

Downstream Development Based on Current Status of Utica Shale Production and Infrastructure Build Out

Shale Symposium: What Communities Need to Know

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Production Analysis

- Production classified as gas, NGL, condensate and oil
 - ODNR production reports provide Oil (barrels), Gas (Mcf) and number of production days
 - Quarterly production for 2013 and 2014 (Q1 and Q2)
 - Annual production for 2011 and 2012
- Analyses based on:
 - 574 producing wells (ODNR 09/13/2014 Cumulative Well Status)
 - Rigdata Locations and Operators reports
 - Initial gas/oil ratio (first quarter of production per well)
 - Media published initial production and test rate information
 - Calculated decline rate based on ODNR production reports
 - Barnett, Haynesville and Marcellus established decline

Utica Producing Wells

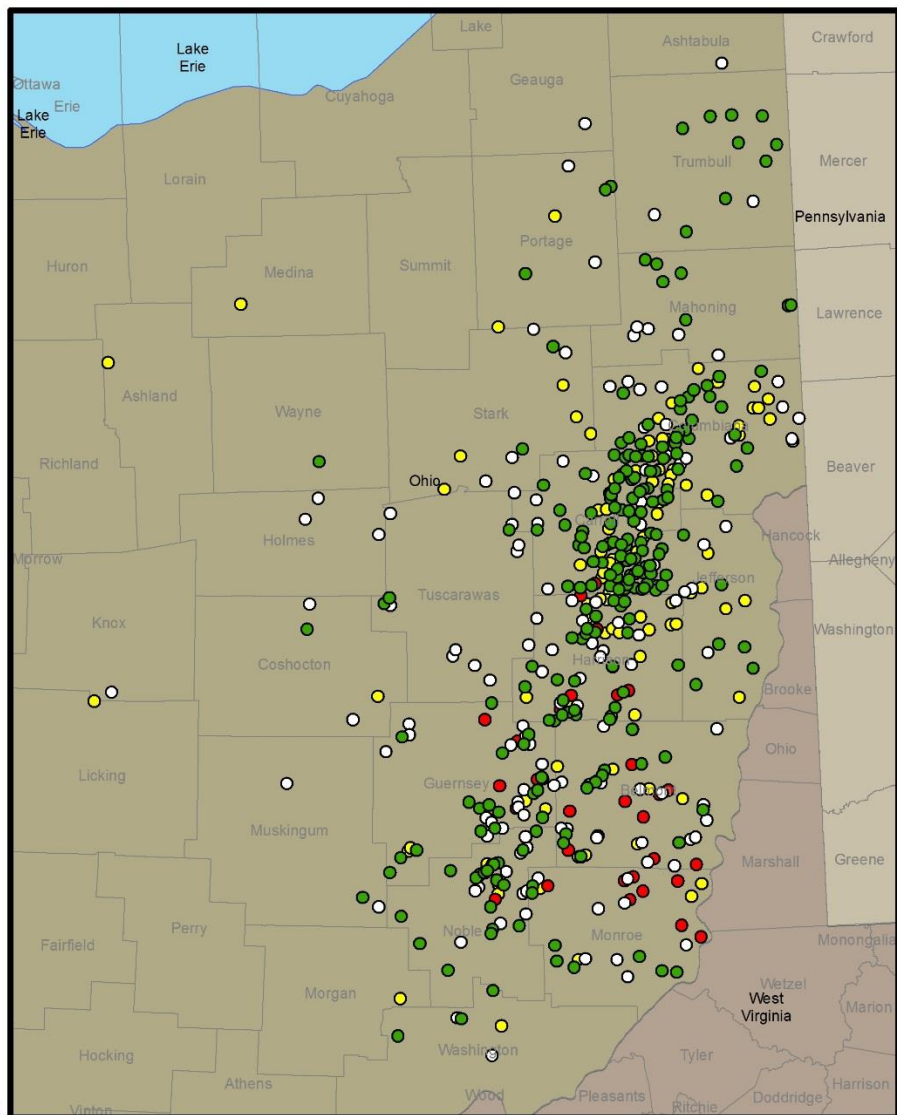
Ohio Utica Shale Well Status October 2014

Status

- Producing
- Drilled
- Drilling
- Permitted



0 5 10 20 Miles



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Utica Shale Production Zones with Initial Production Test BTU Values

• ODNR Utica Producing Wells

BTU

◊ 1000 - 1099

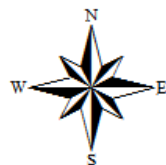
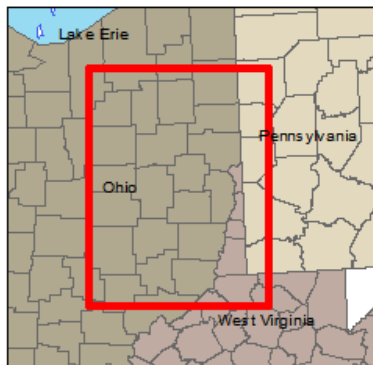
◊ 1100 - 1199

