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LWVPA ADOPTS ONE-YEAR STUDY MARCELLUS SHALE NATURAL GAS EXTRACTION

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Delegates at the June 2009 LWVPA Convention unanimously adopted a one-year study to examine the benefits and costs of the Marcellus Shale natural gas extraction including its ramifications for Pennsylvania's water, air, infrastructure, agriculture, forests, tourism, and economy. To participate in the critical political decisions that are needed to balance the potential economic boost created through employment opportunities and severance taxes with the environmental impact of water demands and waste treatment, we need to educate ourselves. You can begin this process now by reading this article. More information is available on the LWVPA website (www.palwv.org). Study Guides covering the extraction process and environmental issues will be distributed electronically to local Leagues and posted on the LWVPA website in September. In November, these materials will be supplemented to include economic and tax-related issues. Consensus questions and all materials will be distributed to local Leagues before the end of November. Consensus results are due at the state League office by March 26, 2010.

Marcellus Shale is a carbon-rich sedimentary rock lying 5,000 to 8,000 feet below the Appalachian Mountains from the Finger Lakes of New York across to eastern Ohio and into West Virginia. This field, significantly close to large population centers of the northeast corridor, is the largest known natural gas deposit in the United States. Depending on how much of its 500 trillion cubic feet of natural gas can be recovered, this resource could provide enough gas to meet America's energy needs for two to eight years.

Natural gas extraction from Marcellus Shale is currently possible due to horizontal drilling techniques developed in the area of Fort Worth, Texas, for Barnett Shale.

Drilling begins with the driving of a 14-inch diameter conductor pipe forty feet below the surface. Then, a drill bit with rotating cutters goes through the rock layers. As dull drill bits are replaced with sequentially smaller bits, the bore holes are progressively encased in cement. About 600 feet above the Marcellus Shale layer, other bits start to drill diagonally to the desired depth. Finally, horizontal drilling begins and continues out as far as 5000 feet from the original site. Holes are placed about every sixty feet along the horizontal pipe where the natural gas can enter for transport.

Releasing the gas is accomplished by hydrofracking. To force the natural gas out of the shale, drillers force one to nine million gallons of fresh water through the driven pipe into the shale. The high pressure water breaks up or "fracks" the shale that, in turn, releases the trapped gas. Sand is added to the water as a propellant to keep the fractures in the shale open and to enable the gas to flow up the pipe to the surface. A variety of chemicals are also added to the fresh water to keep the well pipe clean and the gas flowing easily. These chemicals include lubricants to reduce friction, biocides to eliminate fouling, scale inhibitors, oxygen scavengers to reduce oxygen in the borehole, and acids to clean the perforations in the pipe.

Dealing with fracking fluid can be a challenge. Along with the gas, 30% to 70% of the chemically-laced frack fluid, or flow back, rises to the surface. Additionally, a significant amount of salt

and other minerals, once a part of the rock layers that were under prehistoric seas, are added to the mix as they dissolve in the frack fluid. To contain this mixture, drilling companies create plastic-lined ponds at the well site. Because of Pennsylvania's geology, frack fluids cannot be pumped into abandoned wells as is done in Texas. Instead, tanker trucks haul most of the fluid from the ponds to treatment plants. Small quantities can be treated with mobile, on-site processing. Municipal sewage plants may treat frack fluid if operators have a plan approved by the Department of Environmental Protection (DEP).

Cleaning, storing, and transporting natural gas is necessary for taking this resource from the well to consumers. When released from the wellhead, natural gas is generally contaminated with water, sulfur, and, depending on the geology and location of the well, other natural gas liquids like ethane, propane, and butane. From an underground gathering pipeline at the

(Continued on Page 6)

Contents

LWVPA Adopts One-Year Study	1, 6
President's Message	2
2009 Civic Leadership Reception	2, 7
Issues and Action	3
LWVPA Convention	4, 5
Healthcare Legislation	7
Membership Application	7
Think Membership	8

(Continued from Page 1)

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wellhead, the gas is sent to a processing plant to become 90% cleaning-burning methane. Depending on seasonal consumer demand, the natural gas can be sent directly into the interstate pipeline distribution system or stored. In its gaseous state, methane can be stored in salt caves or depleted oil and/or gas wells. Natural gas can also be liquefied for storage above ground.

Natural gas pipelines, made of durable carbon steel, were constructed in 1950s to bring natural gas and oil from Texas fields. The network consists of gathering lines that vary from six to sixteen inches in diameter to interstate pipelines ranging from 16 to 48 inches. Most lines extend to markets in the northeast with those running across Pennsylvania near or at capacity. Some pipeline capacity exists to send natural gas to the midwest. To flow in the pipelines, natural gas must be pressurized. At 40 to 100 mile intervals, compressors act to reduce the volume and increase the pressure. As outlet valves open, the gas rushes forward. Compressors may be powered by natural gas or, where emission rules exist, by electric motors. At the “city gate” or local distribution points, the pressure from the interstate pipelines drops from 1500 to 200 pounds per square inch (psi) to as low as 3 psi.

