Marcellus Shale
Natural Gas Development & Production

August 27, 2010

NATURAL GAS: FUELING AMERICA'S FUTURE

CHK Overview

The second largest producer of U.S. natural gas

2Q'2010 natural gas production of 2.497 bcf/d, total company prodution of 2.789 bcfe/d

Most active driller in U.S. – CHK is responsible for 1 of 8 gas wells being drilled in the U.S.

Best assets in the industry

~15.8 tcfe of proved reserves at 3/10, targeting 20-22 tcfe by 2012[(1)(2)]

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

13.9 mm net acres of U.S. onshore leasehold and ~25.5 mm acres of 3-D seismic data

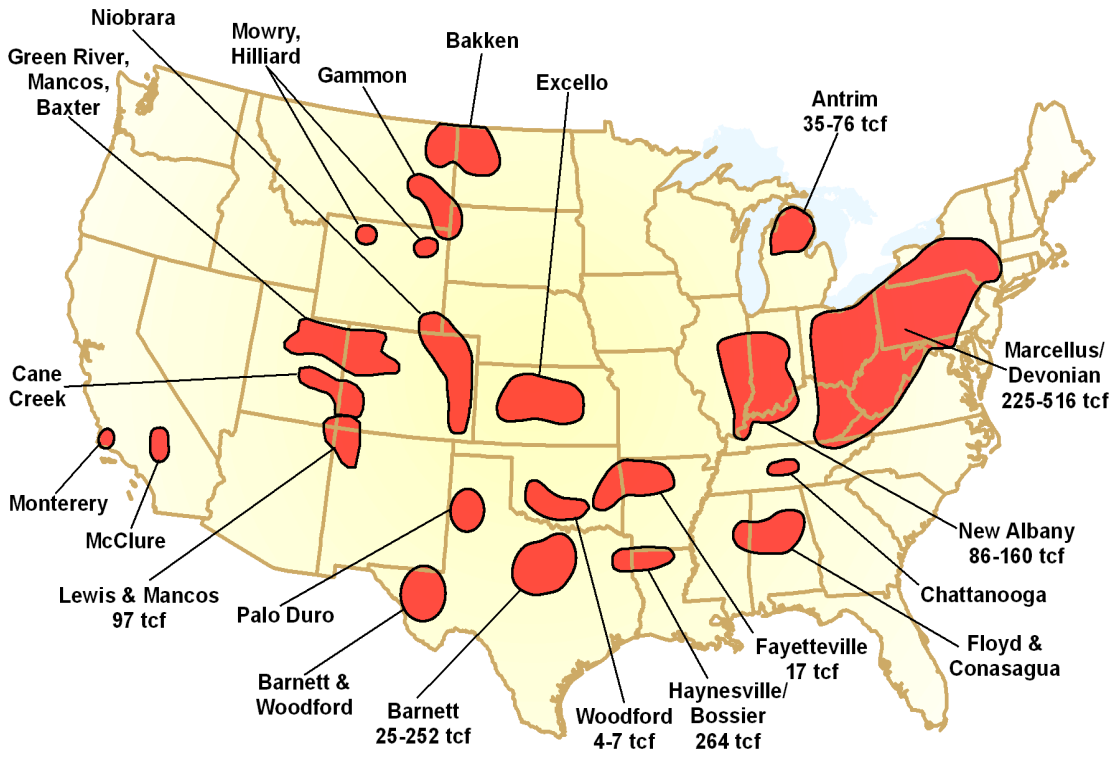
High quality U.S. shale asset base

#1 in Marcellus Shale; ~1,550,000 net acres
#1 in Haynesville/Bossier Shale; ~530,000/195,000 net acres
#2 in Fayetteville Shale; ~455,000 net acres
#2 in Barnett Shale; ~220,000 net acres

Approximately 9,000 Employees – over 1,000 now based here in Pennsylvania

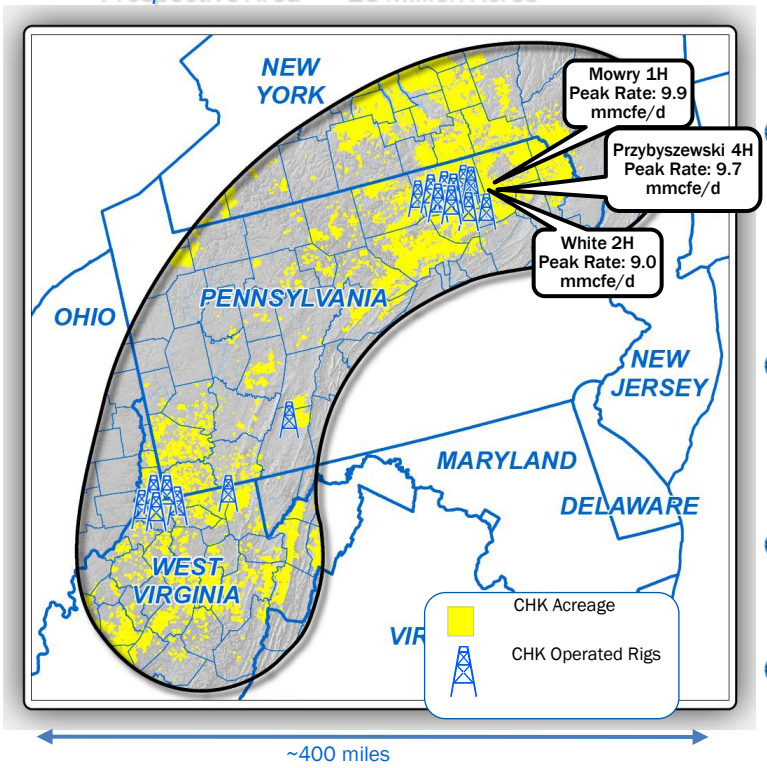
Shale Gas Geography

- Shale gas is found throughout the Eastern, Southern and West-Central parts of the country within Major Sedimentary Basins
- Black shales within the Appalachian Basin, such as the Marcellus, are the primary focus of deep shale gas development in Pennsylvania, New York, West Virginia and Ohio



CHK Marcellus Shale Overview

Prospective Area = ~15 Million Acres



- The Marcellus Shale play is likely to become one of the two largest gas fields in the U.S. (Haynesville the other)
- CHK is the second largest producer, the most active driller and the largest leasehold owner in the play with 1.55 mm net acres of leasehold
- Currently operating 26 rigs in the play; plan to average ~28 rigs in ’10 to drill ~150 net wells
- Currently producing over 130 mmcfe/d
- Anticipate net production reaching ~270 mmcfe/d by year-end ’10 and 450 mmcfe/d by year-end ’11

Natural Gas Production Process

Five Basics Steps

1. Site Selection/Preparation
2. Drilling
3. Completion
4. Production
5. Reclamation

Site Selection

Many factors go into selecting a drilling site:

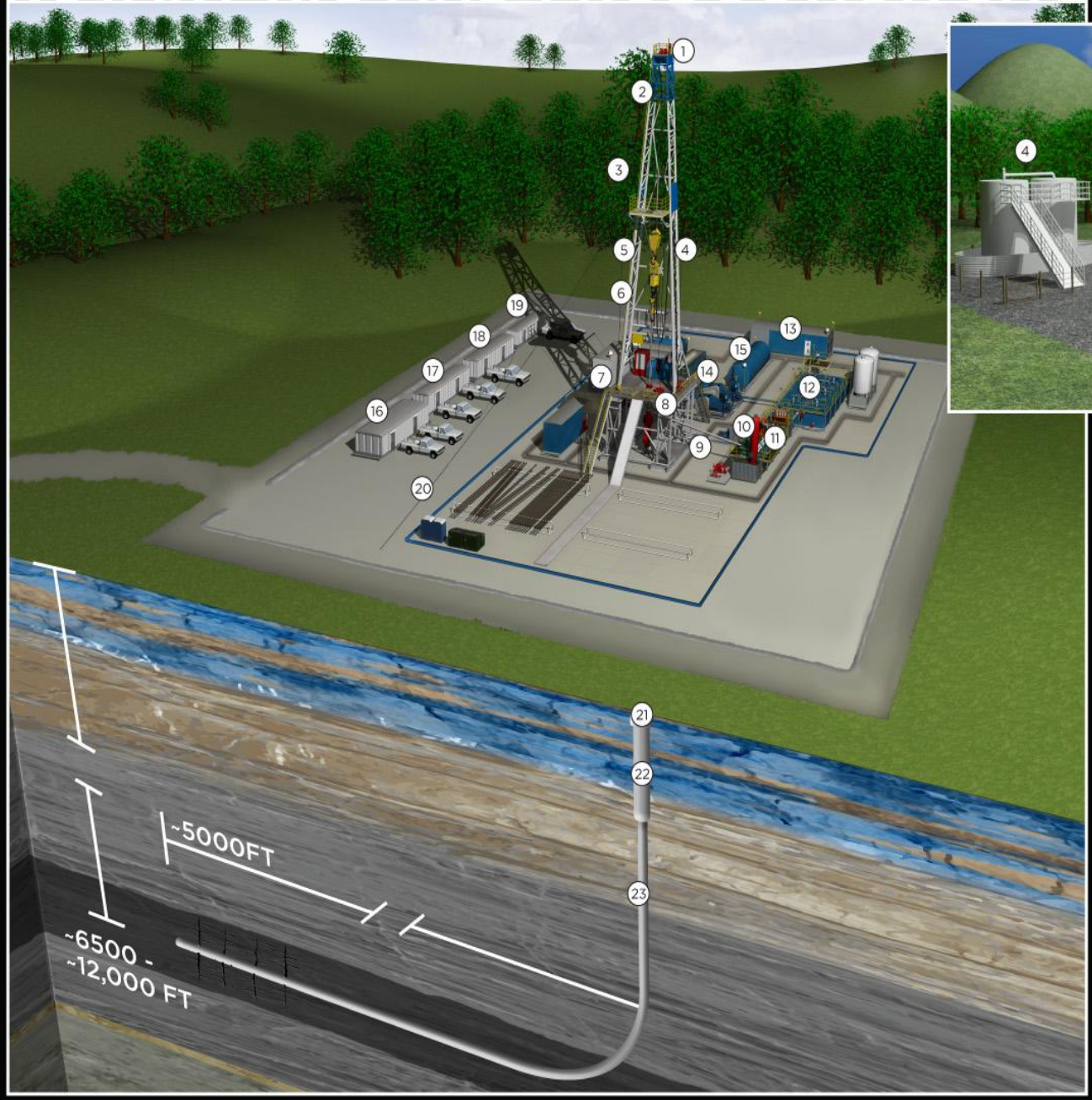
- Geology
- Topography
- Access roads
- Pipelines and utilities
- Proximity to schools and homes
- Available water sources
- Proximity to wetlands, sensitive wildlife habitat or significant archeological sites

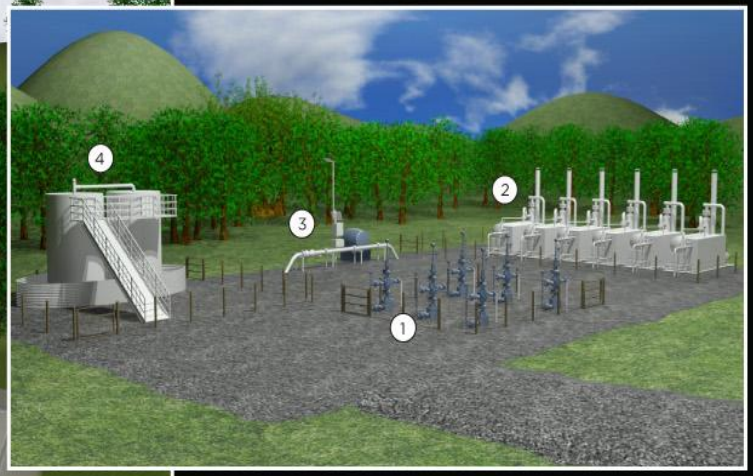
Site Preparation

- Site construction
  Typically 3 to 4 weeks
- Typical pad site
  300 x 400 feet
- E&S Controls installed
- Zero discharge sites
- Containment mechanisms put into place
- Pre-drill water testing

Then drilling rig moves onto location.