◊ 1200 - 1299

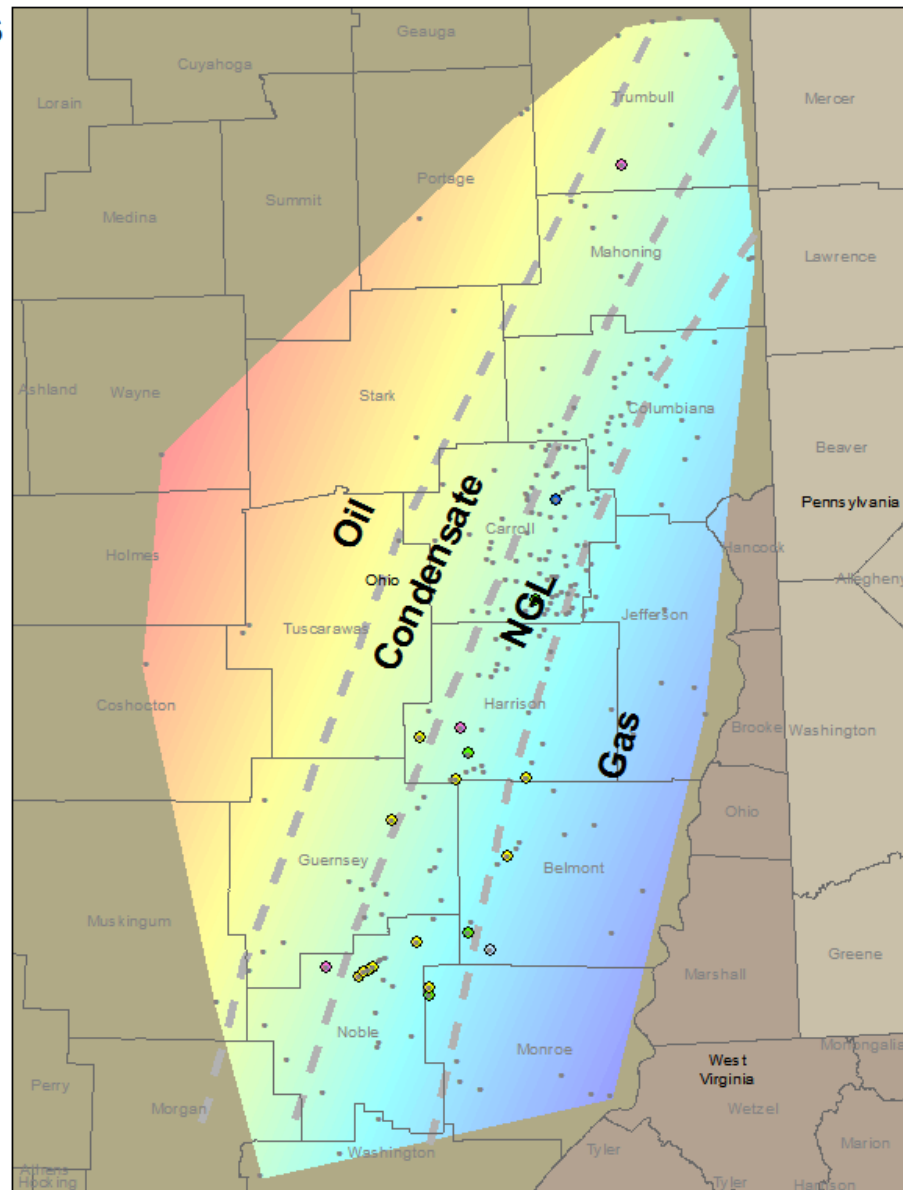
◊ 1300 - 1399

◊ 1400 - 1499

— Estimated Boundary



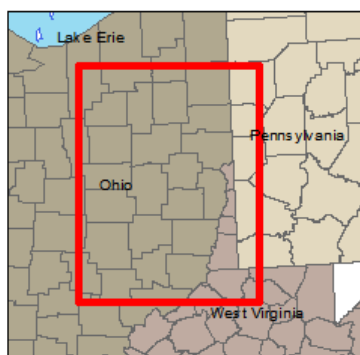
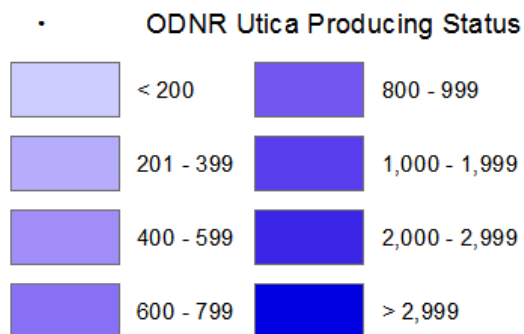
0 5 10 Miles



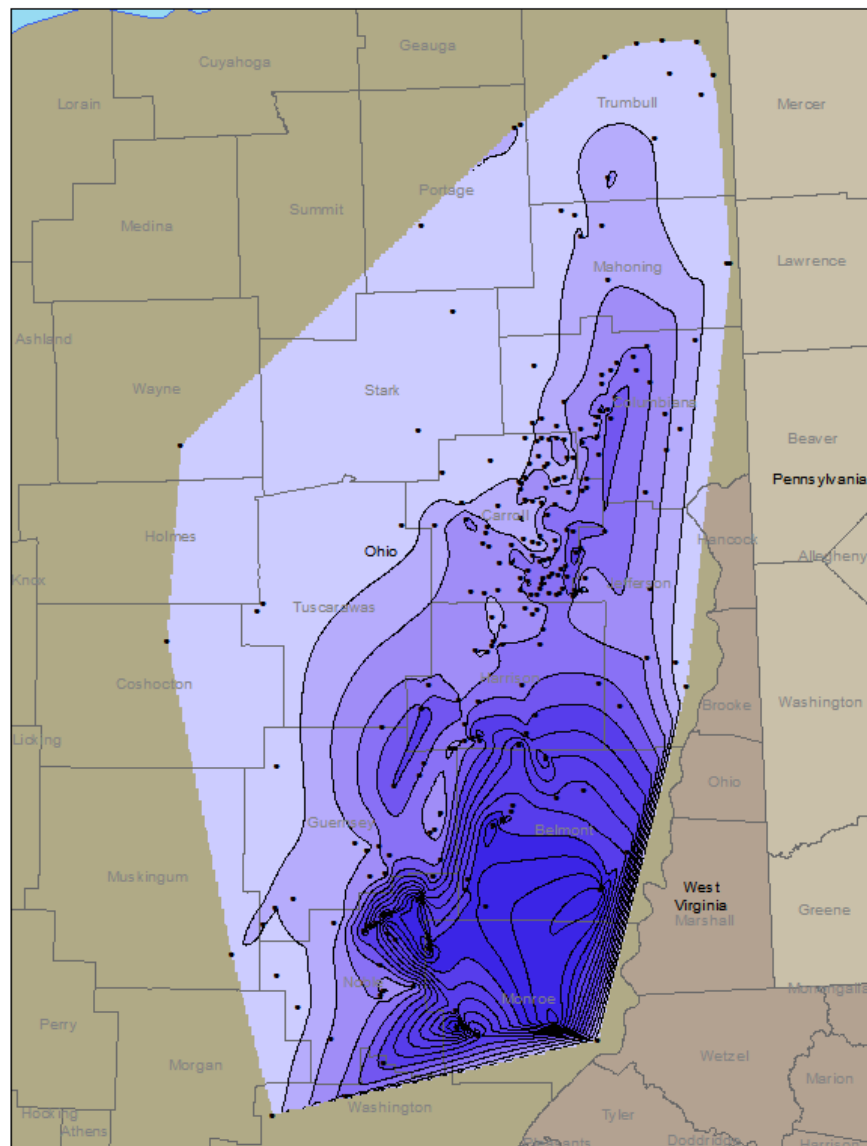
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Utica Shale Peak Average Daily Production Barrels of Oil Equivalent per Day (BOEPD)