Economic benefits include job opportunities, leasing of property and mineral rights, and the potential for increased revenue. Job opportunities may attract engineers planning the wells, title searchers, real estate brokers, lawyers, drillers and the support laborers who drive vehicles and operate frack fluid treatment facilities. In Texas, 83,000 jobs were added to the economy as a result of the development of natural gas extraction from the Barnett Shale. As drilling companies move existing employees into the area or attract new workers, wage earners add to the community’s social and economic base. However, the jobs may be temporary and terminate as the natural gas is depleted.

Lease payments are negotiated between drillers and the owner of the gas rights. Royalties are set by law at a minimum of 12.5%, but can be negotiated higher. Such revenues help keep small farms profitable and add to the overall tax-base. State and National forest lands, along with properties under the jurisdiction of county or local agencies, may also be leased for well sites to bring added relief to taxpayers.

Potential revenue can be obtained by Pennsylvania through a natural gas extraction tax for “severing” the natural gas from the earth. Legislation is currently being considered that would add Pennsylvania to the 27 of 32 states that have established such a tax. Pennsylvania needs to learn from the experience of other states to maximize revenue, minimize administrative costs, and maintain transparency. In terms of income taxes, drilling companies organized as corporations pay a business tax of 9.99%. However, in 2004, 71% of corporations filing Corporate Net Income Tax returns paid no tax at all. If organized as a Limited Liability Company, a drilling company pays at the individual income tax rate of 3.07%. Although Capital Stock and Foreign Franchise Taxes presently exist, they are scheduled to be phased out by 2011.

Environmental concerns focus on the fracking fluids and the

impact of the extraction process on soil, sources of fresh water, air quality, transportation infrastructure, and plant and animal life. Environment regulations are enforced at the national, state and local levels. DEP hired 40 new inspectors in early 2009, bringing its total to 54 individuals whose responsibilities include issuing permits and overseeing the over 63,000 gas wells in Pennsylvania.

Hydraulic Fracking Fluids are excluded from regulation under the Federal Safe Drinking Water Act of 2005. The proportions of these chemicals in the frack fluids or the “recipe” are proprietary. However, DEP requires drillers to list the chemicals used on drilling permits. Waste water treatment operators can use this list to determine how to neutralize and/or remove any potentially hazardous chemicals municipal sewage plants may treat frack fluid if operators have a plan approved by DEP. The fate of the 70% to 30% of the frack fluid that remains under the ground is unknown.

Soil is compacted by drilling equipment and heavy trucks on the three- to six-acre drilling site. Ponds are dug and lined with plastic to hold the frack fluids. These liners have the potential to leak and, once emptied, are buried on-site in the dirt. In spite of plastic fences and bales of straw, erosion is also a threat. For the short term, the land is not restored to its pre-drilling state.

Water withdrawal, if its source is above ground, is regulated by the DEP and the Susquehanna and Delaware River Basin Commissions. However, no such commissions currently have the authority to govern waters from the Ohio River basin or the Lake Erie watershed. No regulations govern groundwater.

Water pollution may result if cement pipe casings fail and natural gas enters aquifers. Plastic-lined ponds with frack fluid or trucks transporting such liquid waste also have the potential to leak into the groundwater. Of the 51 chemicals known to exist in the fracking fluids, 34 have the potential to harm human health if they enter an aquifer.

Air quality is impacted by the fugitives or emissions of diesel-burning vehicles and the motors of drilling rigs. Transmission fugitives from leaking valves create additional problems. Hydraulic frack fluid chemicals can become airborne while stored in open, plastic-lined ponds. Of the 51 chemicals contained in the fluids, 21 have the potential to move into the atmosphere with the evaporating liquid and harm living things.

Transportation infrastructure can be damaged by the estimated 600 heavy-duty tank truck loads that may be needed to supply water for a typical well. Trucks hauling frack fluid to waste water treatment plants may further impact roads not designed for such loads. Currently, bonding for road repair is \$12,500 per mile. This fee is less than the cost of resurfacing the pavement for a single mile.

Wildlife and vegetation are disrupted by natural gas extraction that affects habitats. Roads built by heavy equipment may be needed to reach remote drilling sites. Such encroachments into the deep woods can damage plant life and endanger birds, reptiles and mammals. During the four-to-six week period needed to bring a Marcellus Shale well on-line, animal life is subjected to twenty-four hours of daily noise and constant light. Such activity can threaten natural life cycles.

For more information about the Marcellus Shale Gas Extraction Study, please visit www.palwv.org. There you can find links to additional resources including a power point presentation posted on the LWV of Indiana County website; the Penn State Cooperative Extension Natural Gas Impacts webpage; and, information about Penn State “webinars” on the subject.