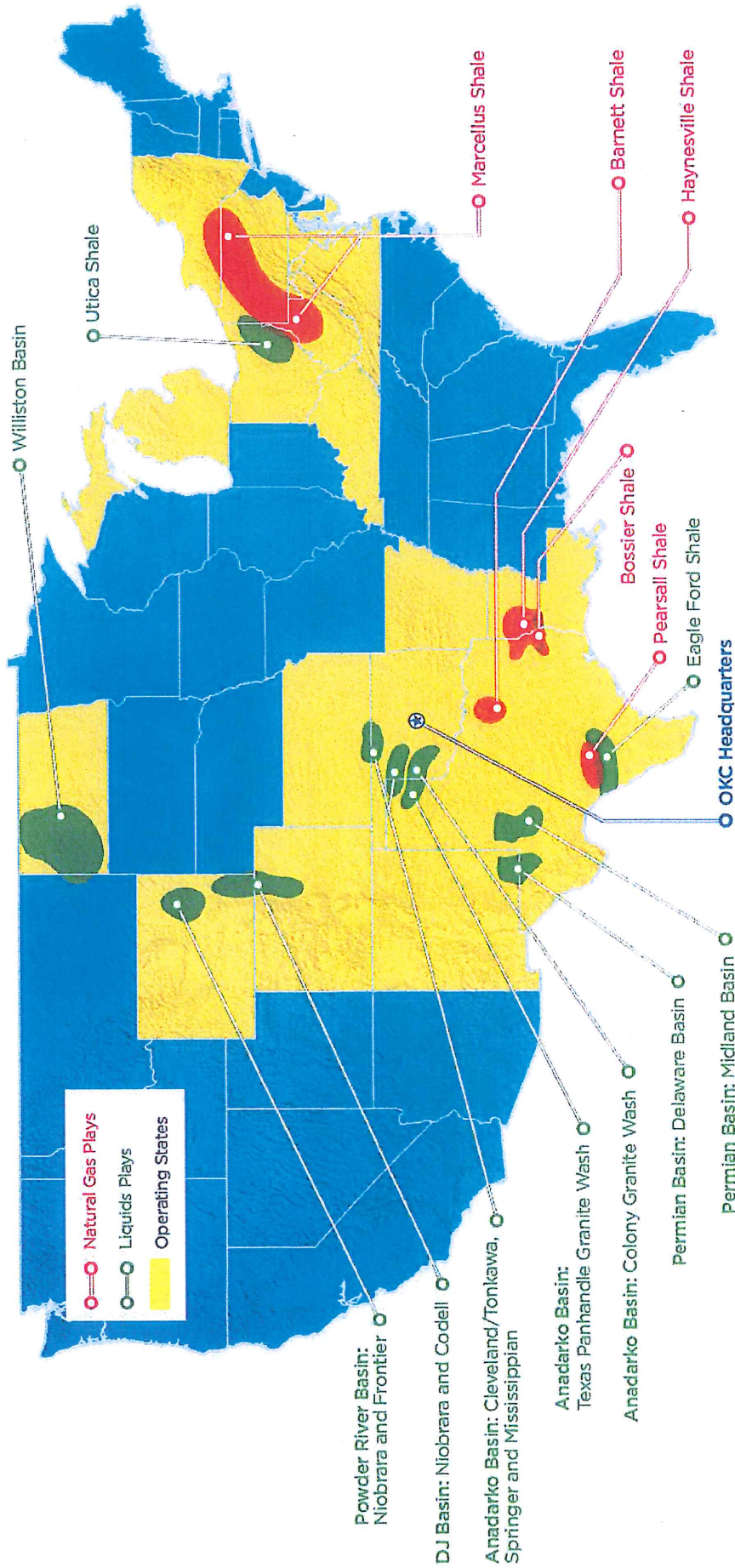
- ▶ Anadarko Basin 2,035,000
- ▶ Eagle Ford Shale 460,000
- ▶ Permian Basin 835,000
- ▶ Powder River and DJ Basin 595,000

## » Advantageous joint venture arrangements and partnerships

- ▶ StatoilHydro, Total, Plains Exploration and Production Company, CNOOC



# Chesapeake's Key Operating Areas



# Major Liquids Discovery- CHK's Ohio Utica Shale

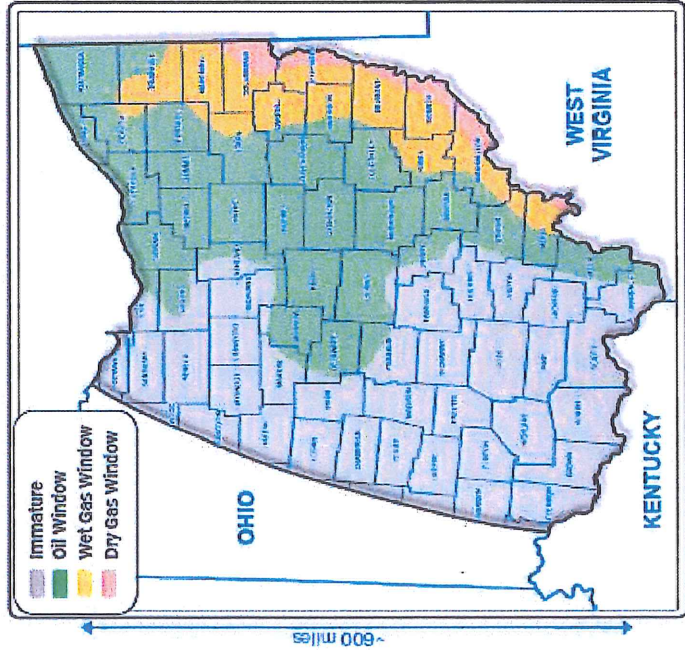


» Began leasing in Ohio for Utica in mid-2010 now have:

- ▶ 1.36 mm net acres of leasehold, by far the largest position in the industry (~50% of the potentially drillable acres)
  - ▶ Extensive well log and petrophysical data as well as 4,000 feet of proprietary core samples
  - ▶ Spudded 19 horizontal wells to date, 8 being completed
  - ▶ Strong initial drilling results from 7 horizontal wells
    - All from the dry and wet phase of the play
    - Early in the process of evaluating the oil phase
- » CHK is currently operating 7 drilling rigs in the play