Contour Interval: 200 bbls

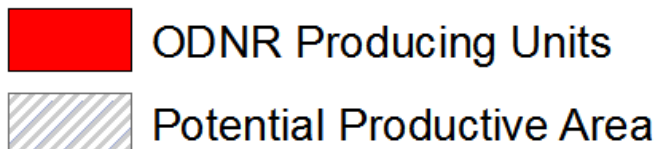


0 5 10 Miles



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Utica Shale Area and Production Units October 2014

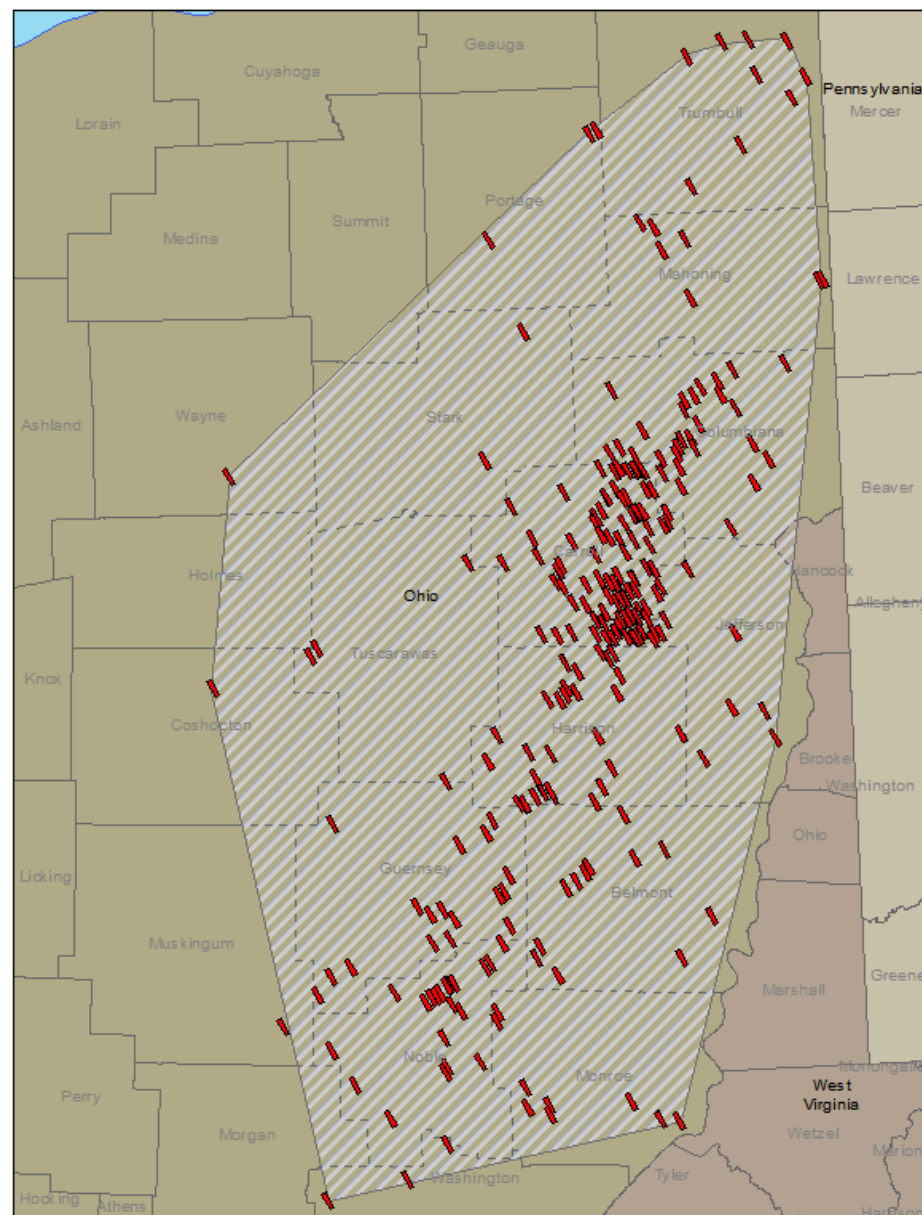
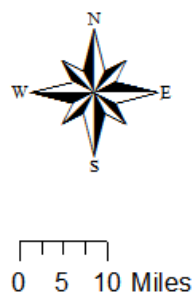
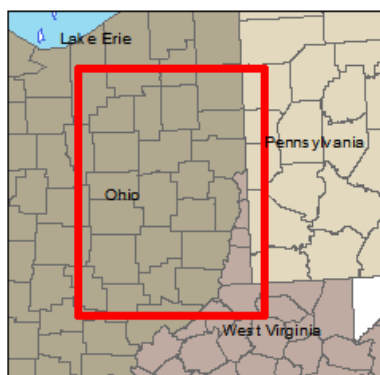