ROTARY RIG AND PRODUCTION SITE





Rotary Rig Legend

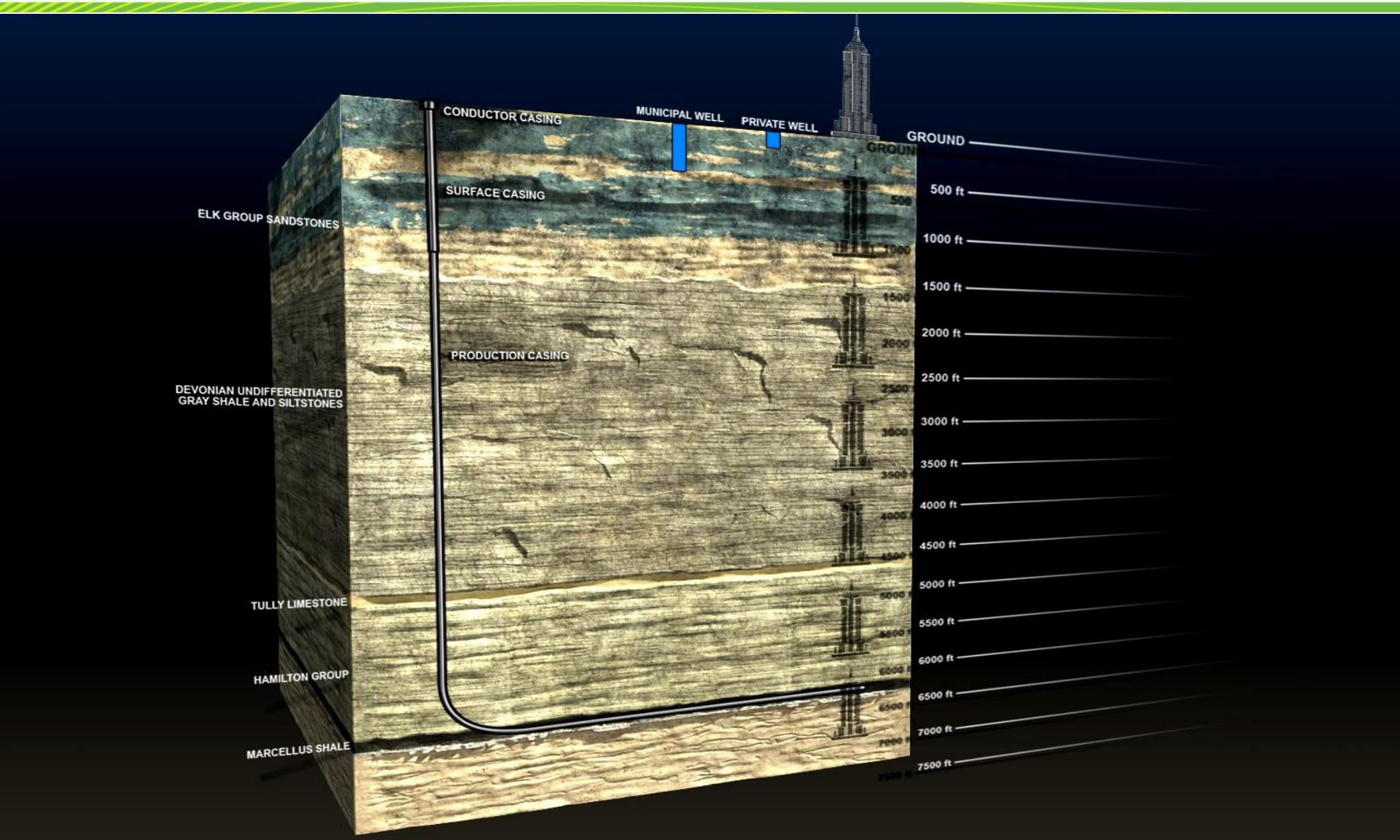
1 Crown Block Assembly
2 Crown Platform/Watertable
3 Derrick Board/Monkey Board
4 Mast
5 Traveling Block
6 Top Drive/Power Swivel
7 Mouse Hole
8 Hydraulic/Air Hoists
9 Mud Return Line
10 Mud-Gas Separator
11 Shale Shakers
12 Mud Pits
13 Mud House
14 Mud Pumps
15 Diesel Tank
16 Company Man - Quarters
17 Toolpusher - Quarters
18 Direction Drillers - Quarters
19 Mud Workers - Quaters
20 Geronimo Line
21 Conductor Casing
22 Surface Casing
23 Production Casing

Production Site Legend

1 Production wellhead
2 Gas Processing units, with line heater
3 Departing Pipeline with chemical treatment tank
4 Brine water Production tanks, in secondary containment

Typically housed on a 300' x 400' padsite, rotary rigs are common to the oil and natural gas industry and can be used to drill multiple wells from a single site. Standing up to 186 feet high, these rigs can drill to a variety of depths and are manned 24 hours a day by rotating five-man crews. Crews live off-site, but report to the rig manager or toolpusher who lives on-site. Chesapeake employs an on-site drilling supervisor, often referred to as a company man, to oversee the complete operation.

How Deep?


CONDUCTOR CASING
MUNICIPAL WELL
PRIVATE WELL
GROUND
SURFACE CASING
ELK GROUP SANDSTONES
PRODUCTION CASING
DEVONIAN UNDIFFERENTIATED GRAY SHALE AND SILTSTONES
TULLY LIMESTONE
HAMILTON GROUP
MARCELLUS SHALE
500 ft
1000 ft
1500 ft
2000 ft
2500 ft
3000 ft
3500 ft
4000 ft
4500 ft
5000 ft
5500 ft
6000 ft
6500 ft
7000 ft
7500 ft

