A Review of Oil and Gas Resource Trends in Kentucky

Brandon C. Nuttall
Things are Looking Up in Kentucky

Well... except for that whole commodity price thing.

1 Mcf = 0.172 barrels (based on Btu content)
Fracture Stimulation in Kentucky

- 1st in 1950s
- More than 10,000 since 1980

Does not count many thousands of explosive fracture stimulations
Horizontal Wells since 2006

1 to 10
11 to 50
51 to 100
101 to 200
201 or more

Ohio Shale

Berea Oil

New Albany Shale

Ohio Shale

1,464 horizontal wells since 2006
Fractured Black Gas Shale

Upper Huron, AA Highway near Vanceburg, KY
At least 100’ thick and 1,000’ deep
Kentucky Shale Wells

- ≥ 15,000 wells
- ≥ 5 trillion cubic feet
- \( \text{N}_2 \) frac

256 Bcf in 2014
Horizontal Wells By Year

- East Kentucky shale wells
- N₂ Foam frac

40 Total

- OIL
- O&G
- GAS
- D&A
- LOC
- Other
- Permits
Western Kentucky: New Albany Shale

At least 100’ thick and 1,000’ deep

New Albany

Chattanooga
West Kentucky Shale Gas

Flaherty discovered 1858
(“Old Rock Haven” field)
Endeavor Wells in Breckinridge Co.

- 2011 – drilled, gas
- 2012 – new report, oil
Cumulative total (2013): 23,649 bo, 246 MMcf

- 5,363 bo
- 3,538 bo
- 9,548 bo, 35.8 MMcf
- 720 bo, 2.4 MMcf
- 1,696 bo, 10 MMcf
- 2,303 bo, 41.8 MMcf
- 32 bo, 4 MMcf
- 449 bo, 152 MMcf

Pre-Endeavor New Albany shale gas well

Endeavor wells
Breckinridge County Activity

Permits since 1/1/2013

- OIL
- O&G
- GAS
- DRY
- Location
- Expired or cancelled

42 permits
At least 100’ thick and 1,000’ deep
Devonian Berea
“Sandstone”

AA Highway near Vanceburg, Lewis County, KY
2014 Oil Production: 4.1 MMbo

75% increase over 2011

East Kentucky 58.5%

31.7%

9.8%

63 Kentucky counties
Berea Renaissance

Oil production (barrels) x 100000

- Greenup
- Lawrence
- Henderson
- Union
Berea Production Data

50% of wells are predicted to average 20 to 30 barrels per day for up to 2 years.

Median of observed production rates each period

Dimensionless oil rate ($q_i/q_{\text{max}}$)

Decline (Oil)

Rate vs Cumulative

Median of observed production rates each period
At least 100’ thick and 1,000’ deep
Rogersville Play Area (Based on data available in 2004)

Rome Trough (deep basin)

Area of possible Rogersville production
- Vertical Rogersville Shale test well
- Horizontal Rogersville Shale test well

2+ million acres
1.5-1.6 million acres

No deep well data

Courtesy Dave Harris, KGS

(Based on data available in 2004)
Bruin #1 Young

- Slickwater frac
- Tested 115 Mcf and 19 bo (5/6/2014)
- Shut-in 5/30/2014
- New permit for horizontal lateral
- Plan to “flow to sales”
One of these drilled and evaluated for HVHF

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<th>COUNTY</th>
<th>WELL</th>
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Natural Gas Liquids

5,000,000 barrels
Gas Processing in Kentucky

- Langley at 50% capacity
- Ranger – Y-grade liquids pipeline (ethane rejection to Big Sandy)
- Big Sandy – natural gas pipeline (ethane)
- No ethane cracker
In Summary

• Kentucky has active shale plays
  – Ohio (Cleveland, Huron) gas shale
  – New Albany

• Horizontal wells and fracking are common
  – Increasing production in historic areas

• NGL production
  – Infrastructure limitations
  – Limited publicly available data

• Rogersville emerging shale play
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- Rogersville emerging shale play

Continued growth depends on commodity prices
Thank you

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