Potential productive area: 4,073,000 acres

Producing unit area: 154,240 acres

Available potential
productive area: 3,918,760 acres

Producing area as percent of
potential productive area : 3.94 percent



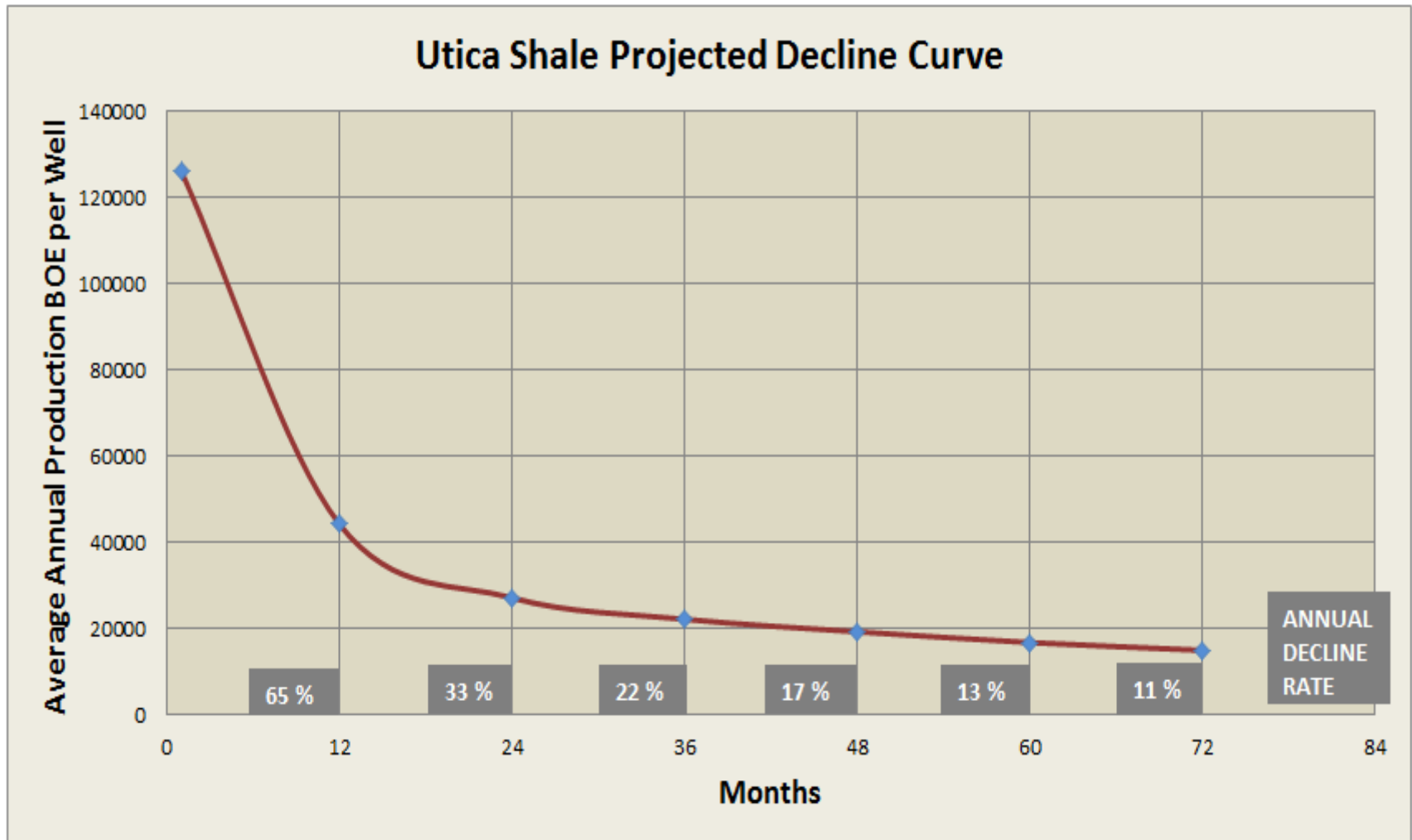
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Five Year Low Side – *Most Likely* Drilling Rate Estimate

- Rig count drops to 40 in 2015 and stays at 40 through 2019
- Drilling efficiency improves to 22 days/well drill time from current 28.4 days/well by 2016 (use 25 days/well for 2015)

Year	Rig Count	Drill Time	Wells/Year	Total Wells
2015	40	25	584	
2016	40	22	664	1248
2017	40	22	664	1912
2018	40	22	664	2576
2019	40	22	664	3240

Utica Decline Curve



Five Year Production Summary

Low-Side Estimated Total Production

= 1,000,000,000 Barrels Oil Equivalent
or 6,000,000,000 MCF Gas Equivalent

High-Side Estimated Total Production

= 1,330,000,000 Barrels Oil Equivalent
or 8,000,000,000 MCF Gas Equivalent

Most Likely Estimated Total Production

= 1,230,000,000 Barrels Oil Equivalent
or 7,400,000,000 MCF Gas Equivalent

Some Factors Controlling Throughput Over Next 5 Years: Global Factors

- Price of oil
- Price of natural gas, natural gas liquids, condensate
- New drilling techniques
- Improved production technologies
- Capital availability
- Growth of global demand for natural gas and NGLs
 - New markets
 - New products
 - Substitution effect

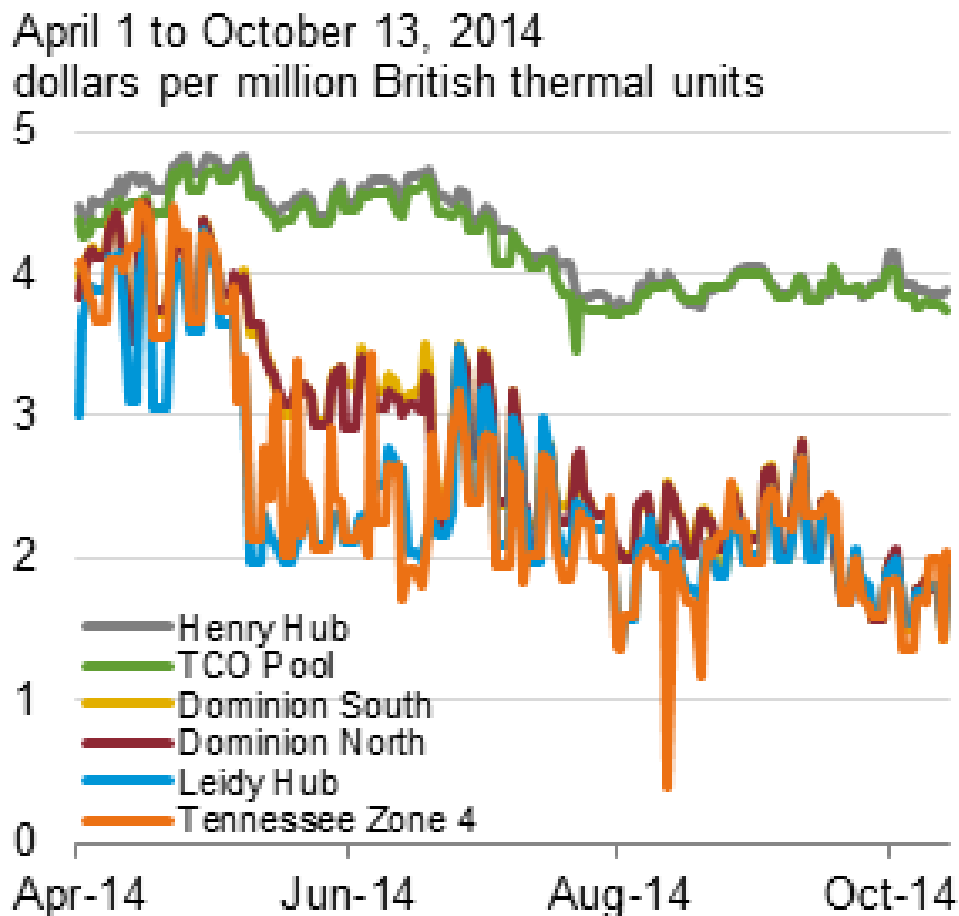
Some Factors Controlling Throughput Over Next 5 Years: Regional Factors