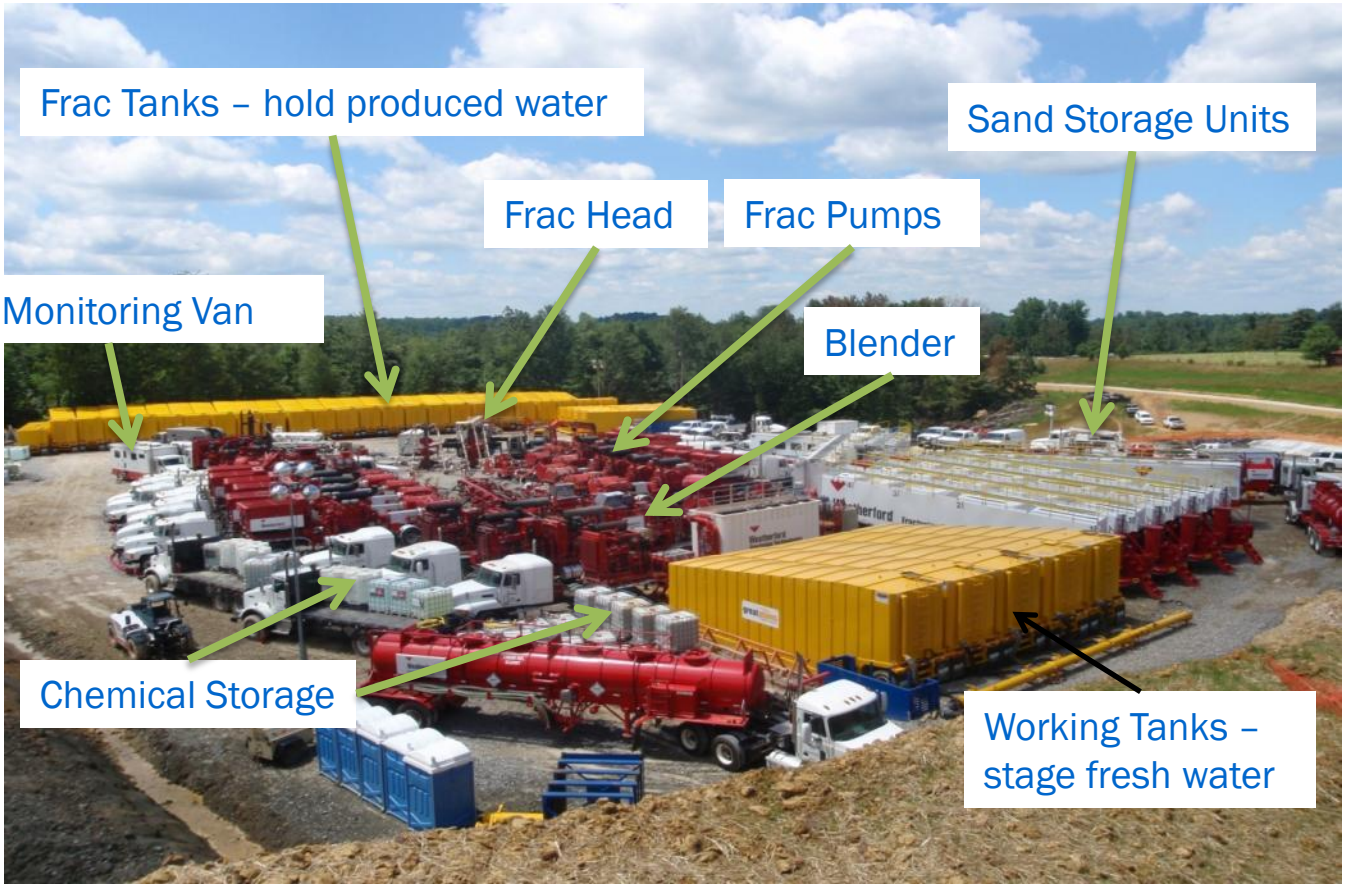
Well Completion – Hydraulic Fracturing

After the Drilling Rig leaves, Hydraulic Fracturing ("Fracing") Begins

- Water is mixed with sand and pumped into the shale reservoir under high pressure
- This process fractures the shale to release the gas
- Completed in a matter of days
- Not new technology –has been in use since after WWII.
- Over 300,000 oil and gas wells have been hydraulically fractured in PA ***prior to Marcellus shale development.***

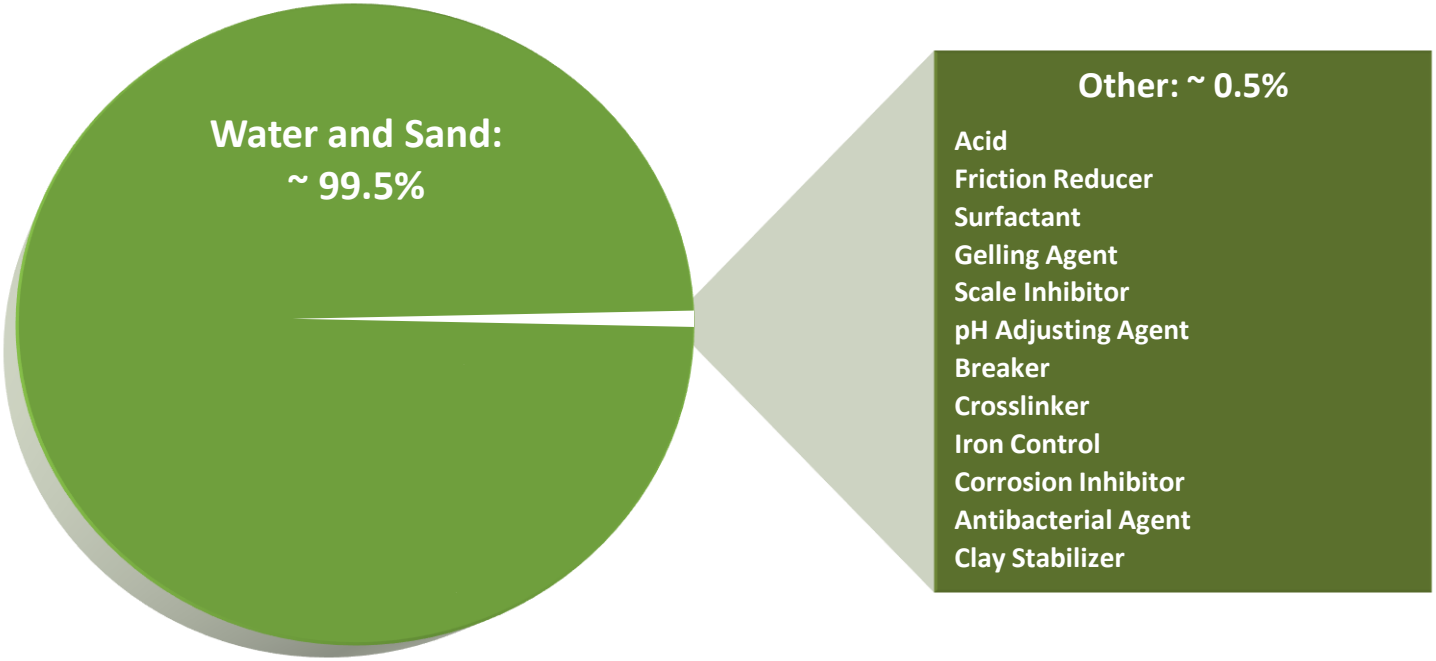
What does it look like?

Typical Site Layout



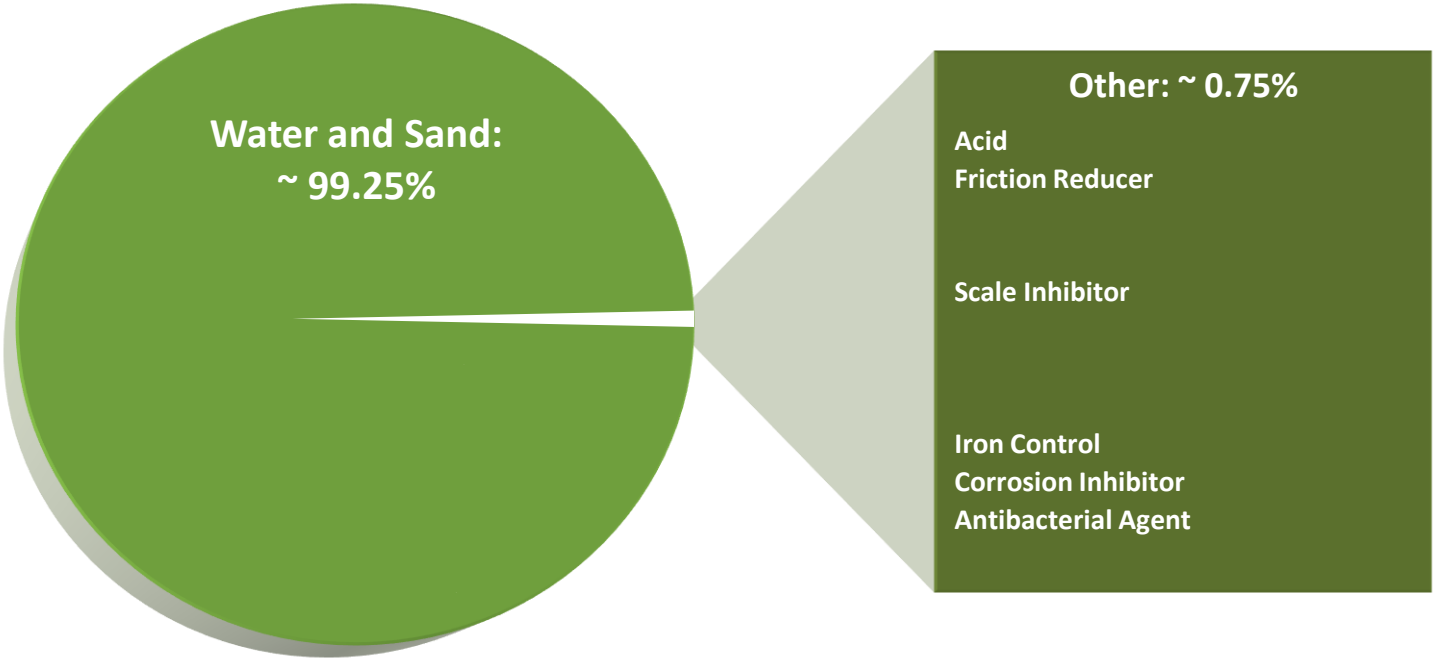
What's in Hydraulic Fracturing Fluid?

