

Shale Gas Development and the Environment

Comments of John Walliser

Vice President, Legal & Government Affairs, Pennsylvania Environmental Council
to the House Democratic Policy Committee

September 16, 2013

Introduction

Chairman Sturla, Co-Chairwoman Snyder, and other distinguished members of the House Democratic Policy Committee, my name is John Walliser and I am a Vice President with the Pennsylvania Environmental Council (PEC). I would like to thank you for the opportunity to discuss environmental issues relating to shale gas development in the Commonwealth.

PEC is a statewide nonprofit organization that, for the past four years, has been deeply engaged in policy and outreach efforts related to shale gas development in Pennsylvania – I have included a reference link in my written remarks to our organization's website, which includes the full suite of our reports, testimony, and other statements.¹

Obviously there has been a wealth of legislative and regulatory activity over the past four years, and with the ongoing implementation of Act 13 of 2012 we are witnessing another sea change to Pennsylvania's regulatory landscape. The most recent development is the pending publication of proposed revisions² to 25 Pa Code Chapter 78 (Chapter 78 Proposal), which will cover numerous surface, water and waste considerations with respect to unconventional gas well sites.

Concurrent with this policy development are an extraordinary number of public and private studies to research shale gas development's impact to the environment and other public resources, including the Environmental Protection Agency's ongoing study of hydraulic fracturing's potential impact on drinking water resources,³ the National Energy Technology Laboratory's environmental impacts study at well sites in western Pennsylvania,⁴ and other academic-driven initiatives in progress throughout the Marcellus and Utica shale plays. The Department of Environmental Protection (Department) is also undertaking two key studies – one on the presence of technologically enhanced naturally occurring radioactive materials

¹ <http://marcellus.pecpa.org/>

²

<http://files.dep.state.pa.us/PublicParticipation/Public%20Participation%20Center/PubPartCenterPortalFiles/Environmental%20Quality%20Board/2013/August%2027%20EQB/Proposed%20Rulemaking%20-%20Ch%2078/Annex.pdf>

³ <http://www2.epa.gov/hfstudy>

⁴ <http://www.netl.doe.gov/publications/factsheets/rd/R%26D167.pdf>

(TENORM) in drilling activities and products,⁵ and one on air emissions from operations and equipment associated with gas development and delivery.⁶

We are also now in receipt of findings from collaborative efforts like the University of Pittsburgh's Institute of Politics Shale Gas Roundtable (Shale Gas Roundtable), which last month issued a recommendations report⁷ resulting from a two-year deliberative process between diverse stakeholders. PEC was a participant in this process and we support the Roundtable's recommendations, several of which are incorporated into my comments today. I am also including the Executive Summary of the Roundtable report as an attachment to this testimony.

All of these efforts must continue to inform oversight of the shale gas industry, and Pennsylvania must be poised to act swiftly in improving agency authority in light of new information and understanding. PEC has long stressed the importance of adaptive management – no rulemaking or statutory enactment should be viewed as the “final say” – and this holds equally true for Act 13, the Chapter 78 Proposal, and any future changes.

With that said, I would like to highlight issues that are of key importance to PEC.

Water Resource and Waste Management Issues

1. Water Sourcing

Act 13 codified⁸ the requirement that operators develop a Water Management Plan prior to operation. This requirement is critical in ensuring that water sourcing for drilling operations will not adversely affect the quality or quantity, including existing and designated uses, of the waters of the Commonwealth. While freshwater usage for gas development is estimated to be less than 1 percent of Pennsylvania's total annual freshwater withdrawals, this estimate does not speak to the locations or timeframes of withdrawals, nor does it convey that much of the water is permanently “lost” from the water cycle. Rapid withdrawals, particularly at times of low water body flow or drought, or from more ecologically significant streams, can create significant problems.

The Department will need to ensure that Water Management Plans are accurate and complete, and that compliance is enforced throughout the life cycle of operation. In the Susquehanna and Delaware River Basins, where Interstate Commissions already have robust programs and staffing in place for this very work, the challenge is minimal. In the Ohio River Basin, however, the Department will bear the weight of monitoring and enforcement – no small task given the size of the basin and current agency capacity.