- Local price for natural gas: Henry Hub vs. Marcellus-Utica
- Rate of liquids production, strategies for drilling
- Improved drilling techniques
- Improved production: pressure management program
- Lease retention/renewal avoidance
- Unitization backlog
- Development of midstream infrastructure
 - Development of processing capacity in the region
 - Take away capacity
 - Regional consumption
- Strategies/positions of companies – main players in Utica and Marcellus

Rate of Liquids Production

- Drilling currently focused on wet gas corridor
 - Shrinkage averages around 30% in wet gas corridor
 - Wet gas generates around 6 gallons of liquid/mcf
 - Typical Utica Natural gas liquid makeup:
 - Ethane – 60%
 - Propane – 22%
 - Butanes – 11%
 - Others: 7%
- Companies will be moving more into dry gas areas
 - Need to protect leaseholds
 - High production rates in dry gas areas
 - Prices for liquids are declining

Marcellus Region Natural Gas Hub Spot Prices



Proposed NGL Pipelines in the Utica and Marcellus Regions October 2014

▲ Fractionation Plants

NGL Pipelines

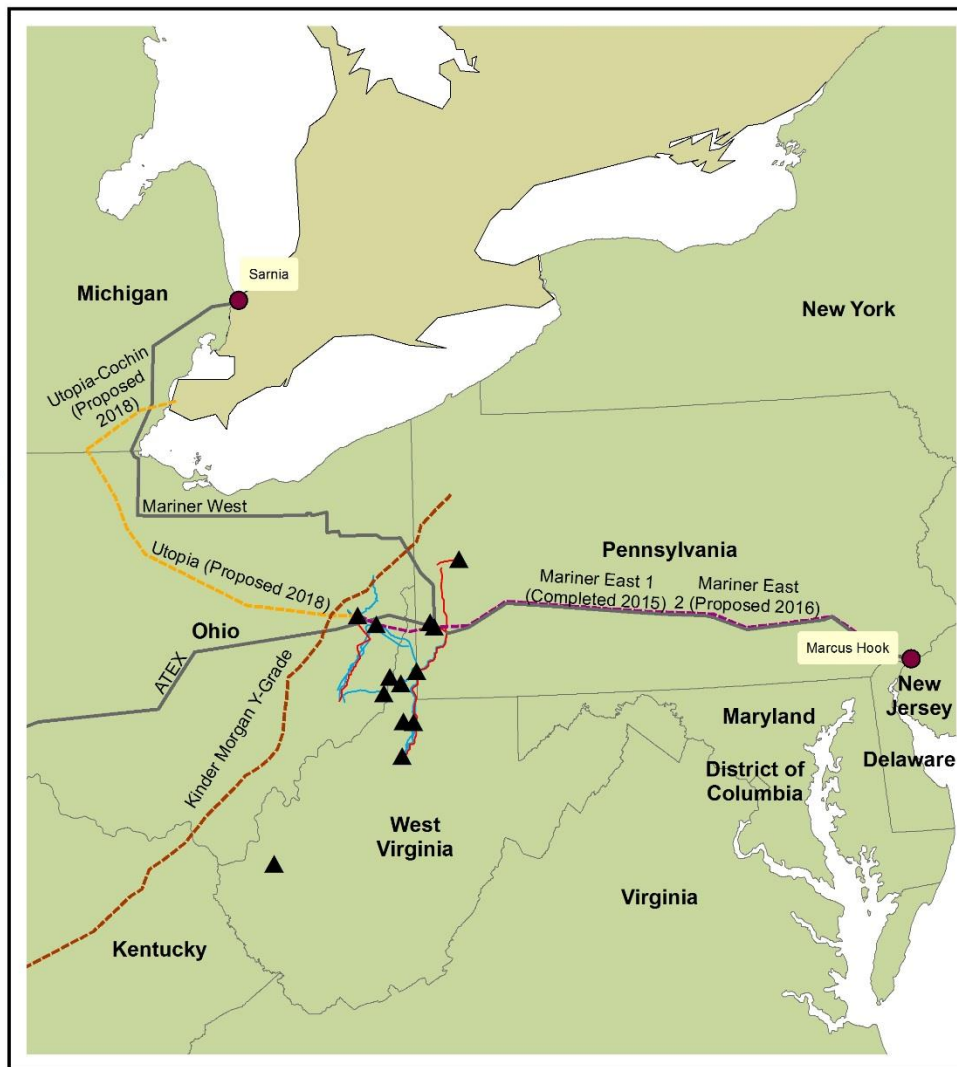
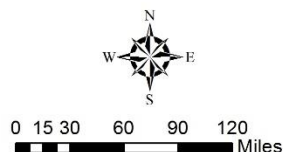
Pipename

- ATEX
- - - Kinder Morgan Y-Grade
- Mariner East 1 (Completed 2015)
- - - Mariner East 2 (Proposed 2016)
- Mariner West
- - - Utopia (Proposed 2018)
- - - Utopia-Cochin (Proposed 2018)

