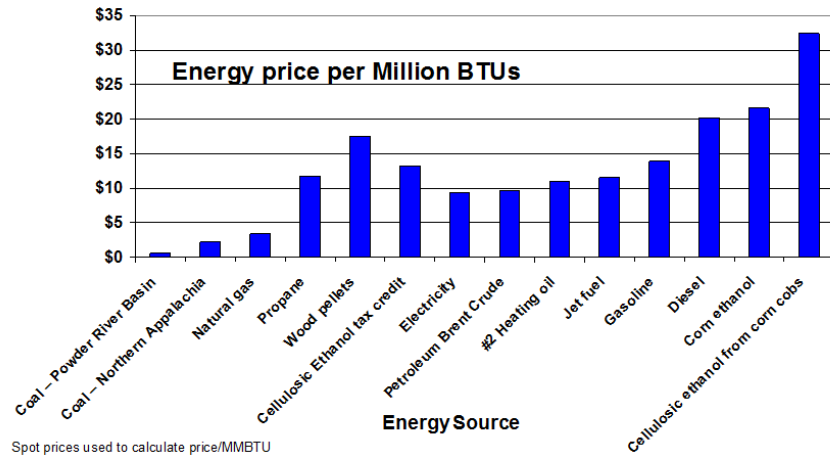


### The Price of Energy

Dec 2016

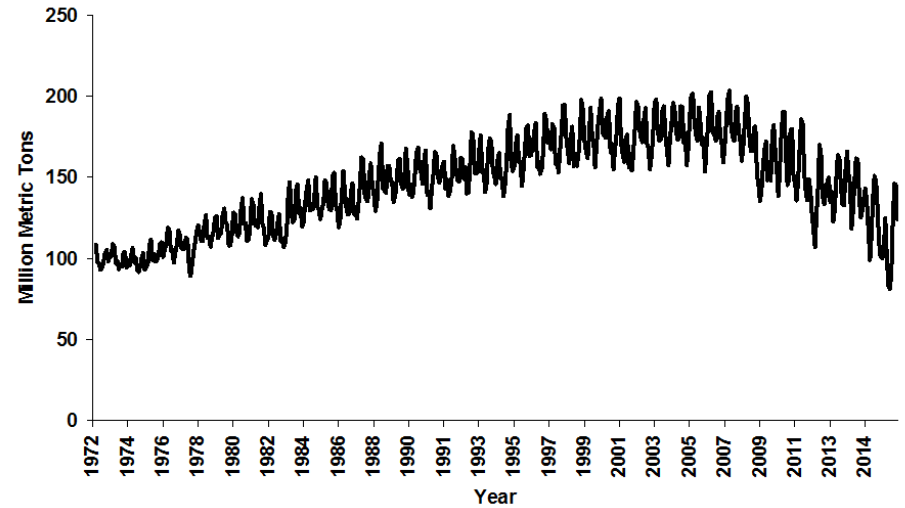


Sources for Data: U.S. Energy Information Administration (EIA) - Coal News and Markets Report 2, EIA, Natural Gas Futures Prices, Bloomberg, Propane Bloomberg generic Future 1 month, Volumetric Ethanol Excise Tax Credit (VEETC) - EthanolInfo.org; Wood Pellets - Bloomberg; Electricity - Bloomberg; Petroleum - Bloomberg; EIA, #2 Heating Oil - Indexmundi.com; Jet Fuel - Indexmundi.com; Gasoline - Bloomberg; Diesel - EIA Weekly Retail On-Highway Diesel Price US Total/USD gallon; Corn Ethanol - Chicago Board of Trade Ethanol Futures for 2017 Contract; Cellulosic ethanol - ethanolproducer.com

Figure 8

### U.S. Carbon Dioxide Emissions from Coal

1972-Sep2016 (Monthly)