» Plan to increase operated rigs in the play up to 8 by YE'11, up to 20 by YE'12 and up to 30 by YE'14

» Believe the play is likely most analogous, but economically superior, to the Eagle Ford in South Texas



Map source: Modified from Rowan, 2006, Geological Survey

# Utica Shale JV and Financial Investment Summary



- » CHK has entered into letter of intent (LOI) with an undisclosed international major energy company
    - ▶ JV partner will acquire an undivided 25% interest in ~570,000 net acres of CHK leasehold in the wet natural gas area of the Utica Shale play for consideration of \$15,000 per net acre or ~\$2.14 billion
    - ▶ ~\$640 million of the consideration will be paid in cash at closing (anticipated by mid-December 2011) and ~\$1.5 billion will be paid in the form of a drilling and completion cost carry, which CHK anticipates fully receiving by YE 2014
  - » Completed sale to EIG Global Energy Partners (“EIG”) of \$500 million of perpetual preferred shares of a newly formed entity, CHK Utica, L.L.C.
    - ▶ CHK expects to sell up to \$750 million of additional CHK Utica, (“CHKU”) preferred shares to other investors, including limited partners of EIG, by 11/30/11
    - ▶ Chesapeake has retained all the common interests in CHKU and therefore the upside
- Approximate potential net proceeds from transactions:  
\$3.4 billion*

# Well Pad Preparation



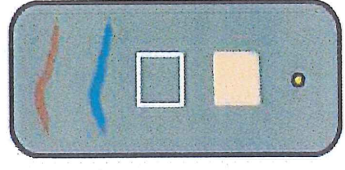
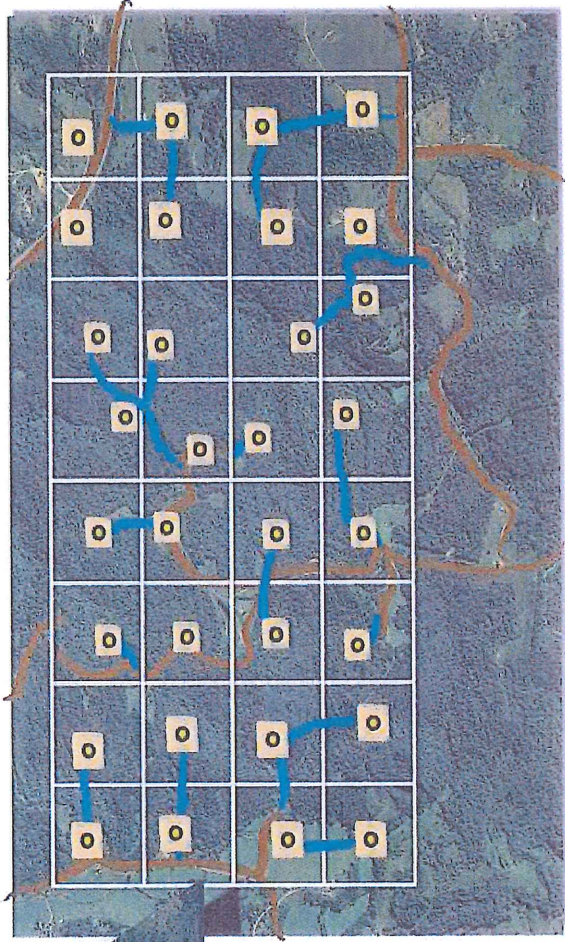
- » Well pads can be located in rural or urban areas
  - ▶ Pad preparation requires approximately 4-6 weeks
  - ▶ Typical horizontal well pad requires 3-5 acres to construct
  - ▶ Appropriate erosion and sediment controls are installed





Area shown is 1,280 acres

### Idealized Vertical Well Spacing

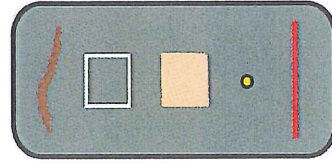
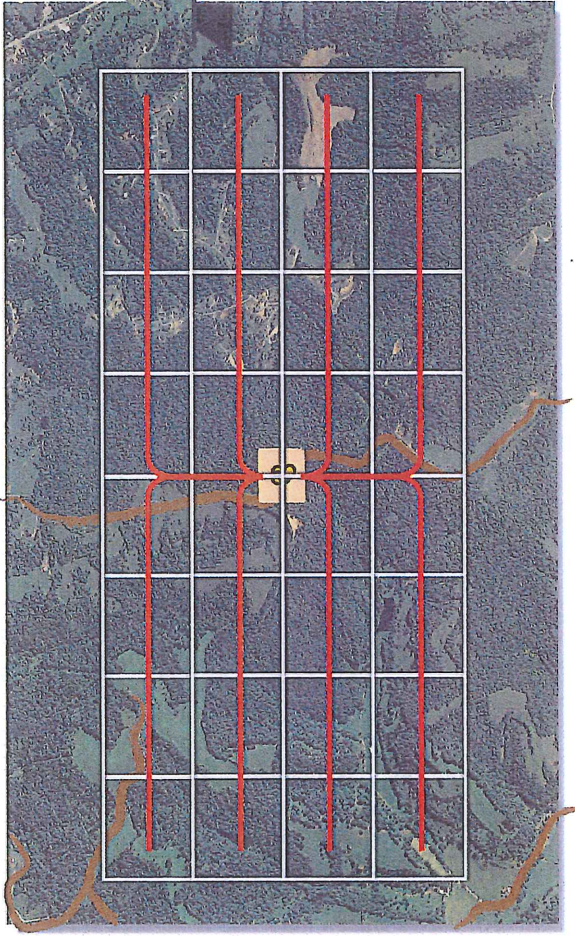


- Existing Road
- Newly Constructed Road
- 40 Acre Grid
- Padsite
- Gas Wells

Well spacing can vary due to a number of factors including state regulatory requirements, location and formation characteristics.