Local Pipelines

Type

- Ethane
- NGL

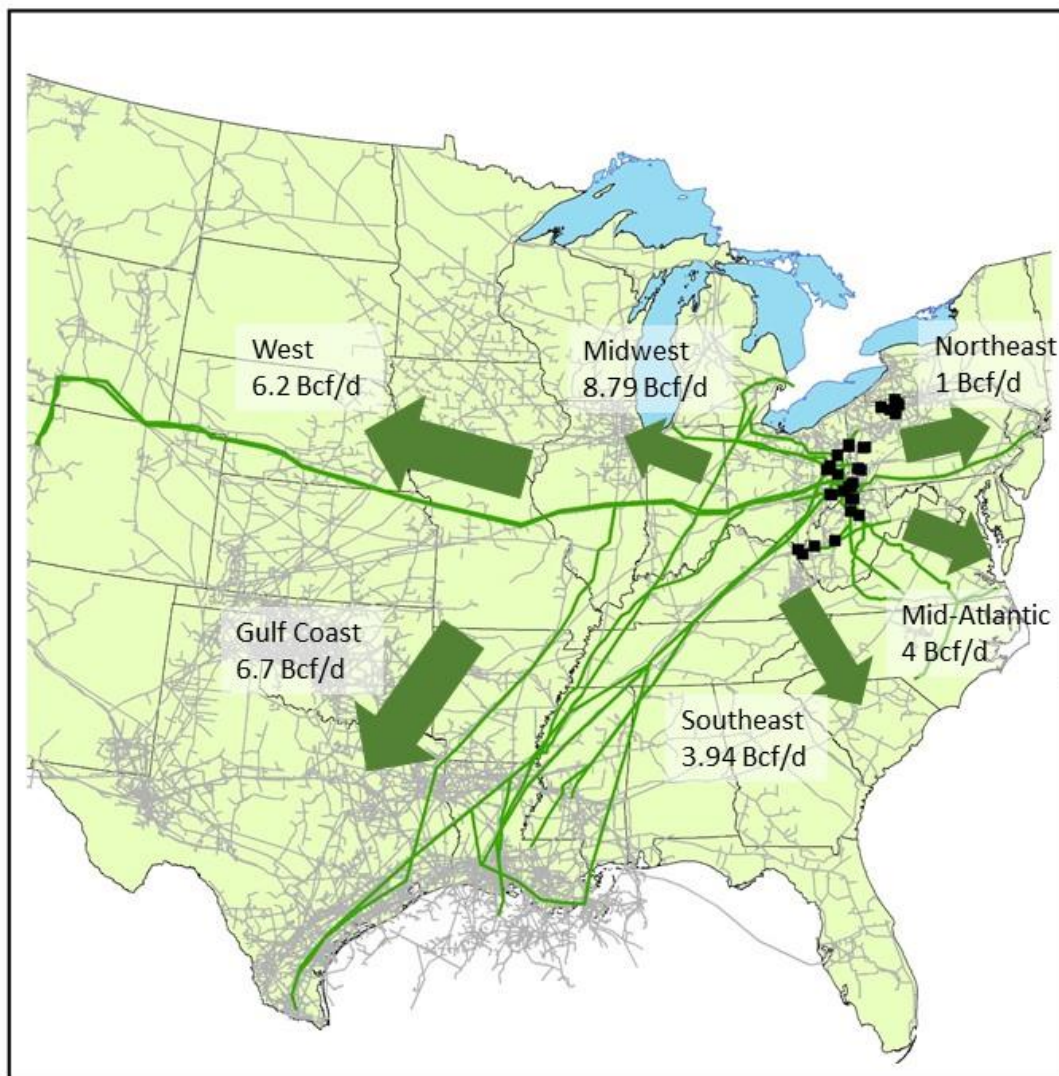
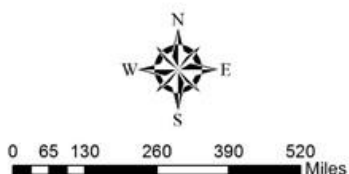


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Natural Gas Interstate Expansion Projects, Announced as of October 2014

Natural Gas Pipeline Expansion Projects in the Utica Region October 2014

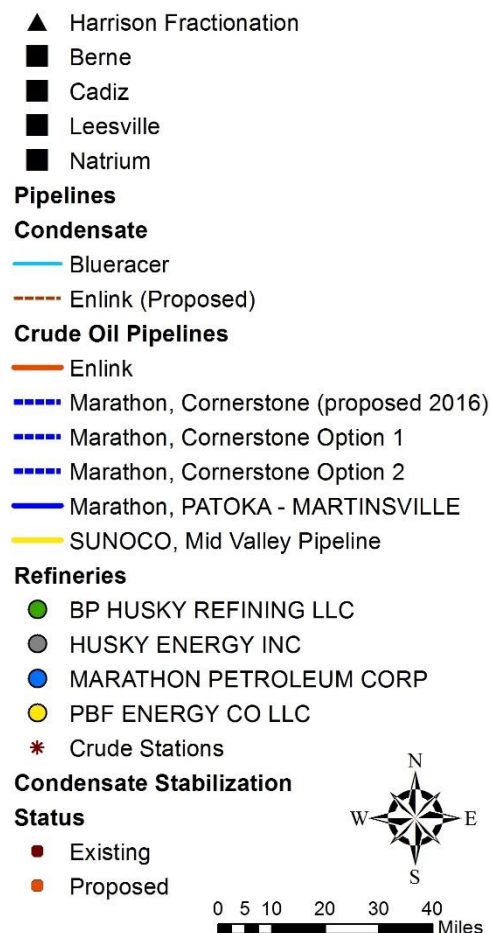
- Processing Plants
- Natural Gas Interstate Pipelines**
- Existing Pipelines
- New or Expanded Pipelines



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Crude Oil and Condensate: Existing and Announced as of October 2014

Existing and Proposed Crude Oil and Condensate Pipelines in Ohio October 2014



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Top Utica Wet/Dry Gas Producers

