Fracking in Kentucky

Brandon C. Nuttall
Kentucky Geological Survey

KGS Annual Meeting
Lexington, Kentucky, 15-May-2015
What is Fracking?

- Inject high-pressure fluids underground
- Induce new fractures
- Connect to existing natural fractures
- Create
  - A larger stimulated reservoir volume
  - Permeable pathways for oil and gas to flow into the well bore
EPA 2015: Fracking in the U.S.

- Water (68% to 99%, median 88%)*
  - <30,000 gal. to >8,000,000 gal.
- Chemicals (2% or less, median 0.43%)
  - Control fluid properties
  - Maintain well integrity
- Sand (2.4% to 24%, median 11%)

* Composition by mass, data from 2015 EPA analysis of frac fluid data from FracFocus 1.0
Fracture stimulation has been used in Kentucky for more than 200 years

- 1806: Explosives to improve water wells
- 1888: 1st Kentucky oil well to be “shot”
- 1960: Hydraulic fracturing
  - 1946: 1st in U.S. (Kansas)
- 1972: Nitrogen frac – Ohio shale
  - Nitrogen frac – vertical wells
  - Nitrogen-foam – horizontal wells (since 2006)
- Hydraulic fracks
  - Berea (Lawrence and Greenup Counties)
  - New Albany shale (Breckinridge County)
Typical Completions

- Lawrence & Greenup: 1,200 ft to 1,800 ft
- East Kentucky: 2,000 ft to 5,000 ft

Depth and thickness varies across Kentucky

- Coal (C)
- Water (Blue)
- Oil (Green)
- Gas (Red)
- Brine (Black)
Water Use in Kentucky Fracks

- **Berea**
  - “Slickwater” (hydraulic) frac
- **Huron**
  - Nitrogen-foam frac
- **New Albany**
  - Hydraulic frac

Thousands of gallons or thousands of pounds

- **Sand (lbs)**
- **Water (gal)**

0  50  100  150  200  250
Fracked Wells in Kentucky

More than 11,000 since 1980
Nitrogen Frac, Eastern KY

Courtesy Brint Camp, NGAS
Horizontal Wells in Kentucky

1,616 total permitted
1,576 since 1/1/2006, 98%

April, 2015

Shale: Nitrogen-foam

Berea: Slickwater

None  1 to 75  76 to 150  151 or more

April, 2015
Horizontal Wells By Year

East Kentucky shale wells
Nitrogen-foam frac

40 Total

OIL  O&G  GAS  D&A  LOC  Other
Kentucky Natural Gas Production

2014: 256 Bcf

99% of natural gas produced in 34 Kentucky counties.
Kentucky Oil Production

2014: 4.1 MMBo

31.7% 9.8% 58.5%

63 Kentucky counties
Division of Oil and Gas

The mission of the Division of Oil and Gas is to regulate the crude oil and natural gas industry in the Commonwealth; protect the correlative rights of mineral owners, fresh water zones and minable coal seams; and conserve and protect oil and gas reserves in Kentucky.

The Division of Oil and Gas maintains a well history database for each well containing data relative to the permit, operator, well location, pertinent dates and well completion. Currently, there are 136,286 wells stored online. This information is shared with the Kentucky Geological Survey (KGS) to assist in the compilation of oil and gas data.

Quick Links

- Kentucky Geological Survey
Senate Bill 186 – KRS 353 Update

• Energy & Environment Cabinet Workgroup
  – Dept. of Natural Resources
    • Div. Oil & Gas
    • Div. Water
  – Economic Development
  – Department of Ag

• Kentucky Oil and Gas Regulatory Modernization Act

• Signed by Governor Beshear 19-Mar-2015
• Law 24-Jun-2015
• “High-volume” (HVHF) defined
  – >80,000 gallons for any stage
  – >320,000 gallons in aggregate for all stages
• Baseline water quality testing, post-frac monitoring
• Notification (surface owners within 1,000’)
• Disclosure at chemical registry, FracFocus.org
  – Trade secrets must be available to health professionals on request
• Site reclamation, BMP
EEC Listening Sessions

- Public comments (not a debate)
  - Oil & gas development
  - Report to oil and gas workgroup
- Check eec.ky.gov for news release
  - Place: Hazard, Somerset, and Madisonville
  - Date & time: TBD
Public records are available through online services at www.uky.edu/kgs.

Online search
Interactive maps
Enable pop up windows!

KGS home page
Public records

Scanned documents are available for browsing, printing, or downloading.

Completion and stimulation

WELL LOG REPORT

Shale (1) = 4197-4361 Shale (2) = 3673-4064

TYPE SHOT: Select Fire & HSC

SHOT INTERVAL: Shale (1) = 4197-4361 Shale (2) = 3673-4064

SHOT AMOUNT: Big Lime (3) = 3420-3448

COMPLETION INTERVAL, PERFORATIONS OR OPENHOLE

FORMATION: Shale (1) INTERVAL 4197-4361 20H

FORMATION: Shale (2) INTERVAL 3673-4064 20H

PLUGGED: Big Lime (3) SHUT-IN 3420-3448 22H

TREATMENT

TYPE OF TREATMENT: Shale (1) & (2) = N2 Big Lime = 650 Foamed Acid

ACID AMOUNT:

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<th>Treatment</th>
<th>BBLs.</th>
<th>2ND STAGE</th>
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<td>(3)</td>
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TOTAL FLUID:

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<td>(3)</td>
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TOTAL NITROGEN:

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<td>(1)</td>
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<tr>
<td>(2)</td>
<td>901,100</td>
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TOTAL SAND:

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Page 1
27 states require disclosure

18 states designate FracFocus

Kentucky – SB 186 becomes law
24-Jun-2015
Summary

• Fracking
  – Used for decades
  – Combined with horizontal wells
    • Devonian Ohio Shale (natural gas)
    • Devonian Berea Sand (oil)
• HVHF regulations (SB 186)
  – Notification
  – Water testing
  – Mandatory disclosure
  – Reclamation
Thank you

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- www.uky.edu/KGS

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