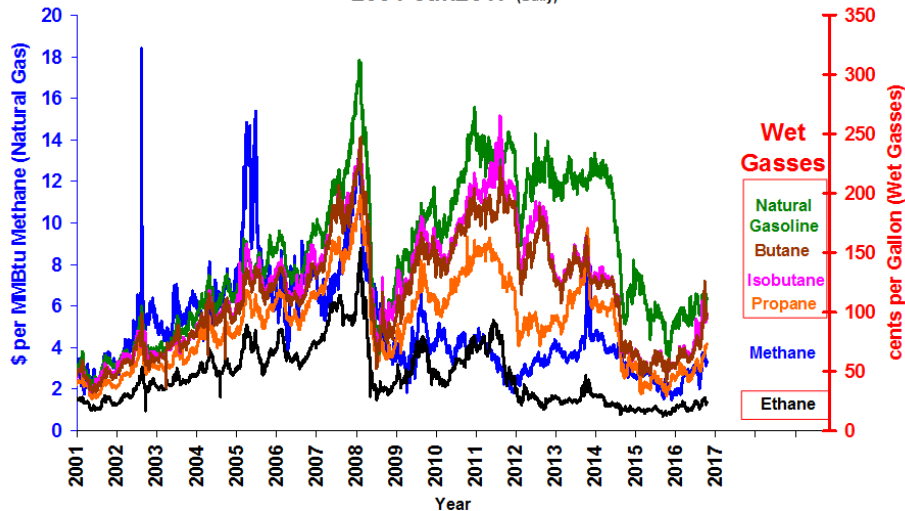


Source: U.S. Energy Infor  
Note: Reflects total carbon

Figure 13

### Natural Gas Price (Left Scale) vs. Wet Gas Prices (Right Scale)

2001-Jan2017 (Daily)

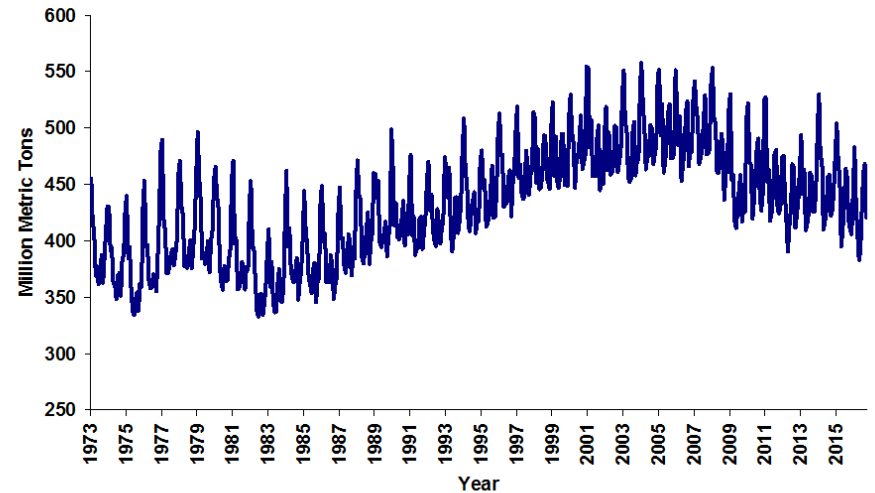


Source: Bloomberg

Figure 9

### U.S. Total Carbon Dioxide Emissions from Energy Demand

1973-Sep2016 (Monthly)

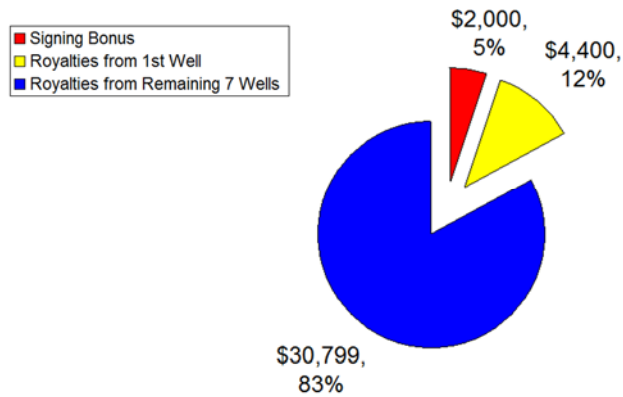


Source: U.S. Energy Information Administration, [Monthly Energy Review](#).  
Note: Reflects total carbon dioxide emissions in metric tons by quarter.

