ACKNOWLEDGEMENT

- Dave Harris, John Hickman, Kentucky Geological Survey

DATA NOTE

- All Data Presented is publicly available and/or acquired from publicly available material
OUTLINE

- ROGERSVILLE SHALE INFORMATION
- ROME TROUGH
- PREVIOUS AND ONGOING WORK
- CORE DATA
- RECENT ACTIVITY
IN THE APPALACHIAN BASIN THE MARCELLUS AND UTICA-POINT PLEASANT DOMINATE SHALE GAS PRODUCTION,

WHILE THE ROGERSVILLE IS NOT LISTED AS A CURRENT OR PROSPECTIVE PLAY.....

WILL THIS CHANGE?
AN EMERGING PLAY?

- What makes the Rogersville different than the Marcellus or Utica-Point Pleasant?
- Does the Rogersville have the potential to be a productive play in West Virginia?
- If it does have potential, what are the reasons it has not been developed yet?
Unit within the Cambrian-age Conasauga Group
Middle Cambrian ~500 Million Years Old
Organic-rich dark shale mixed with siltstone and carbonates
Depth ~10,000-17,000 feet in WV (in KY 5,000-10,000 feet deep)
Thickness 0 - 1,000+ feet (not all is organic rich)
WHERE IS THE ROGERSVILLE IN WEST VIRGINIA?

- Rogersville-(depending on location) is.....
- 7,000-9000 feet below Marcellus
- ~5,000 feet below Utica-Point Pleasant
- Deposition limited to within the Rome Trough
Middle Cambrian
Paleogeography

Rogersville Deposition

Ron Blakey,
Colorado Plateau Geosystems, Arizona USA
ROME TROUGH

Early to Middle Cambrian extensional graben

Extends from northern Tennessee northeastward into southwestern Pennsylvania, possibly into southern New York

Part of interior rift system formed with opening of Iapetus Ocean

Major boundaries are formed by basement rooted faults

Faults are high angle normal faults.
ROME TROUGH

Major boundaries are formed by basement rooted faults.

Faults are high angle normal faults.
GRABEN ARCHITECTURE

- Extensional setting
- “Pulling apart” of landmass
SCHEMATIC SHOWING DIFFERENCE IN GEOMETRY OF ROME TROUGH

Rome Trough Consortium
ROME TROUGH STRATIGRAPHY

Rome Trough Consortium
ROME TROUGH (ROGERSVILLE HIGHLANDS)
WHAT IS OUR DATA BASED UPON?
12 Wells Penetrate Rogersville Equivalent Interval

2 Wells are in structurally complex eastern part of state, and outside of Rome Trough—therefore Rogersville.

Most wells were drilled in 1970’s.

Well in Mason County, drilled in 2003, was a CO$_2$ sequestration test, no Rogersville present.
West Virginia

Most wells are on fringes of Rome Trough

4 wells are located more in the middle of the basin

Rogersville Shale only recognized in those 4 wells
PREVIOUS AND ONGOING WORK
PREVIOUS WORK

  - Multistate project (WV, KY, OH)
  - Mapped individual units in the Rome Trough
  - Correlated across state lines
  - Focused on conventional reservoirs
- U.S. Geological Survey Open File Report 05-1443
DIP CROSS SECTION ACROSS NORTH CENTRAL WEST VIRGINIA
STRIKE CROSS SECTION THROUGH ROME TROUGH, WEST VIRGINIA

Rome Trough Consortium
Noted that Rogersville could be a source rock.
EXXON JAY SMITH #1 - THE CORE THAT STARTED IT ALL

- Well Drilled in 1974
- Depth-14625 Feet to Precambrian
- Plugged in 1975
- WVGES has core from several intervals in this well.
- Rogersville core is 11,135-11,200 Feet
TOC in Rogersville 4.4% from Rome Trough Consortium work

TOC measurements similar or higher than Utica-Point Pleasant
**Recent Smith Core Data**

TOC: Total Organic Carbon
- Indicator for the concentration of organic material in a source rock.
- 0.5% is minimum for effective source rock
- 2% is minimum for shale gas reservoirs

Source: Schlumberger

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Rogersville Interval

Highest TOC % 3.74
Was 4.4% in previous Rome Trough Consortium Testing
Kerogen: naturally occurring solid, insoluble organic matter that occurs in source rocks and can yield oil upon heating (Schlumberger).
Graph shows depth vs normalized oil content

Indication of Maturity
### Recent Core Data from Several WV Wells

- Other wells show much lower TOC% (nothing over 0.5%)
- Not all are from Rogersville interval

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CORE DATA CONCLUSIONS

- Up to 4.4% TOC, but TOC is highly variable within wells and within Rome Trough
- Rogersville has generated gas and condensate. West Virginia is in the wet to dry gas transition zone
- Most of the Rogersville in West Virginia is thermally mature
- Only the Smith core shows good source rock data.
RECENT ACTIVITY
ROGERSVILLE DEPOSITION AND POSSIBLE PRODUCTIVE AREAS
RECENT WV ACTIVITY

Two wells in Putnam County

1. Cabot Oil & Gas
   API 4707901538
   Cabot 50
   Surface Owner-Amherst Industries
   Completed late 2014

2. Hard Rock Exploration
   API 4707901539
   Surface Owner G D Young
   Permitted 11/2015
Cabot 50

- Vertical Well
- Unsure if producing zone is Rogersville
- Records held confidential by WV Conservation Commission

Cabot Putnam County Well 4707901538

2015 Total Gas: 233,280 Mcf
2016 Total Gas: 74,202
Total: 307,482 Mcf
Six wells drilled to date:

1. Bruin Expl. (Cimarex): apparent discovery (shut-in) Lawrence Co., KY

2. Cabot Oil & Gas: 1 vertical, Putnam Co., West Virginia, producing dry gas

3 & 4. Chesapeake Energy: 2 verticals (shut-in), Lawrence County, KY


6. Bruin Expl. (Cimarex): 2nd well, horizontal, Lawrence Co., Ky. Two undrilled horizontal lateral permits in KY
CURRENT KENTUCKY ACTIVITY

Horizontal Tech. Energy (EQT)
Johnson County, KY: 2,000 ft lateral drilled/tested

Chesapeake
Two vertical wells, one re-permitted as a 5,200 ft lateral

Bruin Exploration (Cimarex)
2nd well: Walbridge
5,300 ft horizontal in Rogersville Sh.
27-stage frack, testing
IMPLICATIONS

This activity has generated active leasing

Stacked potential is limited

However, could easily connect to pipeline and refinery infrastructure

1,600,000 ACRES – CHK ADVANTAGE
ROME TROUGH

- Multi-zone stacked potential
  - > ~1 to 4.5 bboe recoverable in single zone
- 1.4mm acres HBP/minerals
  - > Two vertical core wells drilled
- Competitors de-risking around CHK HBP position
- Access to Gulf Coast markets

Chesapeake Investor Report
AN EMERGING PLAY?

- **What Makes the Rogersville Different than the Marcellus or Utica-Point Pleasant?**
  - Depth, Complex Structural System, Depositional System

- **Does the Rogersville have the potential to be a productive play in West Virginia?**
  - Yes, but may not be as geographically expansive as Marcellus or Utica-Point Pleasant

- **If it does have potential, what are the reasons it has not been developed yet?**
  - Sparse dataset, Depth (Increases Cost, some Horizontal Utica-Point Pleasant wells have price tags north of $20 Million, Most Likely Dry Gas
AN INTRIGUING TARGET.....

CIMAREX WALBRIDGE 1H FLARE (4-26-2017)
THANK YOU

QUESTIONS?