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Testimony on ***"Natural Gas – America's New Energy Opportunity: Creating Jobs, Energy and Community Growth"***

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Chairman Lamborn, Congressman Johnson, Congressman Thompson, guests, I am honored to be asked to testify before you today regarding the impact that natural gas can have on America's future.

I have been serving as the chair of the Department of Petroleum Engineering and Geology at Marietta College for the last 35 years. I have had close to 1,000 students go through my program and take their place in industry all over the globe. My students, now numbering nearly 300 in the petroleum engineering program and 48 in the geology program, come primarily from Ohio, Pennsylvania and West Virginia. I also have students from all around the country and the world, including Saudi Arabia, Kuwait, China, and Africa. We offer only an undergraduate program and B.S. degree in petroleum engineering at Marietta College and we are the only small, private liberal arts college in the nation to offer this unique major. This year I have had over 20 companies on campus recruiting my seniors for permanent jobs and my underclassmen for summer internships. Our graduates are in high demand.

The manpower demand won't stop with just engineers and geologists however. I have been working closely with Washington State Community College and the Washington County Career Center in an effort to help them prepare curricula that will educate and train technicians and field personnel that the industry will require going forward. Several other technical colleges around the state are also preparing tracts of study for their students that will prepare them for jobs in our industry as well.

I have been teaching courses in natural gas engineering for 37 years. My masters and PhD research were focused on gas storage operations and producing methane from coal, respectively. I have had research contracts with the Department of Energy and the Gas Research Institute in Chicago, with all of my research being focused on natural gas engineering topics. I was, in fact, way ahead of my time with my research focused on gas production from coal seams and the Devonian shale formation back in the mid-1970's. While we knew we had vast resources of natural gas in coal and shale back in the '70's, we just did not have the technology necessary to free that resource from the very low permeability (or tight) reservoir rocks. The natural gas trapped in those rocks was uneconomical to recover because technology had not been developed to get that gas out of the rock formations.

But things have changed dramatically in the U.S. just in the last ten years. Advances in horizontal drilling that had been traditionally employed mainly in offshore environments and multi-stage fracturing have opened up vast untapped resources of natural gas and oil in shale formations such as the Marcellus and Utica-Point Pleasant shales.

A study recently released by the U.S. Energy Information Agency revised the unproved technically recoverable reserves of natural gas in the Marcellus shale down to 141 Tcf of gas. The 42% downward revision still means that the Marcellus has the potential to meet the nation's entire natural gas needs for seven years. Just fifteen or so years ago, the nation boasted total proven recoverable natural gas reserves of only 200 Tcf. Now one formation alone in the backyard of Appalachia boasts approximately the same.

The Utica shale is in its infancy of development and its recoverable reserve potential cannot yet be estimated with any accuracy, but one thing is known – some of America's largest oil and gas companies have wagered several billion dollars and placed it in the hands of landowners. Companies have leased nearly 4 million acres of land in Ohio with the expectation of producing both gas and especially oil in commercial quantities.

The relatively low current price for natural gas is obviously great for consumers, but makes it difficult for companies to justify spending $5-6 million dollars to drill and complete gas wells. Consequently, companies have focused their attention on other shale formations like the Eagle Ford, Niobrara, Bakken, and now the Utica that produce oil along with natural gas.

The nearly 4 million acres of land that have been leased in Ohio potentially represent 25,000 horizontal wells that could be drilled in the state for a total investment of nearly $125 billion over the next 20 to 25 years. It is estimated that the number of horizontal wells drilled will rise from 11 last year to over 130 this year and over 1,000 a year by 2013 if the resource potential proves true. The surge in drilling activity should result in a significant drop in the unemployment rate in Ohio thanks to the creation of good paying jobs in the petroleum industry and all areas that support it. Job growth across all sectors will likely come in between 65,000 and 200,000 by the year 2014 as estimated by recent economic impact studies supported by the Ohio Chamber of Commerce and the Ohio Oil and Gas Association Energy Education Program.

Thanks to our newfound ability to extract oil and gas from shale, U.S. and Canadian oil production is expected to grow by more than 3.1 million barrels per day (BPD), reaching 12.1 million BPD and surpassing the record of 11.2 million BPD set in 1973, according to BENTEK Energy LLC. U.S. imports of foreign oil will fall more than 40% by 2016 according to their study.

The Boone Pickens' Plan for conversion of our nation's truck fleet to natural gas along with the construction of more natural gas-burning power plants have the potential to reduce green house gas emissions significantly and take advantage of the cheapest and the second most abundant fossil fuel, next to coal, in the nation. America has the potential to reduce its imports of foreign oil even more if it institutes a plan like Pickens'. With our abundant sources of natural gas, we could even become a net energy exporter.

Along with the development of our shale resources comes the necessity to care for the environment. Thanks to movies like *Gas Land* that are rooted more in fiction than fact, the public has been polarized against the process of hydraulic fracturing which is an absolute necessity in the process of extracting gas and oil from tight shale formations. Over a million wells have been fraced in the U.S. since the late 1940's, and over 60,000 wells in Ohio alone. There are no data to substantiate the claims made in *Gas Land* that hydraulic fracturing

contaminates groundwater. In fact, a recent study released by the University of Texas affirms the fact that fracing does not contaminate groundwater.