Typical Deep Shale Gas Fracturing Mixture
Note that all products are rarely used in one shale play

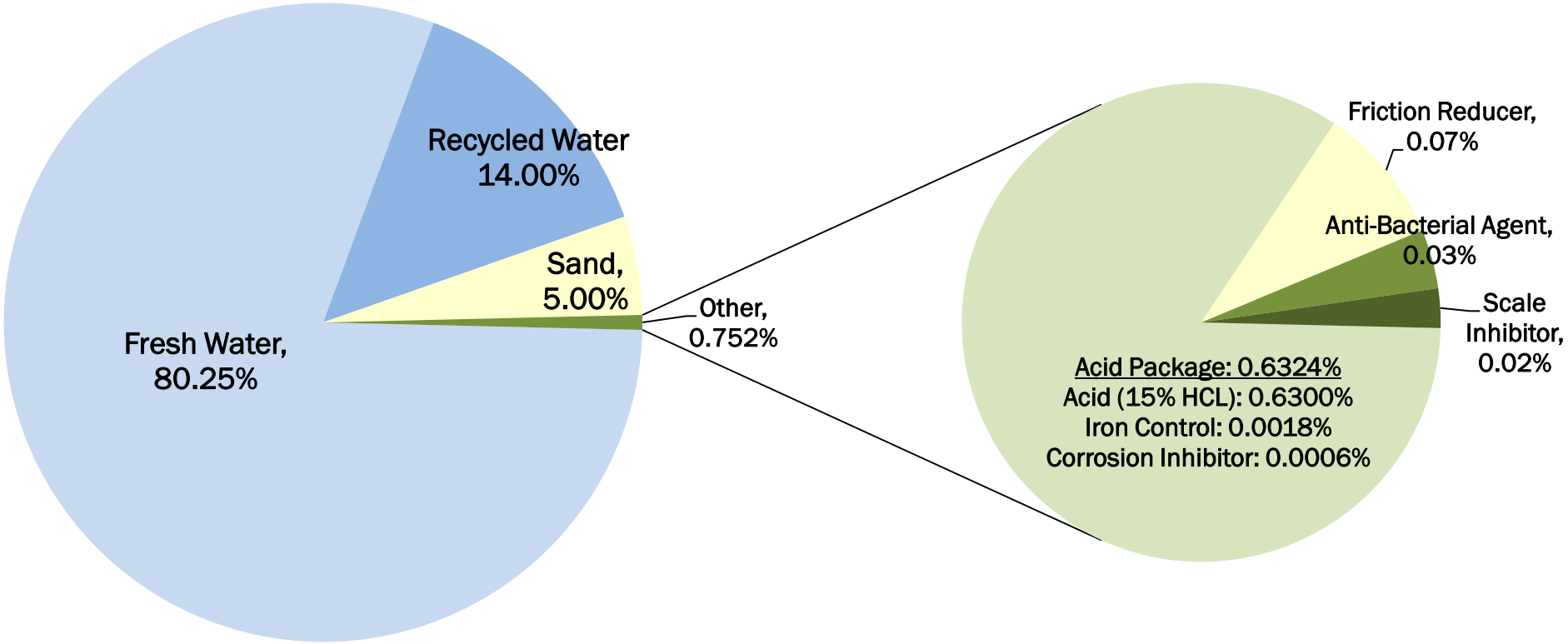


What's in Northern Marcellus Shale Fracturing Fluid?

Typical Northern Marcellus Deep Shale Gas Fracturing Mixture



Typical Northern Marcellus Shale Fracturing Products



Reported values are calculated as percentage of fracturing fluid by VOLUME

For more information, see the Marcellus Shale Hydraulic Fracturing Fact Sheet on http://www.hydraulicfracturing.com

Shale Fracture Additives and Common Uses

Product Type	Main Compound	Purpose	Downhole Result	Other Common Uses
Water	Water	Expand fracture and deliver sand	Some stays in formation while remainder returns with natural formation water as "produced water" (actual amounts returned vary from well to well)	Landscaping, manufacturing
Sand (Proppant)	Silica, quartz sand	Allows the fractures to remain open so the gas can escape	Stays in formation, embedded in fractures (used to "prop" fractures open)	Drinking water filtration, play sand, concrete and brick mortar
Other Additives: ~ 0.5%				
Acid	Hydrochloric or Muriatic Acid	Helps dissolve minerals and initiate cracks in the rock	Reacts with minerals present in the formation to create salts, water, and carbon dioxide (neutralized)	Swimming pool chemical and cleaner
Corrosion Inhibitor	Formamide	Prevents the corrosion of the pipe	Bonds to metal surfaces (pipe) downhole. Any remaining product not bonded is broken down by micro-organisms and consumed or returned in produced water.	Used in pharmaceuticals, acrylic fibers and plastics
Iron Control	Citric Acid	Prevents precipitation of metal (in pipe)	Reacts with minerals in the formation to create simple salts, carbon dioxide and water all of which are returned in produced water	Food additive; food and beverages; lemon juice
Anti-Bacterial Agent	Glutaraldehyde	Eliminates bacteria in the water that produces corrosive by-products	Reacts with micro-organisms that may be present in the treatment fluid and formation. These micro-organisms break down the product with a small amount of the product returning in produced water.	Disinfectant; sterilizer for medical and dental equipment
Scale Inhibitor	Ethylene Glycol	Prevents scale deposits downhole and in surface equipment	Product attaches to the formation downhole. The majority of product returns with produced water while remaining reacts with micro-organisms that break down and consume the product.	Used in household cleansers, de-icer, paints, and caulk
Friction Reducer	Petroleum distillate	"Slicks" the water to minimize friction	Remains in the formation where temperature and exposure to the "breaker" allows it to be broken down and consumed by naturally occurring micro-organisms. A small amount returns with produced water.	Used in cosmetics including hair, make-up, nail and skin products
Surfactant	Isopropanol	Used to increase the viscosity of the fracture fluid	Generally returned with produced water, but in some formations may enter the gas stream and return in the produced natural gas	Used in glass cleaner, multi-surface cleansers, antiperspirant, deodorants and hair-color
Gelling Agent	Guar gum or hydroxethylcellulose	Thickens the water in order to suspend the sand	Combines with the "breaker" in the formation thus making it much easier for the fluid to flow to the borehole and return in produced water	Cosmetics, baked goods, ice cream, toothpaste, sauces, and salad dressings
Breaker	Ammonium Persulfate	Allows a delayed break down the gel	Reacts with the "crosslinker" and "gel" once in the formation making it easier for the fluid to flow to the borehole. Reaction produces ammonia and sulfate salts which are returned in produced water.	Used in hair coloring, as a disinfectant, and in the manufacture of common household plastics
Crosslinker	Borate salts	Maintains fluid viscosity as temperature increases	Combines with the "breaker" in the formation to create salts that are returned in produced water	Used in laundry detergents, hand soaps and cosmetics
pH Adjusting Agent	Sodium or potassium carbonate	Maintains the effectiveness of other components, such as crosslinkers	Reacts with acidic agents in the treatment fluid to maintain a neutral (non-acidic, non-alkaline) pH. Reaction results in mineral salts, water and carbon dioxide which is returned in produced water.	Used in laundry detergents, soap, water softener and dish washer detergents