2013 Q1

Chesapeake
Gulfport

Hess
Anadarko
PDC Energy
Enervest
Rex Energy

2013 Q2

Chesapeake
Gulfport

Hess
Rex Energy
Hilcorp
Anadarko
Enervest

2013 Q3

Chesapeake
Gulfport

Antero
Rex Energy
Hess
Hilcorp
Anadarko

2013 Q4

Chesapeake
Gulfport

Antero
Rex Energy
Hess
HG Energy
PDC Energy

2014 Q1

Chesapeake
Gulfport

Antero
Rex Energy
Hess
HG Energy
Eclipse Resources

2014 Q2

Chesapeake
Gulfport

Antero
Hess
Rex Energy
HG Energy
Eclipse Resources

Total 6Q's

Chesapeake
Gulfport

Antero
Hess
Rex Energy
HG Energy
PDC Energy

Source: ODNR
Utica Production

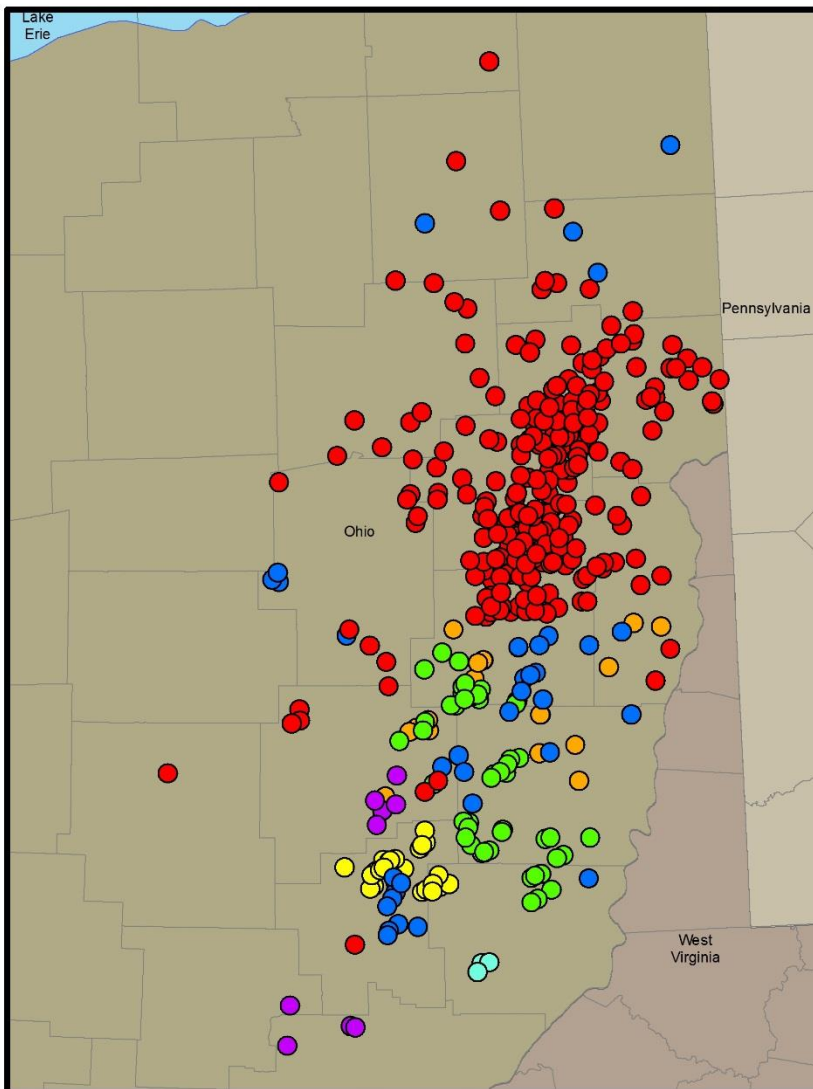
Spatial Distribution of Main 7 Utica Operators

Well Operators in the Utica October 2014

- HG Energy
- PDC Energy
- Chesapeake Exploration & Enervest Operating
- CNX Gas Company & Hess Ohio Developments
- Antero Resources
- Gulfport Energy Corporation
- Rex Energy

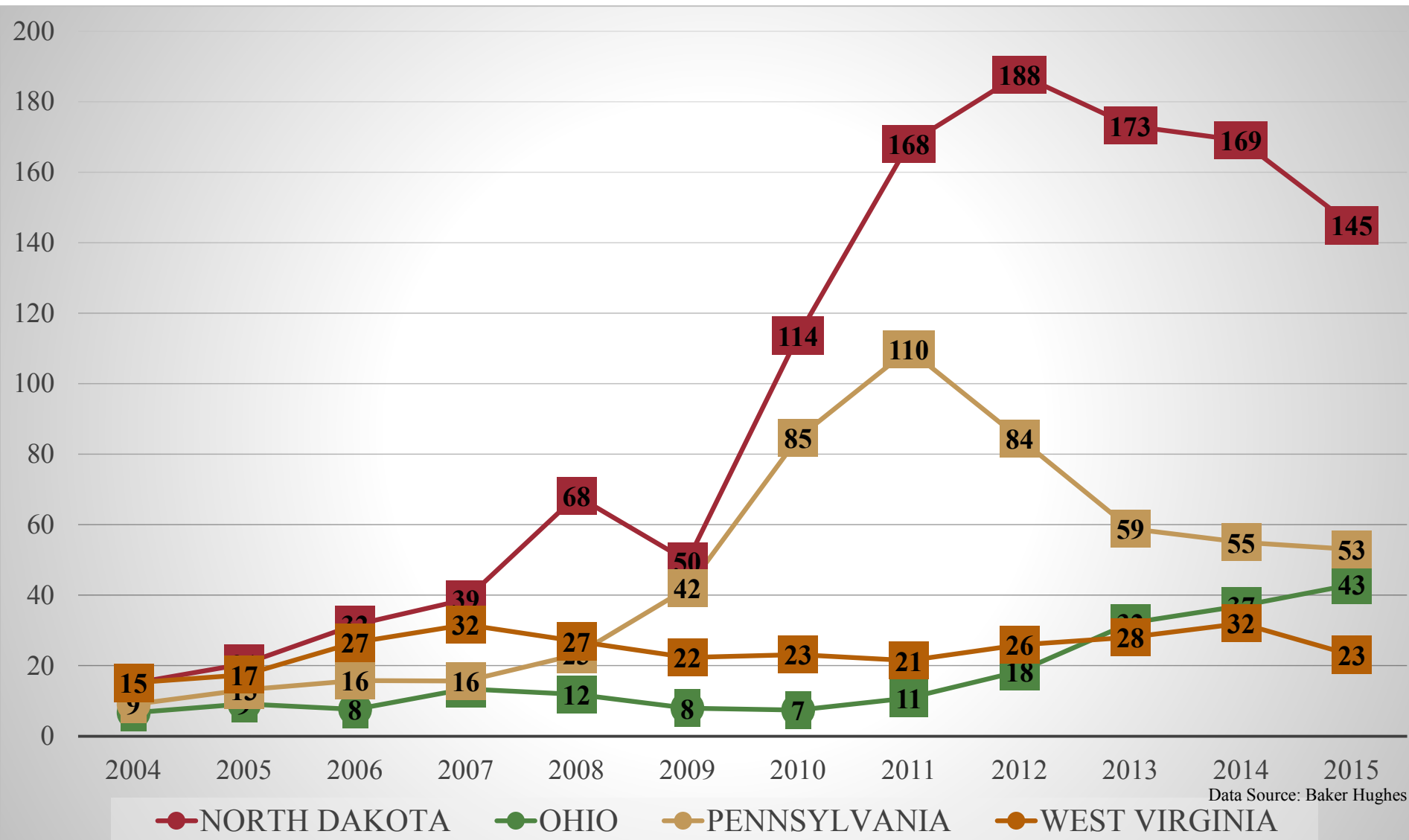


0 5 10 20 Miles



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Rotary Rigs by State



Baker Hughes Drilling Rig Count in U.S. Unconventional Production Basins for the Week Ended 2/6/15

<u>Basin</u>	<u>2/6/15</u>	<u>1/30/15</u>	<u>% Change Last Week</u>	<u>2/7/14</u>	<u>% Change Last Year</u>
Ardmore Woodford	6	6	0%	8	-25%
Arkoma Woodford	7	7	0%	5	40%
Barnett	19	19	0%	31	-39%
Cana Woodford	43	40	8%	37	16%
DJ-Niobrara	48	51	-6%	55	-13%
Eagle Ford	168	178	-6%	216	-22%
Fayetteville	9	9	0%	9	0%
Granite Wash	39	40	-3%	54	-28%
Haynesville	43	43	0%	43	0%
Marcellus	71	75	-5%	81	-12%
Mississippian	53	54	-2%	78	-32%
Permian	417	454	-8%	483	-14%
Utica	41	43	-5%	41	0%
Williston	137	148	-7%	177	-23%
TOTAL	1101	1167	-6%	1318	-16%

Note: Basins as designated by Baker Hughes. Permian likely includes rigs drilling more conventional formations.