Area shown is 1,280 acres

### Idealized Horizontal Well Spacing



Existing Road

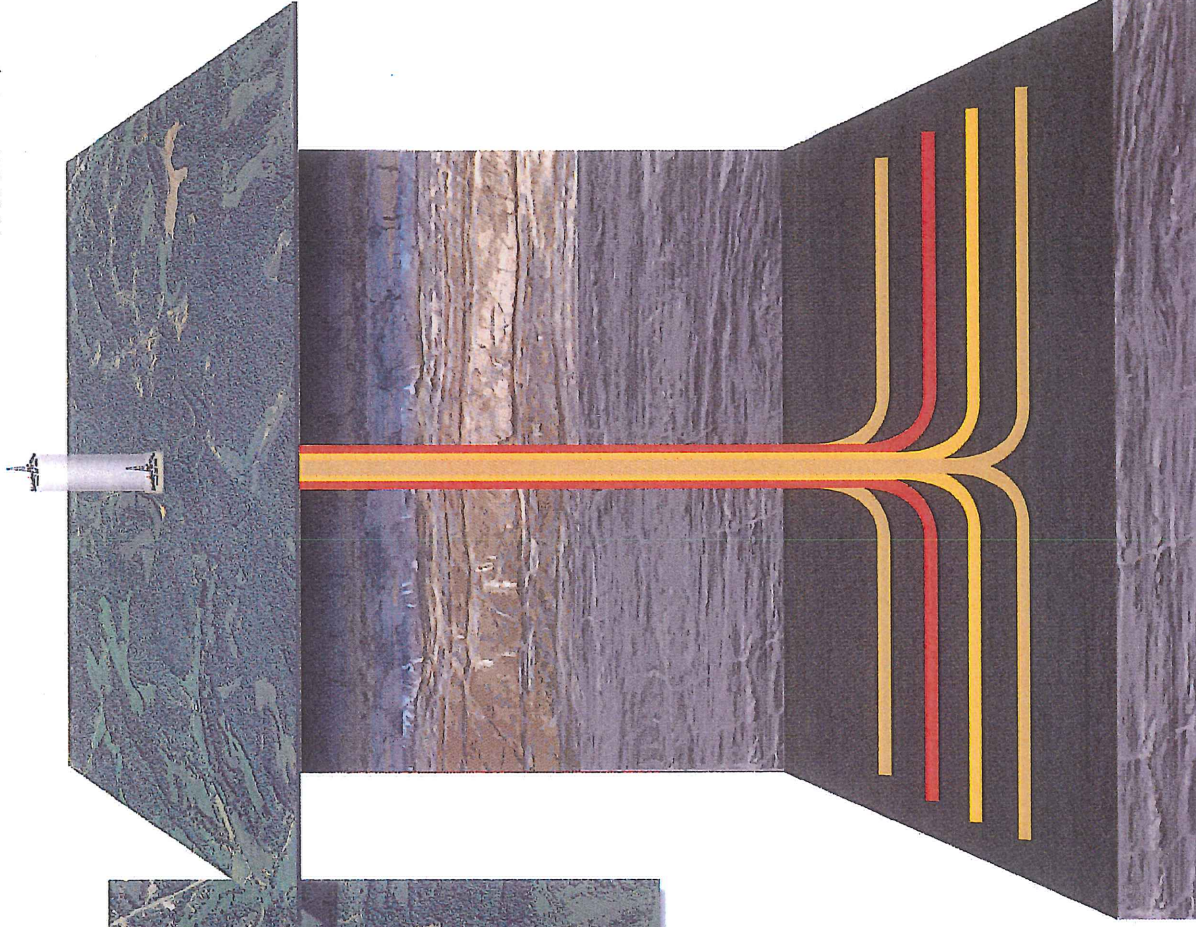
40 Acre Grid

Padsite

Gas Wells

Wellbore

Well spacing can vary due to a number of factors including state regulatory requirements, location and formation characteristics.



# Drilling the Well Using Today's New Technology



- » Wells are drilled and constructed to recover the natural resources while protecting the environment and providing for the safety of workers and area residents
- » Drilling is a 24/7 operation
  - ▶ Reduces rig time on location
- » The drilling phase is a temporary operation, typically lasting 3-4 weeks per wellbore
  - ▶ Multiple wells may be drilled in succession
- » Chesapeake Energy utilizes a “closed-loop” drilling system
  - ▶ All drilling materials are contained
  - ▶ No materials collected in earthen pits

# Drilling the Well Using Today's New Technology



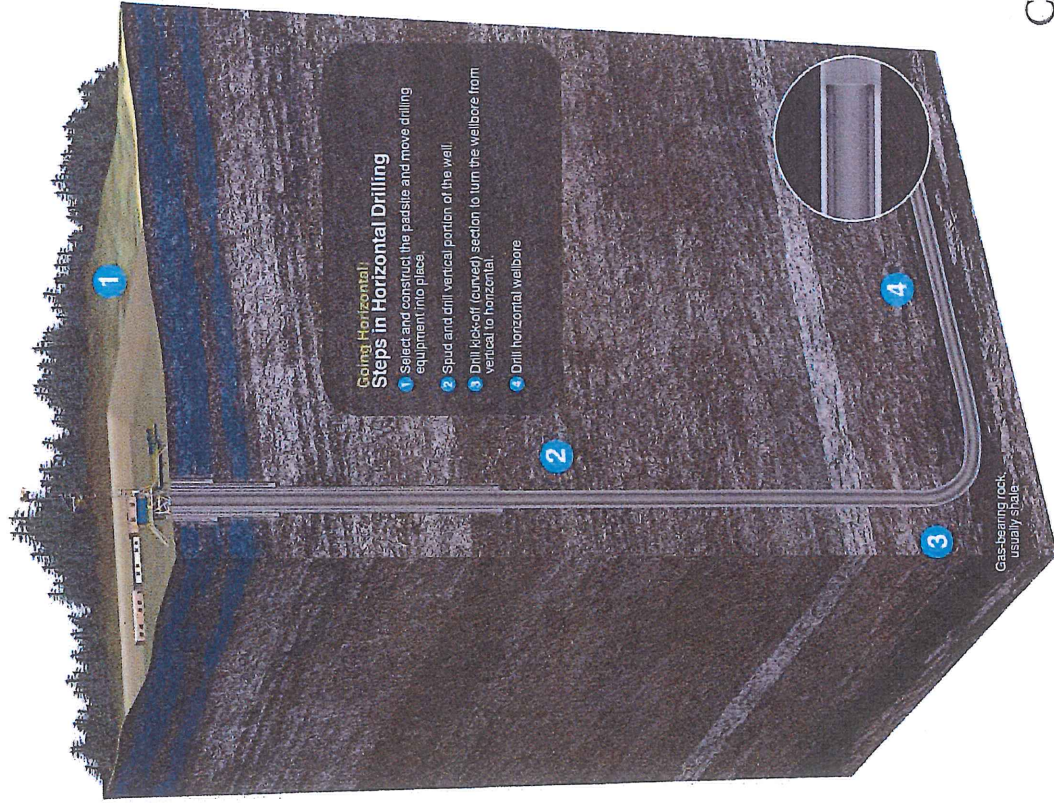
# Drilling the Well- Groundwater Protection



