



SHALE GAS POSITION STATEMENT

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Pennsylvania Council of Professional Geologists

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In April 2010, PCPG's Marcellus Shale Committee (now the Shale Gas Committee) published its first "Marcellus Shale Position Statement". Recently, the committee re-assessed that position paper, as it was over four years old. For the most part, we thought it stood up fairly well, but decided to update portions of the statement. One seemingly minor but important update is the removal of "Marcellus" from the statement. The committee recognizes that the Marcellus Shale is not the only shale gas reservoir within the Commonwealth that is currently being developed. The oil and gas industry has advanced a number of technologies since the initial "Marcellus Shale Position Statement" and it was decided that key technologies should be addressed in the new statement. The updated statement also recommends areas for continued research.

PCPG's updated "Shale Gas Position Statement" is presented below, and has also been posted on PCPG's website www.pcpge.org. PCPG strongly encourages members of the geologic community working in the shale gas industry to continue to utilize best practices and due diligence in their efforts.

The Pennsylvania Council of Professional Geologists (PCPG) is a diverse group of licensed Professional Geologists (PGs) and allied scientists who advocate the use of sound science in the: (a) formulation of public policy; (b) protection of human health and the environment; (c) establishment and evaluation of regulatory programs; and (d) the dissemination of accurate information. Early participation by Professional Geologists and allied scientists in evaluations and decisions involving natural resources facilitates sound scientific outcomes.

PCPG supports the responsible development of Pennsylvania's natural resources, including shale gas, and has prepared this statement to provide a balanced review and discussion of shale gas issues. This statement is also intended to dispel common misunderstandings, provide comments as to appropriate public and regulatory policy (from a technical and geologic perspective) and identify critical areas where additional information and study are needed. PCPG expects to periodically review and amend this statement as shale gas exploration and development procedures evolve, and as geologic and technologic advances continue to change the exploration and production landscape across the Commonwealth of Pennsylvania and the Appalachian Basin.

Current shale gas exploration within the Commonwealth of Pennsylvania is not limited to the Marcellus Shale. Shale gas is also being explored for and produced from other formations, including the Upper Devonian Rhinestreet, Middlesex and Genesee/Burket Shales, the Ordovician Utica Shale and the Point Pleasant Member of the Utica Shale. Although the Marcellus Shale is currently the largest shale gas producer in the Commonwealth, the exploration of and production from the other shales will also continue across the state. In addition, other tight geologic formations are being considered for their potential to economically produce oil and natural gas, throughout the Commonwealth.

The elements of PCPG's position on Shale Gas Exploration and Production are as follows:

1. PCPG considers shale gas exploration and production to be a worthwhile and necessary endeavor that will have a very significant and continuing positive effect on Pennsylvania's economy. Additional shale gas production in Pennsylvania also means more energy independence for the United States. As natural gas is the cleanest burning fossil fuel, there are corresponding positive implications for air and water quality effects throughout the Commonwealth.
2. Subjective and selective interpretation of shale gas exploration and development information (as is sometimes reported in print, broadcast media, and the Internet) often conveys erroneous information to the public and to public officials. This can result in the creation of misinformation, unnecessary confusion, and exaggerated concerns. Such reports should be carefully scrutinized for accuracy and partisan agenda.
3. Natural gas well drilling and production can and must be done in an environmentally responsible and scientifically sound manner while minimizing the potential for adverse environmental impacts. PCPG recognizes that the natural gas drilling industry continues to implement and upgrade its best practices, in order to protect the environment throughout the drilling, completion and production phases of shale development. Some best practices already implemented by industry, and utilized as appropriate for the given situation or area include:
 - Closed-loop drilling systems, diminishing the utilization of earthen pits for drill cuttings and produced water collection and storage;
 - Produced water recycling and reuse programs;
 - Natural gas and dual-fuel fired drill rigs and completion equipment;
 - "Walking rigs" (which allow for dramatically shortened rig moves on pads, thereby taking less time on any given well pad);
 - Water impoundment and piping systems, thereby diminishing water truck traffic;
 - Air drilling shallow portions of wells using pneumatic hammer drill bits that increase Rate of Penetration (ROP) two to three times over traditional mud rotary drilling techniques, thereby reducing onsite rig time, fuel usage and emissions; and
 - Improved casing and cement designs and optimized cement emplacement procedures reducing the potential for non-zonal isolation and stray gas migration.
4. Historically, horizontal drilling and hydraulic fracturing technologies have a low incidence of proven adverse impacts to groundwater and surface water quality. Marcellus Shale natural gas wells typically consist of a vertical bore (drilled with technically sound, time-tested equipment and methods) which is advanced downward to depths of 5,000 to 9,000 feet below the ground surface and then directionally drilled horizontally to tap into the Marcellus Shale formation. Hydraulic fracturing of such horizontal wells is designed with a radius of influence limited to approximately 500 feet around the well bore. It is unlikely that a properly designed and constructed shale gas well will have an adverse effect on the much

shallower fresh water aquifer zones, which typically occur within 500 feet or less from the ground surface. Key to the successful installation of shale gas wells is a proper well design, casing and construction program conducted by experienced and competent natural gas drilling operators; detailed permit application submitted by the operators; Pennsylvania Department of Environmental Protection (PA DEP) permit approvals based on a thorough review process; and correct execution and verification of the well drilling, casing, cementing and plugging programs.