Figure 14

Per Acre Estimate of Pre-Tax Cumulative Dollars Received by the Landowner Over the Life of a Typical Marcellus Shale Dry Gas Well in Southwestern Pennsylvania\*

\$3/MMBtu Dry Gas Price



- \* Typical Marcellus Shale dry gas well pad as of 7/1/15: Assumes • 18% Royalty Payment • 15% Expenses
- 80 acre spacing • 6 Bcfe EUR/well\*\* • 8 Wells Total per Unit • \$3/MMBtu Dry Gas Price • Lateral Length 4,800'
- 1,252 Mcfe EUR/Ft • Well life span 58 Years



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Figure 37

How Shale Gas Benefits the Homeowner

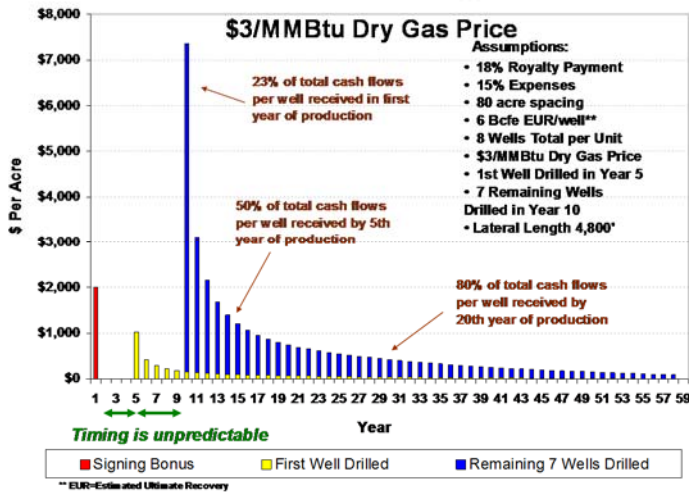
	Cost per mcf at 11/2006 rates	Cost per mcf at 11/2008 rates	Cost per mcf at 11/2011 rates	Cost per mcf at 7/2013 rates	Cost per mcf at 7/2015 rates	Difference per mcf between 2015 and 2006
Delivery Charge	\$4.76890	\$4.88940	\$4.77030	\$4.72170	\$6.56670	\$1.79780
Gas Cost Adjustment	-\$0.59220	\$0.48500	\$0.49780	\$1.08520	\$0.45000	\$1.04220
Commodity Charge	\$8.29520	\$11.19840	\$5.51330	\$4.17880	\$2.66670	-\$5.62850
<b>Total</b>	<b>\$12.47190</b>	<b>\$16.57280</b>	<b>\$9.78580</b>	<b>\$9.98570</b>	<b>\$9.68340</b>	<b>-\$2.78850</b>

Source: Muhlenkamp & Company, Inc.



Figure 2

Estimate of Pre-Tax Cash Flows to the Landowner from a Typical Marcellus Shale Dry Gas Well in Southwestern Pennsylvania\*



- \* Typical Marcellus Shale dry gas well pad in SW Pennsylvania as of 07/01/14
- \*\* EUR = Estimated Ultimate Recovery



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Figure 38

Percent of Total U.S. Electricity Net Generation: Electric Power Sector by Energy Source 1950-2015 (Yearly)