» 4 or more layers of protection are installed in the well to isolate the well from the surrounding strata and protect groundwater supplies and the environment

- ▶ Multiple layers of steel casing and cement are utilized
- ▶ Casing set in place below freshwater aquifer zone
- ▶ FIT test performed and cement logs recorded to ensure proper seal

» ODNR must be notified prior to the installation and cementing of all casing strings



Cemented to Surface

Average Depths:  
40' - 120'

Conductor Casing

Cemented to Surface

Average Depths:  
350' - 4,500'

Surface Casing

Cemented to Surface

Average Depths:  
2,500' - 11,200'

Intermediate Casing

Drilling Mud

Cemented to Surface

Average Depths:  
4,400' - 17,000'

Production Casing

Production Tubing



Depths vary by play

# Well Completion-Hydraulic Fracturing



» After the drilling rig is removed, hydraulic fracturing (“fracing”) begins

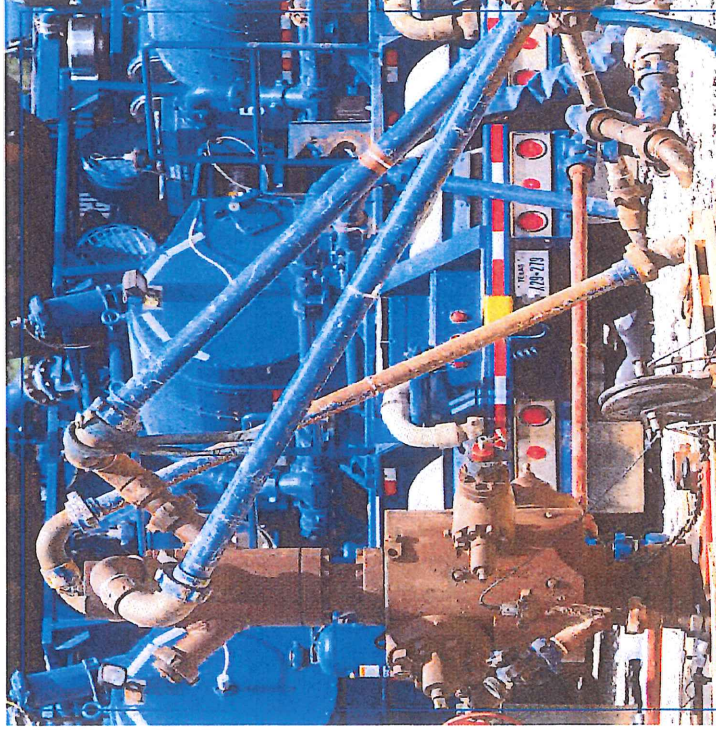
- ▶ Not new technology; has been in use since after World War II

- ▶ ODNR estimates over 80,000 wells have been hydraulically fractured in Ohio

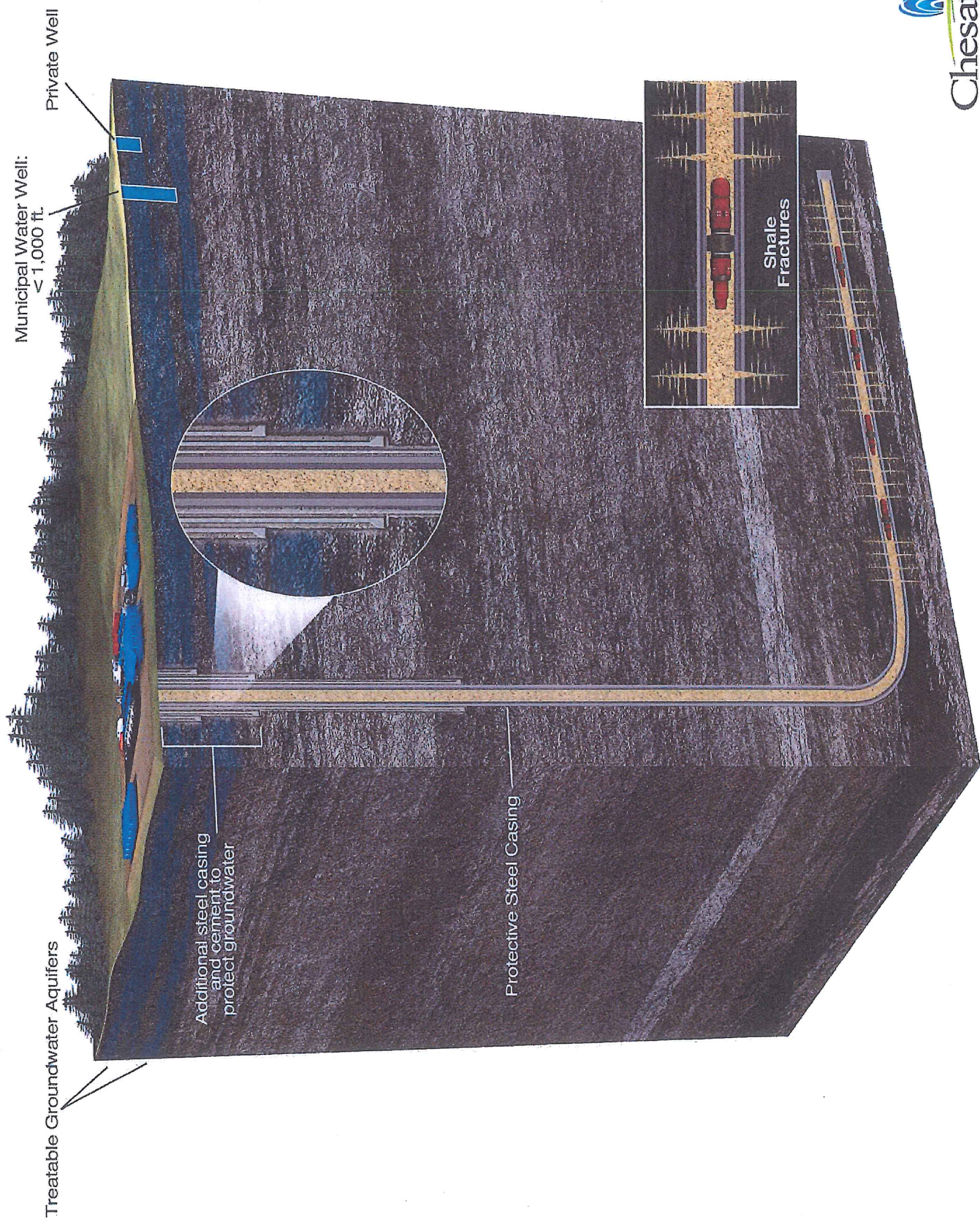
» Water is mixed with proppant (such as sand) and pumped into the shale reservoir under pressure