What happens to the water?

Process

- **Currently recycling / reusing nearly 100% of produced water via improved filtering processes**
- Produced water during frac flowback process collected and stored in holding tanks onsite
- Produced water pumped from the tanks through 20-micron filter
- Filtered fluid is pumped into a clean storage tank
- Prior to re-use in frac, the water is tested for remaining chlorides not removed in filtration process
- Test results determine the rate at which the filtered water can be blended with fresh water during the frac job

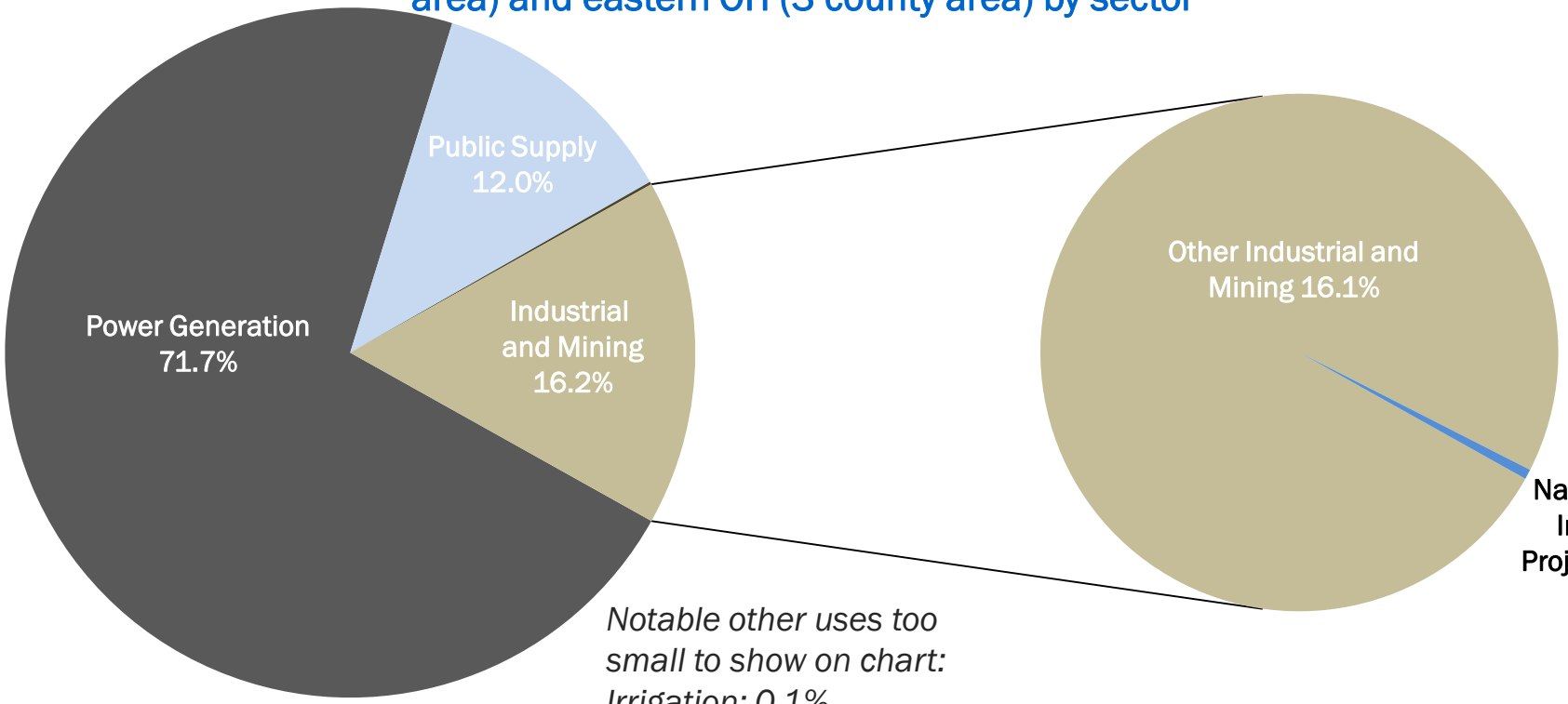
Benefits

- **Reduction in the volume of wastewater means less water sent offsite for disposal**
- **Less fresh water needed for fracturing operations means reduced impact on local supplies**
- **Reduced truck traffic (less water hauled) means lower impact on roads, noise and air**
- **Filtration process does not require substantial amounts of energy like other processes that remove salts (i.e. reverse osmosis membranes, distillation)**
- **Helps reduce the cost of operations**


BRINE
Aqua Renew™
CHESAPEAKE ENERGY'S WATER RECYCLING INITIATIVE

Water Use in the Marcellus Shale

Total water use (Surface Water and Ground Water) in northern and central PA (32 county area), southern NY (10 County Area), northern WV (29 county area), western VA and MD (5 county area) and eastern OH (3 county area) by sector



Total water use in Marcellus area:
3.6 trillion gallons per year

Notable other uses too small to show on chart:
Irrigation: 0.1%
Livestock use: 0.01%

Source: USGS Estimated Use of Water in US, County Level Data for 2000

Water Efficiency of Deep Sale Energy

Chesapeake's Four Major Deep Shale Plays

Shale Play	Average Water Use Per Well	CHK Est. Avg. Natural Gas Production Over Well Lifetime	Resulting Energy From Natural Gas Production Per Well (based on 1,028 Btu per Cubic Feet)[3]	Water Use Efficiency (in gallons per MMBtu)
Haynesville	5.6 million gallons	6.5 billion cubic feet	6.68 trillion Btu	0.84
Marcellus	5.6 million gallons	5.2 billion cubic feet	5.35 trillion Btu	1.05
Barnett	4.0 million gallons	2.65 billion cubic feet	2.72 trillion Btu	1.47
Fayetteville	4.2 million gallons	2.4 billion cubic feet	2.47 trillion Btu	1.70