⁵ <http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/RadiationProtection/rls-DEP-TENORMStudy-012413.pdf>

⁶ <http://www.depweb.state.pa.us/portal/server.pt/community/air/6000>

⁷ <http://www.iop.pitt.edu/shalegas>

⁸ 58 Pa.C.S. §3211(m)

The Department has rightly looked to the Susquehanna River Basin Commission (SRBC) for guidance, and we have urged the Department to fully adopt the framework of SRBC's Low Flow Protection Policy⁹ which takes a basin-specific, ecologically-driven approach toward decision making on water withdrawals. The Low Flow Protection Policy is based on extensive research performed by The Nature Conservancy,¹⁰ and requires impact assessment and alternative analysis to ensure that withdrawals do not adversely affect headwater or environmentally sensitive stream and river segments. The Department and Nature Conservancy are in the process of finalizing a similar study for the Ohio River Basin.

With respect to other potential sources of water, we are also supportive of the Department's consideration of allowing the use of abandoned mine drainage as a water supply for hydraulic fracturing.¹¹ Reducing one of the Commonwealth's largest sources of water pollution to decrease demand on fresh water supplies is a win-win for the Commonwealth. Without question, there are significant concerns and challenges; and while our view is that current legislative and regulatory proposals still fall short of ensuring necessary environmental protections under existing law, we believe this dialog should continue.

2. Water Use in Well Operations

Once water is sourced for hydraulic fracturing, the breadth of well siting and management issues is extensive and beyond the scope of what we can hope to discuss today. Act 13 updated the Oil & Gas Act to achieve many important improvements to water resource protection, but its ultimate effectiveness will depend on regulatory interpretation and implementation. I'd like to touch on a few key issues.

(A) Area of Review

A critical component to the Department's Chapter 78 Proposal is what's commonly referred to as "Area of Review".¹² This will require operators to perform more robust analysis of subsurface or geologic hazards that may effect migration of gases or well drilling and stimulation fluids. The identification, mitigation and monitoring of features like abandoned and active wells is a key component of this process. Area of Review analysis has received considerable attention in published Best Management Practice guides and other policy proposals throughout the country, and is of particular importance in Pennsylvania, as estimates place thousands of abandoned wells within the shale gas play – many of which are unaccounted for. The Department's proposal is a good start, but we believe it should go further to ensure a more comprehensive analysis and proactive avoidance or mitigation of identified hazards.

⁹ Low Flow Protection Policy Related to Withdrawal Approvals (Policy No. 2012-01)(December 14, 2012)

¹⁰ The Nature Conservancy, 'Ecosystem Flow Recommendations for the Susquehanna River Basin' (November 2010)

¹¹

http://files.dep.state.pa.us/Mining/Abandoned%20Mine%20Reclamation/AbandonedMinePortalFiles/MIW/Final_MIW_White_Paper.pdf

¹² PEC promoted this site review concept in its 2010 Report 'Developing the Marcellus Shale'

(B) Well Siting Setbacks

Act 13 increased presumed well pad setback standards for, among other features, surface waters, water wells, and wetlands. While the new standards are an improvement in most respects from the prior version of the Oil & Gas Act, it fell short of a key recommendation¹³ of the Governor's Marcellus Shale Advisory Commission in two key respects. First, the definition of stream or water body in the Commission report is broader than the one used in Act 13, which limits the definition to solid blue line streams identified on USGS topographic maps. Second, the Commission also suggested requiring additional setbacks or best management practices for well sites in proximity to High Quality and Exceptional Value streams.

It should be noted that these setback standards, along with the local ordinance preemption provisions (Chapter 33) of Act 13, are subject to legal challenge in an appeal before the Pennsylvania Supreme Court. At issue in this particular instance is the scope of the setback waiver authority granted to the Department. Our understanding is that the Department is currently in the process of developing written guidance for issuing waivers to setback standards pursuant to the amended Oil & Gas Act, but of course the utility of this policy will hinge on the Supreme Court's decision.

(C) Impoundment Pits

The Department's Chapter 78 Proposal also includes new standards for well site and centralized impoundments for the storage of fresh and wastewater (including flowback and produced liquids). Evolving best management practices for the industry reflect a trend toward both:

- Requiring, in most instances, closed loop systems for all drilling and waste fluids utilized and produced at well sites; and
- Requiring impoundment pits to be double lined with impermeable materials along with real-time leak detection monitoring both up and down gradient from the site.