- ▶ 99.5% of fracturing fluid is made up of water and sand

» Generally takes several days per wellbore



For more information on hydraulic fracturing, please visit  
[AskChesapeake.com](http://AskChesapeake.com)



Municipal Water Well:  
 $< 1,000 \text{ ft}$

Private Well

Treatable Groundwater Aquifers

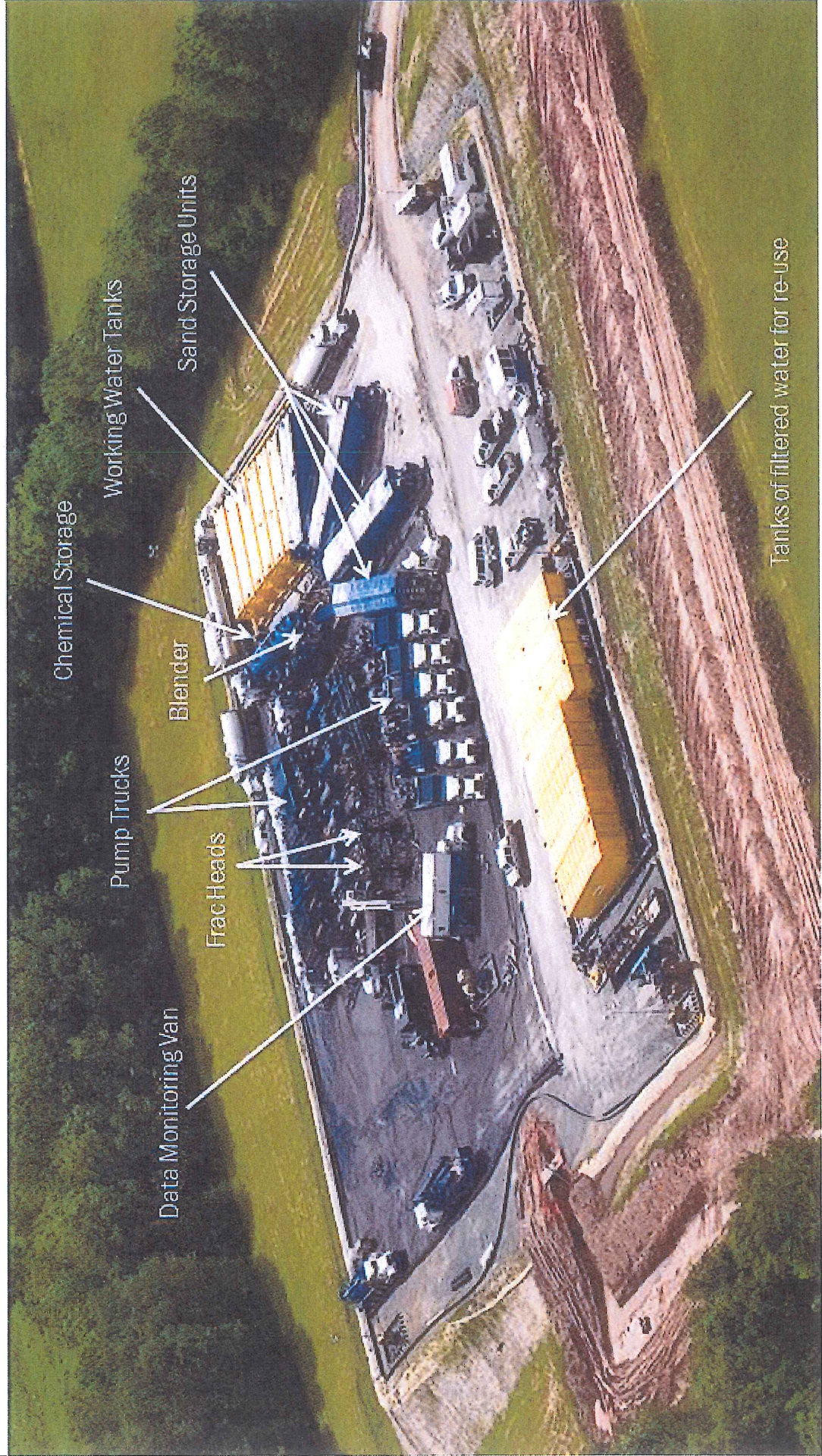
Additional steel casing  
 and cement to  
 protect groundwater