British Thermal Unit (Btu)
Million British Thermal Units (MMBtu)

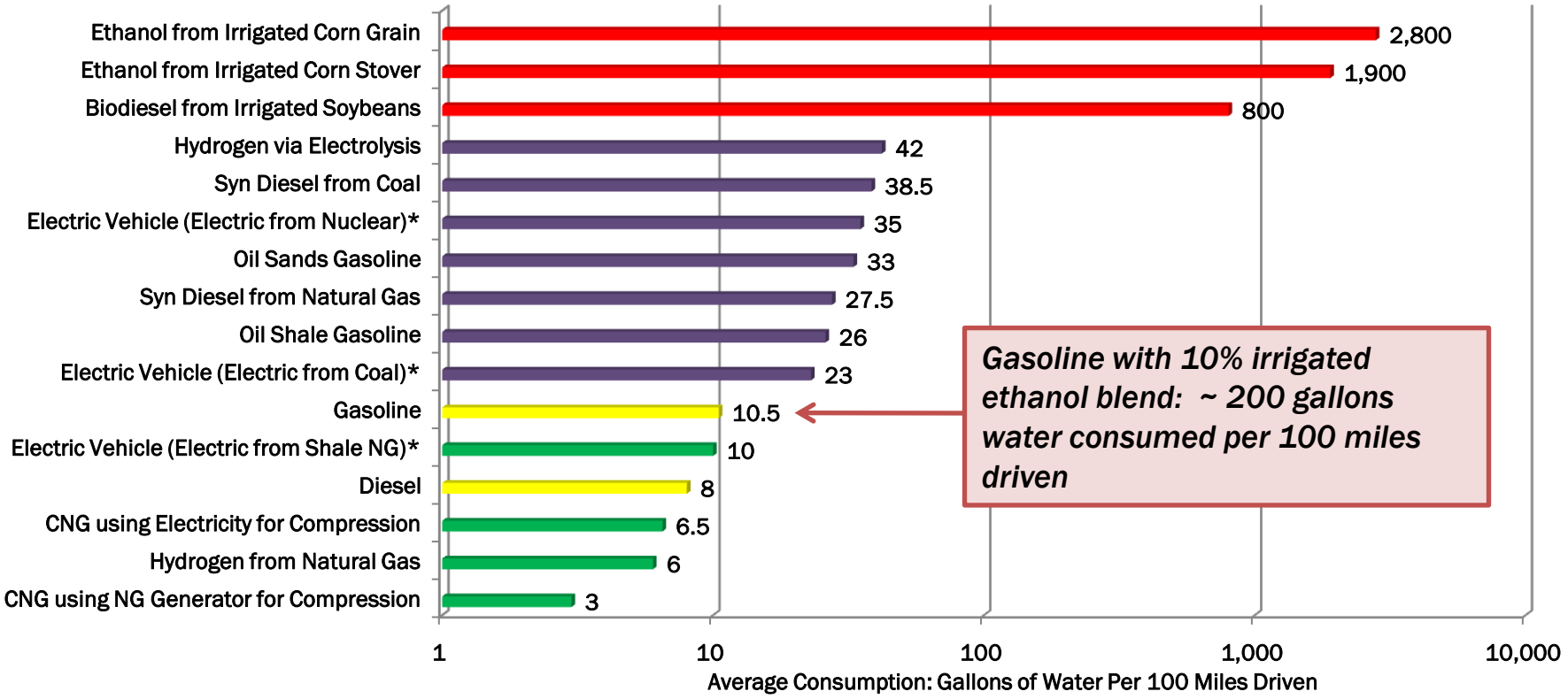
Raw Fuel Source Water Efficiency

How well are we using our water resouces for all energy?

Energy resource	Range of gallons of water used per MMBtu of energy produced
Chesapeake deep shale natural gas – Marcellus Shale	1
Conventional natural gas	1 – 3
Coal (no slurry transport) (with slurry transport)	2 – 8 13 – 32
Nuclear (processed uranium ready to use in plant)	8 – 14
Conventional oil	8 – 20
Synfuel - coal gasification	11 – 26
Oil shale petroleum	22 – 56
Tar sands petroleum	27 – 68
Synfuel - Fisher Tropsch (Coal)	41 – 60
Enhanced oil recovery (EOR)	21 – 2,500
Biofuels (Irrigated Corn Ethanol, Irrigated Soy Biodiesel)	> 2,500

Source: USDOE 2006 (other than CHK data)
*Does not include processing which can add from 0 - 2 gallons per MMBtu
Solar and wind not included in table (require virtually no water for processing)
Values in table are location independent (domestically produced fuels are more water efficient than imported fuels)

Water Intensity of Transportation Fuels

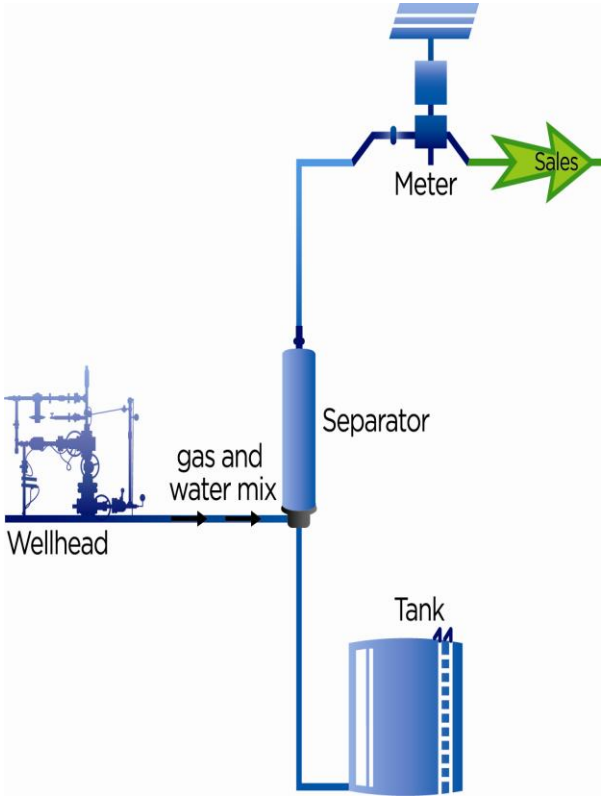


Compressed Natural Gas (CNG)
Source: Adapted from King and Webber 2008a;
*Adapted from King and Webber 2008b, combined with data from USDOE 2006

Production

Production to Sales

- Gas and produced water reach surface
- Gas and water are separated by the “Separator”
- Gas travels through sales meter to pipeline
- Pipeline carries gas to market
- Produced water is retained on location in tanks until removed via truck



Gathering Line Construction – Spring 2010
Asylum Township, Bradford County

Gathering Line Reclamation – Summer 2010
Asylum Township, Bradford County

Site Reclamation
Two Phases

- Pad site is reduced by about half.
- Rock surface is removed from reclaimed area and topsoil is returned and re-vegetated.
- Small quiet, ongoing footprint.
- Site is completely reclaimed when well is no longer productive.