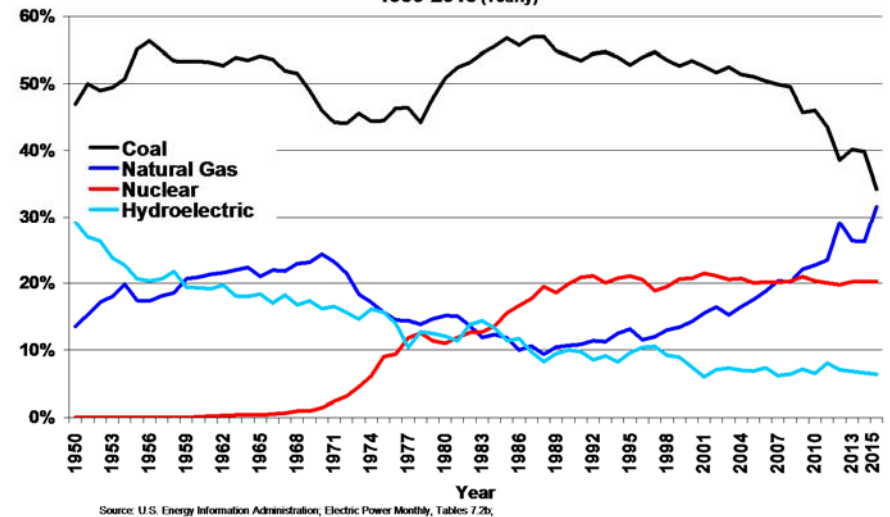
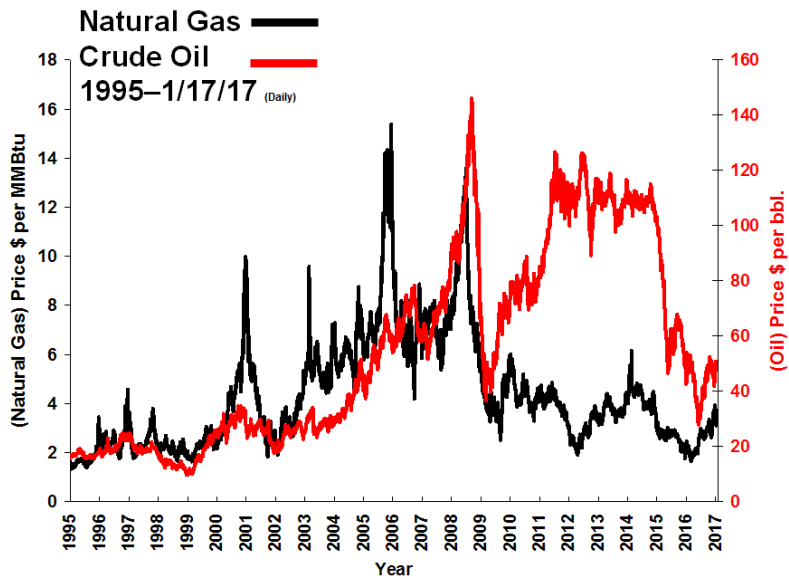
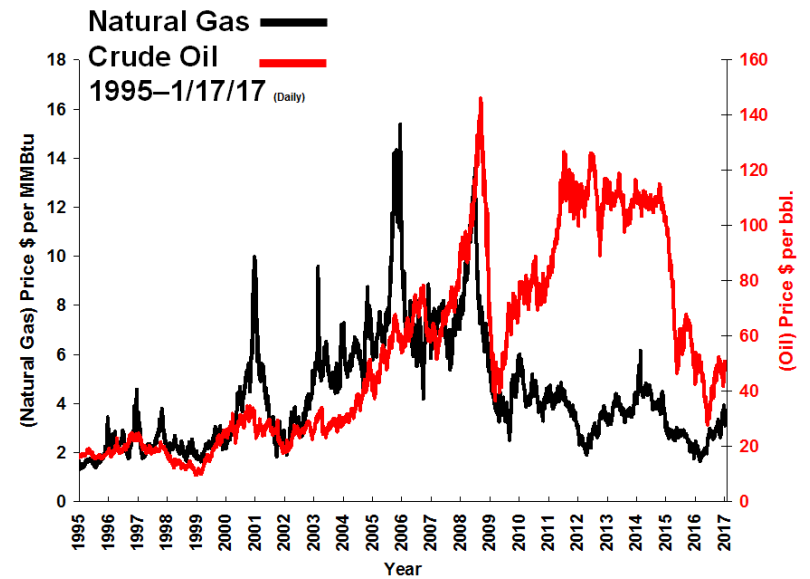