Protective Steel Casing

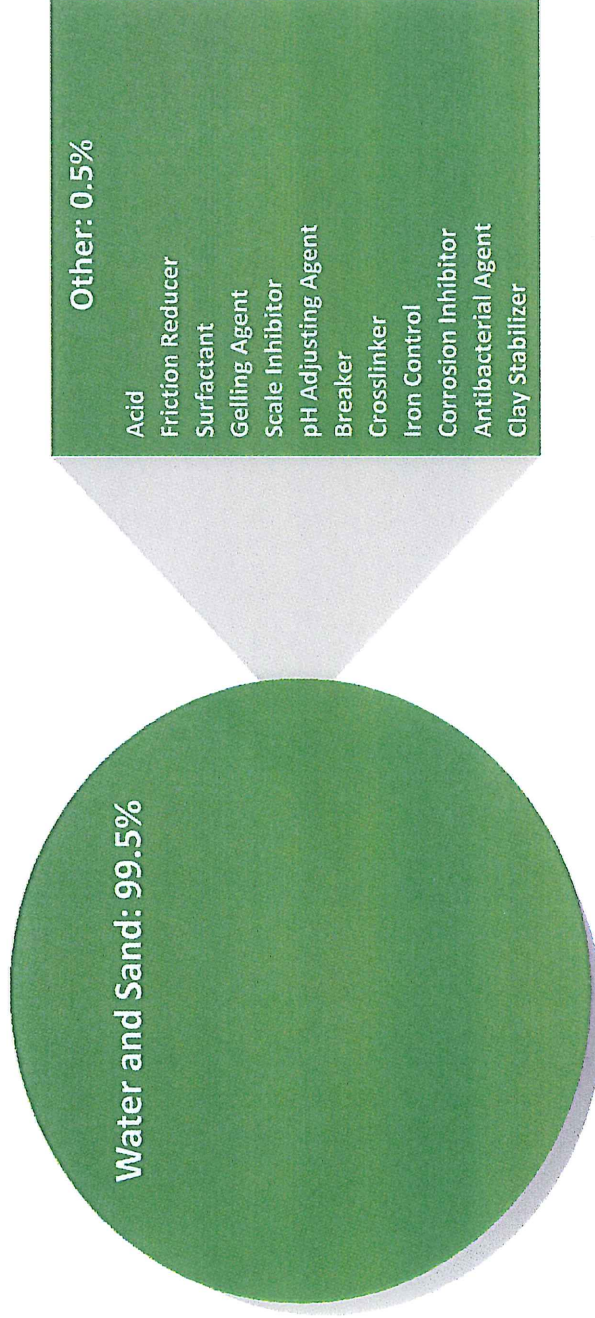
Shale  
 Fractures



# Hydraulic Fracturing Site Layout



# Typical Deep Shale Gas Fracturing Mixture

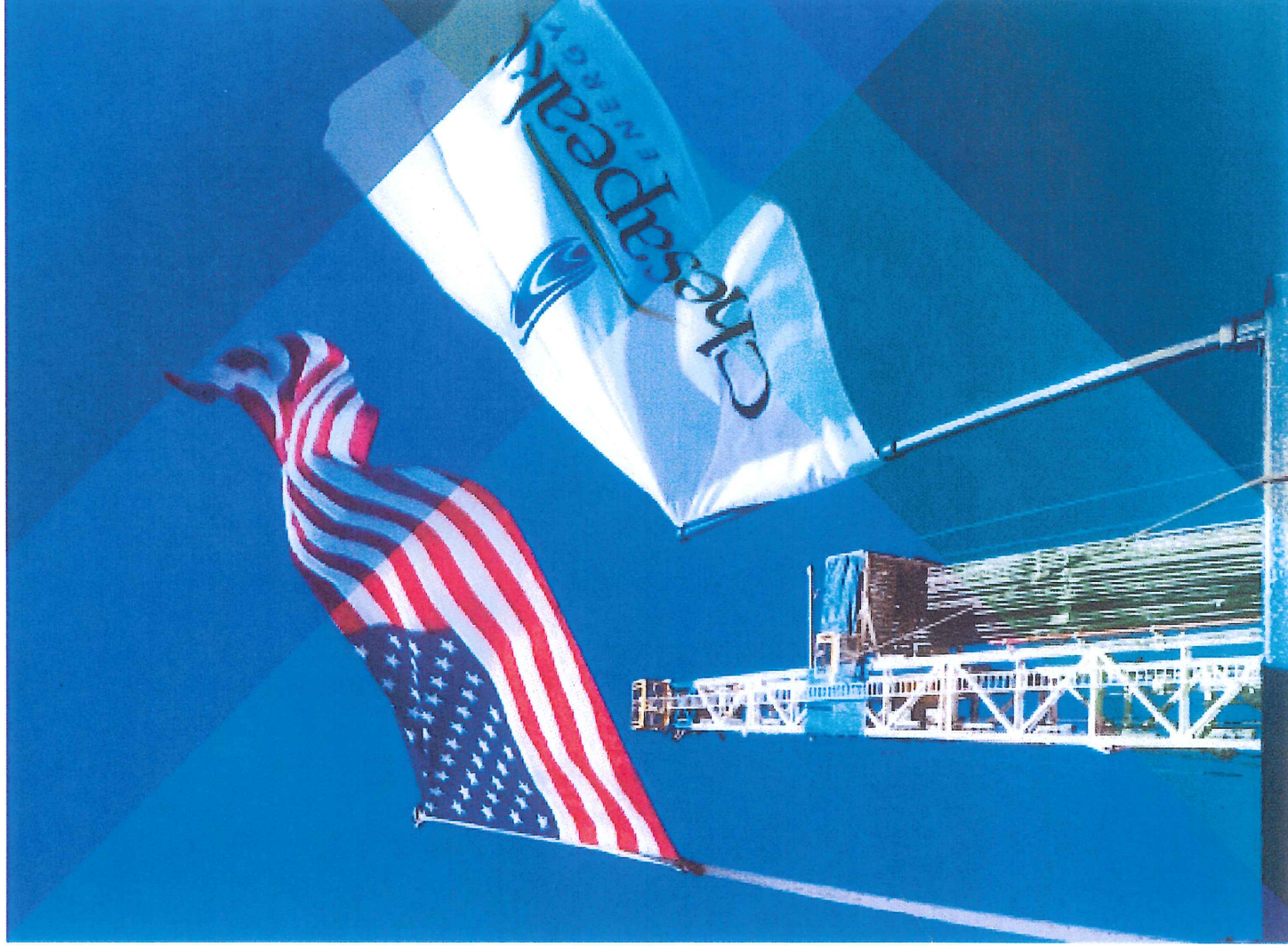


# Fracturing Fluid Additives

Product Category	Main Ingredient	Purpose	Other Common Uses
Water	99.5% Water & Sand	Expand fracture and deliver sand	Landscaping, manufacturing
Sand (Proppant)		Allows the fractures to remain open so the gas can escape	Drinking water filtration, play sand, concrete and brick mortar
Other	- 0.5%		
Gel	Guar gum or Hydroxyethyl cellulose	Thickens the water in order to suspend the sand	Cosmetics, baked goods, ice cream, toothpaste, sauces, and salad dressings
Friction Reducer	Petroleum distillate	"Slicks" the water to minimize friction	Used in cosmetics including hair, make-up, nail and skin products
Acid	Hydrochloric acid or muriatic acid	Helps dissolve minerals and initiate cracks in the rock	Swimming pool chemical and cleaner
Anti-Bacterial Agents	Glutaraldehyde	Eliminates bacteria in the water that produces corrosive by-products	Disinfectant; sterilizer for medical and dental equipment
Scale inhibitor	Ethylene glycol	Prevents scale deposits in the pipe	Used in household cleansers, de-icer, paints, and caulk
Breaker	Ammonium Persulfate	Allows a delayed break down the gel	Used in hair coloring, as a disinfectant, and in the manufacture of common household plastics
Corrosion inhibitor	Formamide	Prevents corrosion of the well casing	Used in pharmaceuticals, acrylic fibers and plastics
Crosslinker	Borate Salts	Maintains fluid viscosity as temperature increases	Used in laundry detergents, hand soaps and cosmetics
Iron Control	Citric Acid	Prevents precipitation of metal oxides	Food additive; food and beverages; lemon juice ~7% citric acid
Clay Stabilizer	Potassium Chloride	Creates a brine carrier fluid that prohibits fluid interaction with formation clays	Used in low-sodium table salt substitute, medicines, and IV fluids
pH adjusting agent	Sodium or potassium carbonate	Maintains the effectiveness of other components, such as crosslinkers	Used in laundry detergents, soap, water softener and dish washer detergents