Regulation

- Clean Water Act (CWA)
  - Regulates surface discharges of water associated with drilling and production
  - Storm water runoff from drilling and production sites
- Underground Injection Control (UIC) program of the Safe Drinking Water Act (SDWA)
  - Regulates the underground injection of wastes from all industries including oil and gas
- Clean Air Act (CAA)
  - Limits air emissions from engines, gas processing equipment and other sources associated with drilling and production
- Resource Conservation and Recovery Act (RCRA)
  - Requires industry to handle and dispose of its waste or refuse according to specific guidelines
- National Environmental Policy Act (NEPA)
  - Requires that exploration and production on federal lands be thoroughly analyzed for environmental impacts.
- Occupational Safety and Health Act (OSHA)
  - Protects the health and safety of oil and gas workers, as well as other industries

Note: State /local rules must be as stringent – and are often more stringent – than federal rules.

Environmental Protection & Regulation

- All operations overseen by internal Regulatory, Environmental Health & Safety, and Field Safety staff.
- Chesapeake has implemented industry-leading Best Management Practices in all phases of field operations.
- Chesapeake has retained PA-based consultants to audit all development activities
- Auditors are trained to be scientific, objective and independent of CHK's operations
- Chesapeake's environmental performance has improved dramatically since 2009 in PA field operations across the board.
- Chesapeake's drilling locations have been frequently touted by state regulators as model sites.

CHK's independent environmental auditors ensure our contractors are consistently implementing best management practices.

Benefits of Natural Gas

Clean

- The cleanest fossil fuel
  - No SO2
  - No Mercury
  - Negligible Particulates
  - 80 percent less NOx than coal
- Carbon Light
  - 50% less carbon dioxide than coal, 30% less than oil.
- Large transportation potential
  - 8 million NG vehicles worldwide. Only 150,000 in US.
- Tremendous electric generation potential, supplanting coal in future
- Excellent “partner” fuel as renewable production grows.

Abundant Affordable American

Chesapeake ENERGY

❖ Abundant Domestic Supply

- Barnett Shale: 44 Tcf*
- Fayetteville Shale: 42 Tcf*
- Haynesville Shale: 250 Tcf*
- **Marcellus Shale: 490 Tcf****

Total equates to nearly 40 years of national supply

❖ Affordable

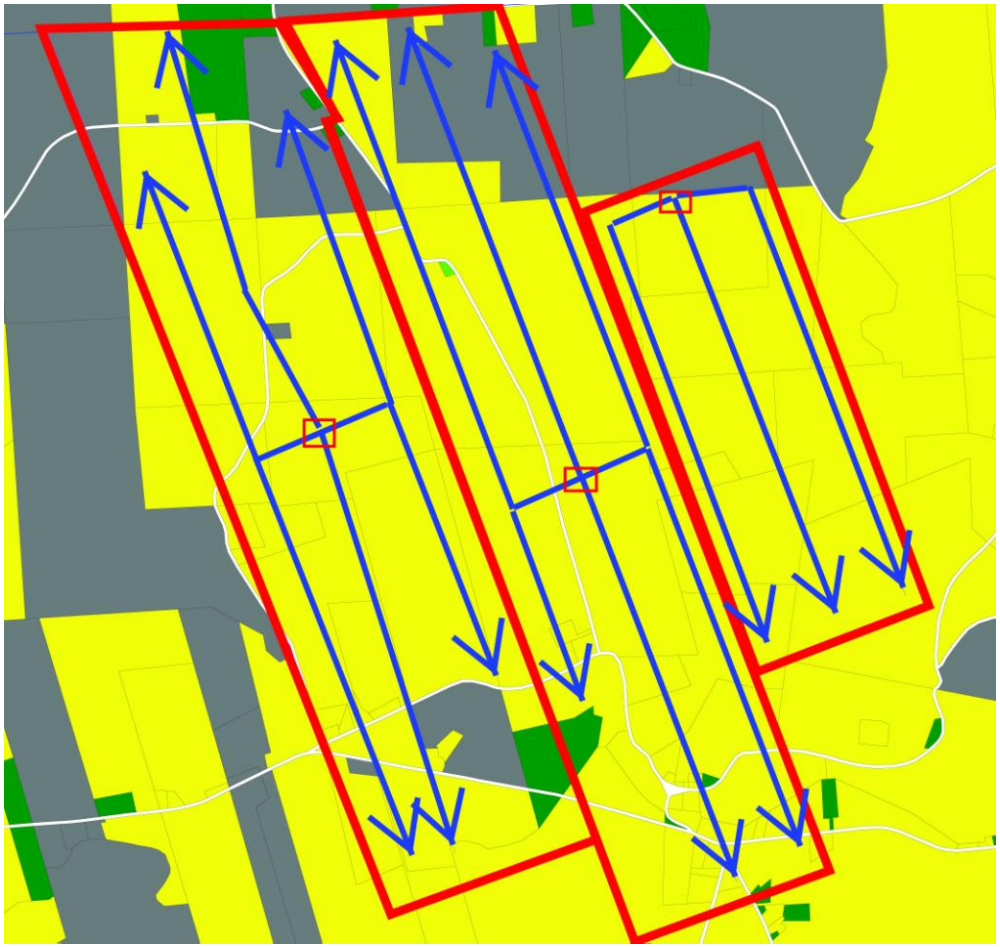
- Natural gas price of $5.50 per MMBtu equivalent to $33 Bbl oil
- Current oil price around $80 Bbl

❖ Versatile – Most Widely Used Fuel

- Clean burning power plants
- Residential use
- Industrial and manufacturing
- Commercial space heating
- Transportation fuel (CNG)

*US Department of Energy (April 2009): *Modern Shale Gas Development in the United states: a Prime,r p. 17*)
**Dr. Terry Engelder, Penn State University)
Tcf = trillion cubic feet

Drilling Units and Royalties



- Drilling unit size and shape can vary depending on geology, topography, leasehold, drilling et. al. issues
- Usually 640 acres or larger
- Once drilling is complete – Division Order process begins
- Royalty payments generally begin within 120 days of first sale and then continue monthly for the life of a well.

Northern Pennsylvania – Real Numbers

- 21 rigs currently
- ~30 rigs by the end of 2010
- Over 100 wells drilled
- ~200 wells planned for 2010
- Over 1,100 employees in PA
  (less than 250 in January 2009)
- Over a $1.2 billion paid to landowners since 2008
- Over $350 million in contracts to PA vendors since 2009 – growing quickly
- Over $1,000,000 in community investment in 2009.

Bradford County lead PA in real job growth last year – net gain of over 2,000 jobs

Chesapeake ENERGY

Questions?

- Field Visit Overview
- Safety Briefing
- Release Forms
- PPE