5. Natural gas drilling and production can and must be conducted in accordance with industry best practices and Federal/State/Local oil and gas regulations. Spills of drilling-related fluids and improper disposal of wastes, although infrequent, should all be preventable. The natural gas industry bears responsibility for mitigating the effects of any ground surface releases and using lessons learned to continually improve best management practices. Although rare, stray gas issues can arise from faulty surface and production casing installation and when this occurs, the natural gas industry bears responsibility for mitigation.
6. The natural gas drilling industry must continue (as a course of responsible operations) to conduct pre-drill sampling of water sources to establish a baseline for aquifer and surface water conditions and quality in any given proposed drilling area. Although landowner privacy is an important issue, environmental testing data need to be utilized by all parties (industry, academia and government) as appropriate. Better communications and joint utilization of environmental testing data will allow for better characterization of surface and ground water geochemistry and conditions throughout the shale gas plays area.
7. It is important that state agencies such as the PA DEP and the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) (where drilling on state lands) have sufficient resources to enforce existing regulations and/or propose new regulations as appropriate. In addition, these regulatory agencies should continue to conduct research, data-gathering, and database management to document the environmental effects, or lack thereof, of shale gas drilling and development.
8. PCPG believes that the careful management of effluent (drilling fluids, flowback water, and production brines) generated during well installation, treatment and production, is a significant concern. Technical research and innovation by industry, trade associations, stakeholders, and government must continue with regard to: a) drilling waste volume reduction; b) modification/construction of existing/new treatment facilities with advanced treatment technologies; c) use of on-site treatment and reuse and recycling systems to properly handle remaining water and wastes; and d) induced seismicity related to effluent disposal by deep well injection.
9. Of great concern to Pennsylvania citizens is the withdrawal of surface water and groundwater for use in the drilling and hydraulic fracturing processes. PCPG believes that the Water Management Plan component of the well drilling permit application package and the additional required approvals from the Susquehanna River Basin Commission and other regulatory authorities for projects, provides ample protection of Pennsylvania's groundwater and surface water resources and their inherent ecological values. PCPG supports the research of using degraded waters, such as Acid Mine Drainage (AMD), to

allow these waters to be viable, economic alternative sources used on well sites. As technology improves, costs are reduced, and regulatory liability issues are addressed this could be a suitable water source in the Commonwealth with the added benefit of reducing the historic impacts of AMD.

10. The majority of the volume of completion fluids (hydraulic fracturing fluids) currently utilized by industry consists of water and quartz sand. Small quantities of chemical additives are also typically utilized. The likelihood that the low concentrations of man-made chemical components will impact drinking water supplies is very low. However, public concern over the use of chemical additives remains heightened and should be addressed. The natural gas industry therefore should prioritize continued research and development of completion fluid formulas that reduce and/or exclude the use of hazardous substances, and provide transparent and accessible reporting of completion fluid composition to the public and to regulatory agencies. Efforts made to disclose completion fluid chemistries at specific well sites, as reported on “FracFocus.com” for example, are an important step in gaining the public trust.
11. Air quality considerations are important to the Commonwealth of Pennsylvania and its citizens. The natural gas industry (including drilling and production segments) needs to integrate processes for reducing emissions from drill rigs, completion equipment, operating and abandoned wells and compressor stations. Technological advances in natural gas-fired drill rigs and completion equipment should be utilized as a best practice wherever feasible.
12. Induced seismicity associated with hydraulic fracture treatments are rare events. However, industry should continue efforts for study of the subsurface structural/tectonic conditions, to better understand the types of conditions where induced seismicity associated with hydraulic fracturing may occur. The natural gas industry should take care to prevent drilling and completing wells near known potentially active faults. In addition, microseismic monitoring should be utilized during hydraulic fracture treatments, to better assess potential induced seismicity in areas thought to be susceptible to such rock movements.

Summary of PCPG Marcellus Position Statement

Bad news often travels faster than good news – much of the information in the news over the last several years regarding shale gas exploration in Pennsylvania has contained sensationalized language, inaccurate statements and misrepresentations that have neglected to consider reasoned geologic science. PCPG believes it is important to maintain perspective and understand that:

- Currently in Pennsylvania shale gas production is predominately from the exploitation of the Marcellus Shale. However, exploration is occurring in both shallower Upper Devonian shales and deeper Ordovician Utica Shale, and production is being established from those other shale formations across the state.
- Shale natural gas exploration, like other energy production and industrial endeavors, involves risks that can be successfully managed and controlled, and is a source of significant benefit to the citizens of Pennsylvania. Potential adverse environmental impacts must be recognized and prevented via the use of best industry practices, technological advancements, appropriate regulations and strict enforcement.

- Reliable public education opportunities are readily available and important for the dissemination of accurate information about the geology and technical processes associated with shale gas development.
- Accidental spills of chemicals and/or waste materials to soil, surface water, or groundwater unfortunately can and have occurred from industrial, manufacturing, and transportation activities. However, rather than discouraging industrial, manufacturing, or transportation enterprises in Pennsylvania, PCPG strongly advocates environmental stewardship through best management practices and appropriate regulation and enforcement to minimize releases to the environment and to promptly address releases when they occur. Such diligence is good for business and the community, as it helps to create and preserve jobs while protecting the environment. Existing regulations and enforcement provisions ensure that responsible parties are held accountable for damages and for restoration of adverse environmental impacts.
- Continued regulatory and economic pressures on drilling waste management and disposal practices are already resulting in rapid advancements and improvements in waste treatment, waste minimization, and beneficial water reuse/recycling.

Shale gas development is a source of widespread benefit to the Commonwealth of Pennsylvania for boosting our state's economy, increasing our energy independence, lowering energy costs, adding much needed jobs, and providing a cleaner-burning fossil fuel. With proper management, technological innovation and constant attention to Pennsylvania's environment, the benefits of shale gas development are likely to persist for future generations.

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