Surfactant	Isopropanol	Used to reduce surface tension of the fracturing fluids to improve liquid recovery from the well after the frac	Used in glass cleaner, multi-surface cleansers, antiperspirant, deodorants and hair-color

# Who Shares In The Revenue

- » **Mineral Owners**
  - ▶ Bonuses and royalties
- » **Local workers**
  - ▶ Wages and benefits
- » **Local Business**
  - ▶ Subcontractors and service companies
- » **Counties, Cities, School Districts**
  - ▶ Ad valorem and other taxes
- » **Other Stakeholders**
  - ▶ Charitable organizations
  - ▶ Chesapeake shareholders



# 10 Interesting Facts



- » **>\$1 billion**
  - ▶ Per day, how much the U.S. spends to buy energy or \$2,000 per U.S. citizen, per year
- » **\$2 billion**
  - ▶ The amount invested by Chesapeake to date via lease bonus payments and acquisitions
- » **~ \$6-10 million**
  - ▶ The amount to bring one Utica well into production
- » **~ 5 million pounds**
  - ▶ The amount of sand used to hydraulically fracture one Utica well
- » **5,000 tons**
  - ▶ The amount of aggregate used to construct one drilling pad
- » **\$20 million**
  - ▶ The amount spent on Ohio roads to date; \$200 million has been spent in Pennsylvania
- » **204,000**
  - ▶ Number of projected jobs the Ohio oil and gas industry will generate by 2015
- » **410 people across 150 different professions**
  - ▶ The size and diversity of the workforce needed to bring one horizontal well into production
- » **\$1 billion**
  - ▶ The amount Chesapeake is investing in the development of CNG projects over the next 10 years
- » **2015**
  - ▶ The year CHK plans to have all of its 3,000+ fleet of vehicles converted or dedicated to CNG, thus saving \$6 million/year

# Ohio Economic Impact Study



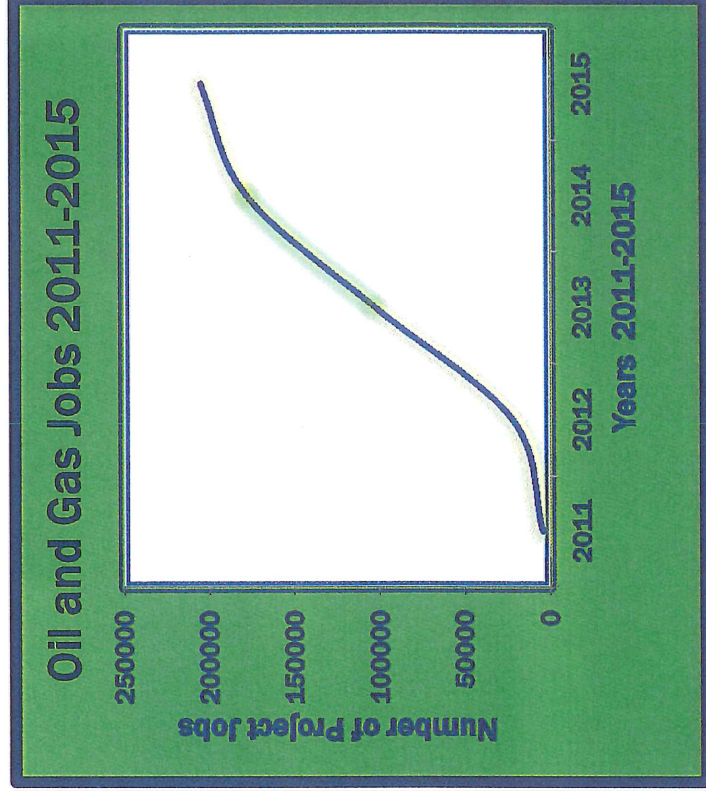
## Recent OOGEEP economic-impact study projects (2011 - 2015):

### ► Tax Revenues

- Severance - \$50.9 million
- Commercial Activity - \$27.9 million
- Ad Valorem (Property) - \$125.4 million
- Income (Federal) - \$219.7 million
- Income (State & Local) - \$54.9 million
- TOTAL Tax Revenue - \$478.8 million