Crude Oil: WTI (NYMEX) Price

CLJ15 - Crude Oil WTI (NYMEX)



WTI Crude Futures



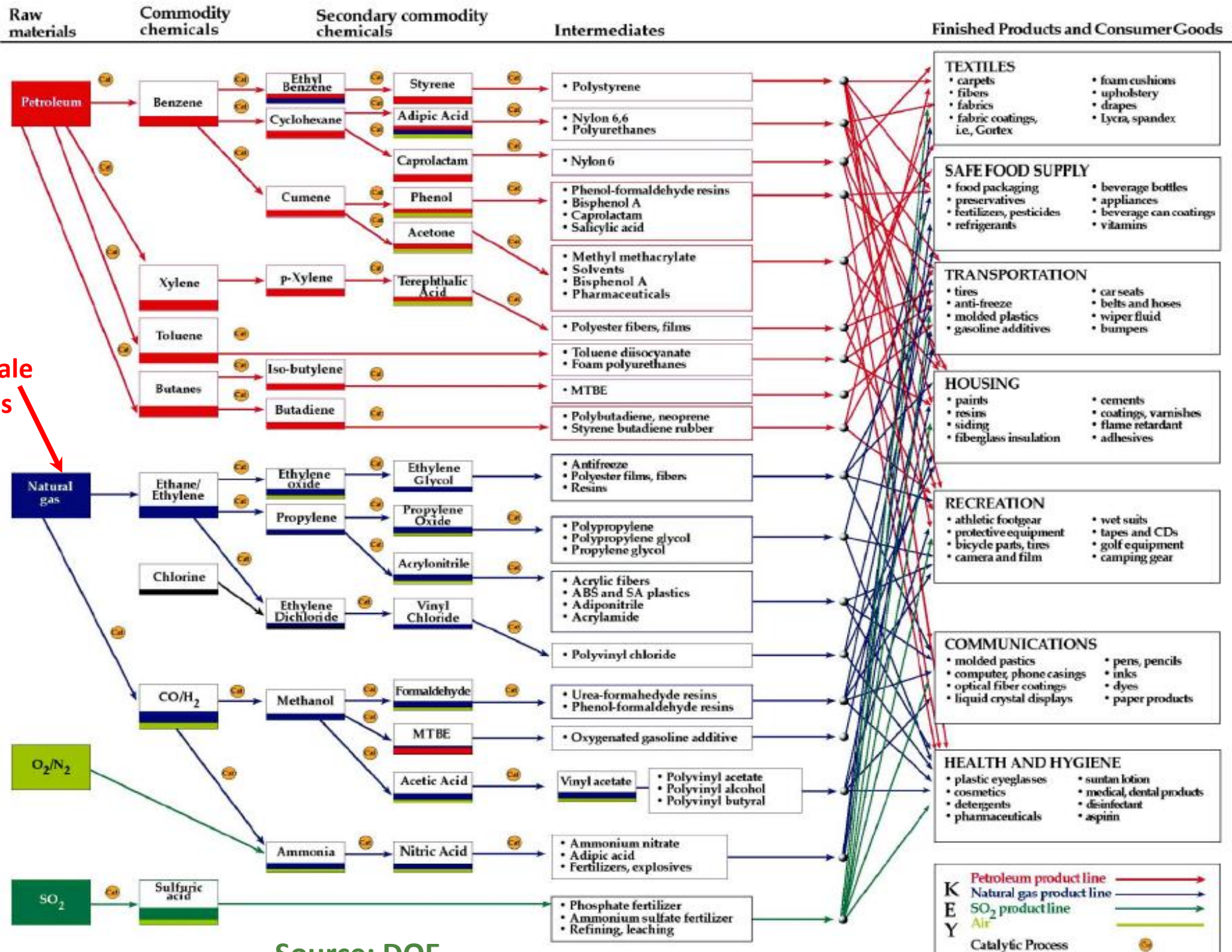
Source: Bloomberg

Current Development towards the Petrochemical Cluster

- NGLs from shale gas are used by the chemicals industry to produce derivatives to be used as raw materials in manufacturing
 - Utica liquids are about half ethane
 - Volumes of ethane in the Utica and Marcellus are large enough to ramp up regional chemical industry after refining
 - Ethane is converted into ethylene- “most significant single chemical”
 - Shell and Odebrecht are planning to build crackers in the Appalachian Basin
 - Ethane production throughput by 2020 is expected to be considerably greater than the take-away capacity
 - **Expected production from Utica and Marcellus: 798 mbbl/d**
 - **Expected take away capacity: 460 mbbl/d**
 - *Relevant uncertainty: capacity and market for ethane rejection*

Shale Gas

Products from Petroleum Feedstocks



Source: DOE

2013 Employment

0 - 1
1.1 - 3
3.1 - 7
7.1 - 12
12.1 - 24
24.1 - 37
37.1 - 117

Source: American Chemistry Council, July 24, 2014

Innovation in Plastic Products

- Additional demand for polyethylene and derived chemicals will come from:
 - Making new products from plastic
 - Substituting other materials with plastics in existing products
- Smaller niches of products in medical industry, construction, transportation, and consumer goods:
 - Self-designed plastic heart valve
 - Plastic Frogbox
 - Box-O-Mania plastic playboxes
 - Plastic bathtub protector
 - Plastic Roofing: “Perfectuille”
 - Navy prototype plastic boat
 - Ethylene-absorbing plastic covers to improve shelf life of fruits and vegetables
 - Plastics used in concrete tents at disaster sites
 - Polyester fabric wrap for London’s Olympic Stadium
 - Floating pump set for Indian farmers
 - “Solar windows” sprayed on with flexible plastic film which generate electricity

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