The Chapter 78 Proposal makes significant steps in this direction. However, we believe the proposal could be strengthened with respect to pre-treatment and monitoring requirements for centralized impoundments, including monitoring and mitigation of potential hazardous air emissions. As operators move toward greater recycling of wastewater, which is a commendable objective, problems with centralized impoundments could escalate.

(D) Monitoring and Reporting

Impacts to drinking water supplies continues to be an area of particular concern to landowners and communities, and there remains considerable public uncertainty regarding how baseline water quality information is obtained by individual operators, and what information is subsequently reported by the Department to landowners. Industry associations have begun to develop standards¹⁴ for these processes, and we believe the Department should follow suit by establishing its own published guidance for pre- and post-drilling water testing parameters and

¹³ Recommendation 9.2.24

¹⁴ As one example, the standard developed by the Marcellus Shale Coalition can be found at http://marcelluscoalition.org/wp-content/uploads/2013/03/RP_Pre_Drill_Water.pdf

reporting requirements. In addition, the Department should conduct public outreach on testing requirements and procedures to ensure public confidence in the appropriateness of testing and disclosure.

This issue also points to the need for private water well construction and decommissioning standards; Pennsylvania is one of only two states to not promulgate such standards. PEC supports legislation¹⁵ introduced this session in the House of Representatives that would accomplish this goal.

(E) Chemical Disclosure

Act 13 made important changes to the disclosure of chemicals utilized in hydraulic fracturing; these changes, at the time of the law's passage, resulted in some of the most proactive reporting requirements in the country. But in little more than a year after enactment, current best management practices¹⁶ now point toward more comprehensive disclosure standards that include all chemicals and drilling fluids utilized by operators and subcontractors on unconventional well sites. We believe this is a timely issue for consideration by the Department and General Assembly.

3. Waste Disposal

(A) Onsite Disposal of Drill Cuttings

With respect to drilling wastes, one ongoing concern is the on-site disposal of drill cuttings after well development activities are complete. The Department's pending regulatory proposal includes new restrictions for on-site disposal of wastes from unconventional operations, and the pending TENORM Study will include more complete characterization of drill cuttings. It is worth noting that several unconventional operators are already voluntarily deciding to forgo on-site disposal, opting instead for removal to an approved waste facility – we cannot say, however, whether this is due to logistical considerations like on-site capacity, or is based on contamination concerns. Given the long-term implications to landowners and the environment, we believe this issue is ripe for further review by the Department and General Assembly once the Department's TENORM study is complete.

(B) Disposal of Waste Fluids

Act 13 requires operators to track the transport and disposal of wastewater resulting from well development, but submission of that information is left to the discretion of the Department. We believe the Department should require operators to include transport and disposal data in their biannual waste reporting, and should make this information readily available to the public.¹⁷ Several other oil and gas states have similar requirements, and the cost to the industry is not great because they are already required to collect and track this information.

¹⁵ House Bill 343 (P.N. 350)

¹⁶ Please see Standards of the Center for Sustainable Shale Development, attached at the end of these comments.

¹⁷ This is consistent with Recommendation 9.2.7 of the Governor's Marcellus Shale Advisory Commission.

Air Quality

Reporting and Monitoring

Act 13 did not address new control standards for air emissions, although it did establish an annual emissions reporting requirement on owners and operators of facilities conducting natural gas development, production, transmission, and processing operations in unconventional formations.¹⁸ The Act does not stipulate estimation methods, but rather authorizes the use of forms and procedures specified by the Department. We have encouraged the Department to develop those protocols to assure compliance and accuracy in reporting.

The Department has been conducting its own monitoring of emissions from natural gas facilities, and recently released an update¹⁹ on its ongoing study in southwestern Pennsylvania, including more detailed information with respect to the scope of the study.²⁰ PEC is currently reviewing this new information. The Department is expected to release the results of this study in early 2014.

Exemption 38

The Department has also recently finalized guidance that narrows eligibility criteria for air quality permit exemptions. Astonishingly, under prior guidance almost all oil and gas production facilities were exempted from state requirements.²¹ In Pennsylvania 90 percent of wells are concentrated in ten counties, with three counties accounting for 50 percent of all wells. Without proper pollution controls and monitoring, this intensive development can easily lead to unhealthy local air quality.