### ► Job Impact:

- 2011 - 4,614 jobs
- 2012 - 22,297 jobs
- 2013 - 102,924 jobs
- 2014 - 178,088 jobs
- 2015 - 204,520 jobs



# Supply Chain and Transportation



## Steel Industry

- Long-standing partnership with US Steel
- Steel companies in northeast Ohio have already made investments to expand
  - US Steel/Republic Steel- \$85.2 Million- 450 new jobs- \$1 Billion into economy- Lorain, OH
  - Timken- \$85 Million- Canton, OH facility
  - V&M Star- \$650 Million- 350 jobs- Youngstown, OH
  - TMK Ipsco- \$10 Million invest- 120 jobs for new Brookville, OH Plant

## Railroad Transportation

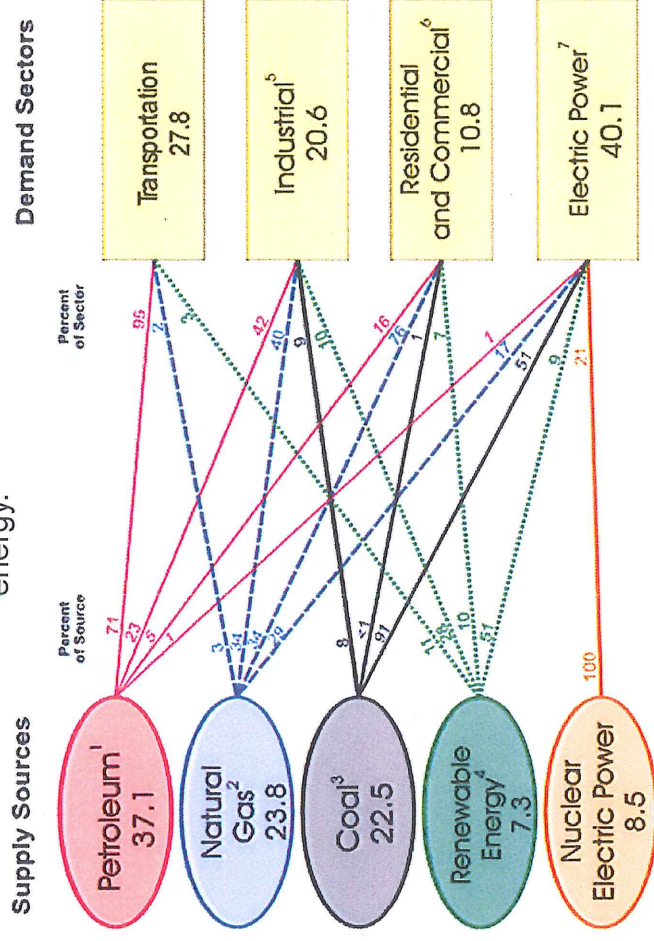
- Great opportunities for the industry to partner with rail companies
- Could see expansion similar to PA
  - Norfolk Southern- expanded to 57 terminals in the Marcellus Shale region
  - Partnered with 18 short line companies
- Transportation for steel pipe, frac sand, and other materials

# The Versatility of Natural Gas Makes it the Premier U.S. Fuel



- » 71% of **petroleum** is used for transportation
- » 91% of **coal** is used to generate electricity
- » 100% of **nuclear** is used to generate electricity
- » 51% of **renewables** are used to generate electricity
- » **Natural gas** is versatile
  - ▶ 34% Industrial
  - ▶ 34% Residential/commercial
  - ▶ 29% Electrical generation
  - ▶ 3% Transportation

In 2008 the U.S. consumed over 99.2 quadrillion Btu's of energy.



Source: Energy Information Administration, Annual Energy Review 2008, June 2009, Table 1.3 and Figure 2.0.

**93 percent of energy consumed is from nonrenewable sources**

U.S. EIA, "U.S. Primary Energy Consumption by Source and Sector, 2008," *Annual Energy Review 2008* (June 2009), [http://www.eia.doe.gov/emeu/aer/pecss\\_diagram.html](http://www.eia.doe.gov/emeu/aer/pecss_diagram.html) (accessed January 2010); U.S. EIA, "Table 2.1d: Industrial Sector Energy Consumption, Selected Years, 1949-2008," *Annual Energy Review 2008* (2009), available at <http://www.eia.gov/FTPROOT/multifuel/038408.pdf>; U.S. EIA, "Annual Energy Outlook", DOE/EIA-0383(2010), April 2010, Appendix A - Table A6, available at [http://www.eia.doe.gov/oiia/aer/pdf/0383\(2010\).pdf](http://www.eia.doe.gov/oiia/aer/pdf/0383(2010).pdf)

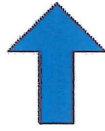


# Natural Gas Liquids U.S. Supply Sources and End Uses – Five-year Averages

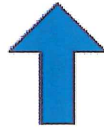


## NGL Supply Sources

**Gas Processing**  
73% of U.S. Supply



**Crude Oil Refining**  
16% of U.S. Supply



**Overland & Waterborne Imports**  
11% of U.S. Supply



## NGLs Supplied

Ethane – 39%  
Propane – 29%  
Normal Butane – 7%  
Iso-Butane – 10%  
Natural Gasoline – 15%

Ethane – 3%  
Propane – 62%  
Mixed Butanes – 35%

Propane – 29%  
Mixed Butane – 24%  
Pentane Plus – 11%

## NGL End Uses

**Primary Petrochemicals**  
50% of NGL Supply

**Space Heating & Other Fuel Uses**  
27% of NGL Supply

**Motor Gasoline & Blend Stocks**  
19% of NGL Supply

**Ethanol Denaturing**  
<1% of NGL Supply

**Fuel Exports**  
3% of NGL Supply

# Uses of NGLs



## NGLs

Ethane

Propane

Isobutane

Normal Butane

Natural Gasoline

## Typical Uses of NGL

Fibers and Other Plastics

Dye, Drugs, Detergents, Antifreeze, Cosmetics

Resins for Paint & Varnishes

Plastics, Solvents

Jet Fuel