In another technical paper published by George E. King of Apache Corporation through the Society of Petroleum Engineers, King estimates, in a worst case scenario, that the odds of a hydraulic fracture treatment in a formation less than 2,000 ft deep penetrating a fault that extends back to the surface at 1 in 200,000. He estimates the chance of this happening in a stratum deeper than 2,000 feet as being zero.

The key to ensuring that there is no contamination of the ground water lies in proper well construction. Multiple strings of casing properly cemented back to the surface can and do eliminate the possibility of frac water from entering fresh water aquifers. Most, if not all, of the companies drilling wells in Ohio exceed Ohio regulations with regard to well construction and cementing practices. A typical well diagram is shown as Attachment 1 to this testimony. In the diagram, it can be seen that there are actually four strings of casing and two layers of cement protecting the fresh water aquifer. And with the depth of the wells at 6,000 to as much as 9,000 ft, the odds of an induced hydraulic fracture growing back to the surface are essentially zero.

Oil and gas companies, the Department of Natural Resources, the EPA and other related agencies must cooperate to ensure that well design, construction and cementing procedures ensure that the public water supply is protected. At the same time, the public must be informed of the actions taken by these groups to protect the water supply so that fear is not allowed to be spread by groups that believe America's energy shouldn't come from their backyard.

In the United States today we have an opportunity at hand to significantly lessen our dependence on foreign oil while growing our economy with good paying jobs. We can develop our vast oil and gas resources in the shale while simultaneously protecting the environment if all entities involved, both on the extraction side and the environmental side, work together and not in juxtaposition to each other.

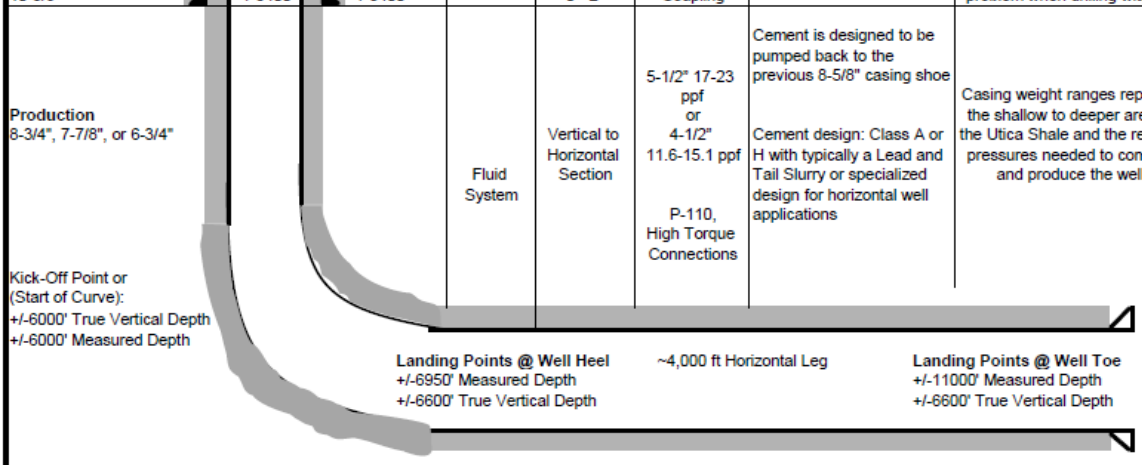
Thank you again for giving me the opportunity to appear here today. I'll be happy to answer any questions you might have.

General Wellbore Schematic

Area

Utica Shale, Eastern Ohio

Hole Size	MD (ft)	TVD (ft)	Drilling Fluid	Directional	Casing	Cement	Comments
Conductor	+/-275'	275	Air/Mist	0 - 1°	20" .375" X-42 Welded Jts	Cemented back to surface Cement design: Class A	
Surface 19"	+/-500'	+/-500'	Air/Mist	0 - 2°	16" 65ppf, H-40, Buttress Thread Coupling	Cement back to surface Cement design: Class A	
1st Intermediate 14-3/4"	+/-1750'	+/-1750'	Air/Mist	0 - 2°	11-3/4" 47ppf, J-55, Buttress Thread Coupling	Cement back to surface Cement design: Class A	This casing string is set below the Berea Sandstone, the Berea is typically has a salt water zone that needs to be sealed off for drilling to continue without salt water handling issues.
2nd Intermediate 10-5/8"	+/-5400'	+/-5400'	Air/Mist	0 - 2°	8-5/8" 36ppf HCK-55, Buttress Thread Coupling	Cement is designed to be pumped back to the previous 11-3/4" casing shoe Cement design: Class A with a Lead and Tail Slurry	This casing string is set below the Queenston formation which can be a wellbore stability problem when drilling with fluid.
Production 8-3/4", 7-7/8", or 6-3/4"			Fluid System	Vertical to Horizontal Section	5-1/2" 17-23 ppf or 4-1/2" 11.6-15.1 ppf P-110, High Torque Connections	Cement is designed to be pumped back to the previous 8-5/8" casing shoe Cement design: Class A or H with typically a Lead and Tail Slurry or specialized design for horizontal well applications	Casing weight ranges represent the shallow to deeper areas of the Utica Shale and the required pressures needed to complete and produce the wells.



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