Figure 4



Source: Bloomberg; Oil; Generic 1st 'CO' Future, Natural Gas; Generic 1st 'NG' Future delivery to Henry Hub

Figure 1



Source: Bloomberg; Oil; Generic 1st 'CO' Future, Natural Gas; Generic 1st 'NG' Future delivery to Henry Hub

Figure 39

**Natural Gas Pipeline  
 Distribution Hubs  
 2009-Jan2017**

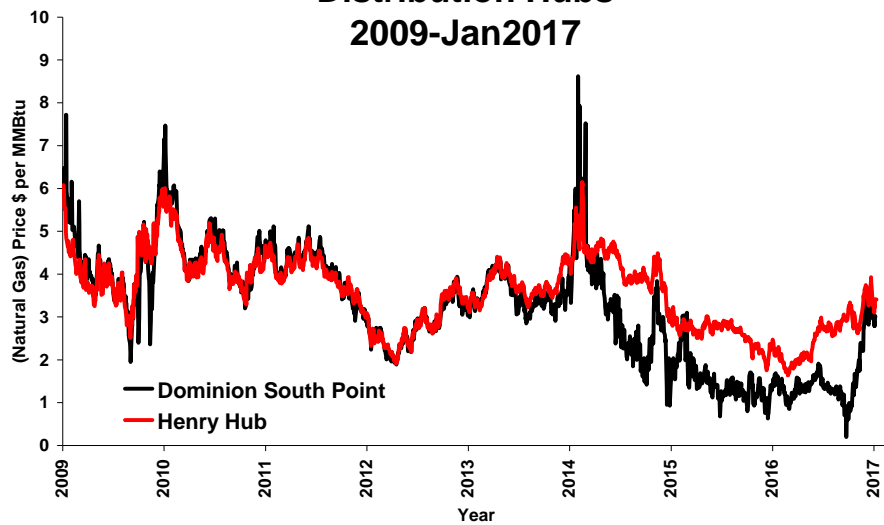
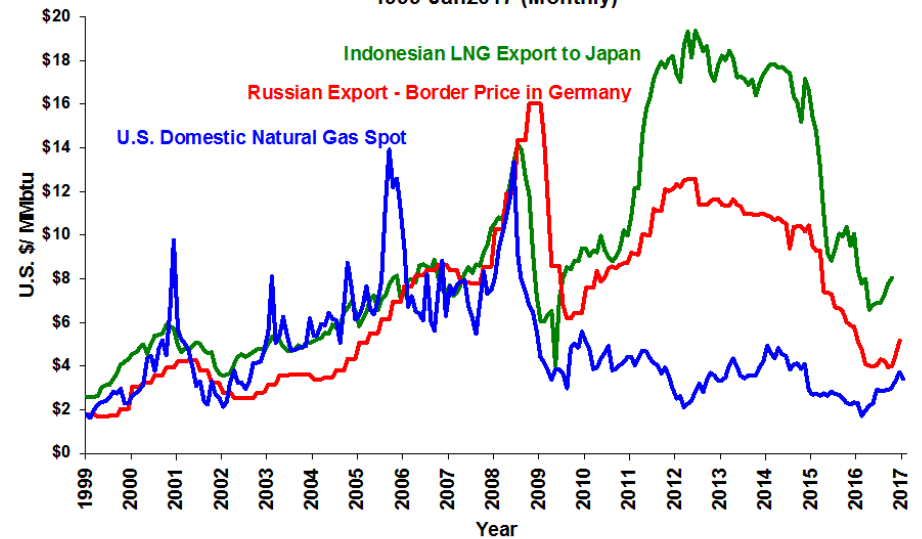


Figure 1 - Supplement

**Natural Gas Price by Region  
 (Delivered Basis)  
 1999-Jan2017 (Monthly)**



Source: Bloomberg

Figure 41

# **Natural Gas:** ***An Energy Game Changer***

January 2017 update for the natural gas  
booklet published in November 2013.



**Muhlenkamp & Company, Inc.**  
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