The new guidance (Exemption 38) limits the availability of this exemption to only those facilities whose emissions fall below a certain threshold, and requires documentation within 180 days of production to ensure compliance.²² Operators must also implement pollution control strategies that go “above and beyond” legal minimums – including leak detection and repair and the use of enclosed flares on tanks and other equipment.

While these and other aspects of Enforcement 38 will improve operations at well sites, the fact remains that when operators get permit exemptions, regulatory agencies lose some of their ability to perform oversight responsibilities in a meaningful way. To the Department’s credit, the final version of the Exemption 38 guidance includes detailed directions to operators outlining the type of information they need to provide in order to document their eligibility for the exemption. However, we believe it is critical that any exemption program be coupled with detailed monitoring and more frequent reporting requirements; otherwise, regulators and the

¹⁸ 58 Pa.C.S. §3227(a).

¹⁹ http://files.dep.state.pa.us/Air/AirQuality/AQPortalFiles/rls-DEP-AQStudyUpdate-073013_FINAL_DRAFT.pdf

²⁰ http://files.dep.state.pa.us/Air/AirQuality/AQPortalFiles/TSD_for_Marcellus_LTMS_Final_August_2013.pdf

²¹ Past guidance considered well sites and the equipment associated with them to be “minor sources”.

²² While we believe it would be wise to require such documentation earlier in the process, we recognize this is a marked improvement over the status quo.

public have no assurance that oil and gas operators are staying in compliance on an ongoing basis.

Management of Midstream Infrastructure

Midstream infrastructure consists of pipelines, processing facilities, compressor stations, and related infrastructure for transporting natural gas from well sites and preparing the gas for markets. Issues related to the development of midstream systems from an environmental perspective include surface disturbance (both temporary and permanent) and erosion and sedimentation, air quality concerns, forest fragmentation, impacts to critical resource areas, and stream crossing and encroachments. Infrastructure development also greatly concerns local government from a land use perspective.

Oversight of midstream infrastructure is spread across multiple federal and state entities, with the Department having limited statutory authority on discreet environmental issues. Because of the sheer breadth and complexity of the management issues involved, it is difficult to make concrete policy recommendations. However, the report of the Shale Gas Roundtable offers several attainable steps toward reducing the environmental footprint of infrastructure development, including:

- Create legislative and regulatory provisions that encourage the consolidation or coupling of intrastate midstream infrastructure (including sharing of pipeline infrastructure and co-location with other utilities);
- Have the Department and other resource protection agencies establish a voluntary pre-construction consultation process to ensure that ecological and natural resource data are more effectively used in the review and siting of proposed pipelines; and
- Encourage the development and use of other siting decision support tools that include mitigation banking or avoidance of important conservation or ecological areas.²³

These recommendations are consistent with the report of the Governor's Marcellus Shale Advisory Commission.

Inspection and Enforcement; Agency Capacity

Act 13 and the Chapter 78 Proposal contain numerous requirements relating to increased inspection frequency of well sites, as well as more comprehensive public reporting of inspection reports, enforcement activities, and operator compliance. All of these are essential to better understanding the impacts of shale gas development, and in ensuring both compliance and public confidence in the Department's oversight of the industry.

This is a tremendous set of responsibilities placed on an agency that has seen its budget and staffing levels decreased by successive Governors and the General Assembly for almost a decade. While the Oil and Gas Program has rightfully been expanded to help meet the

²³ One example is the Energy by Design protocol developed by The Nature Conservancy

challenge, this has come at the cost of other Bureaus tasked with management of shale gas activities – including Air and Water. The Department cannot be expected to do more with less. Passing laws and regulations fails its purpose if the agency does not have the means to implement and enforce them. I urge you to consider the core recommendations of the Shale Gas Roundtable with respect to establishment of regulatory staffing parameters and ongoing budget support (please see attachment).

In addition, the Office of the Auditor General is currently conducting a performance audit²⁴ of the Department's water testing and waste handling programs with respect to natural gas development. The findings of this audit, expected by the end of this year, will be extremely important in appraising the capacity and execution of the Department. We urge members of the General Assembly to also closely consider this report once released.

One final observation worth noting is how permit violations are reported by the Department. Single incidents often spawn multiple violations depending on the circumstances of the incident, the number of state laws used to cite the violation, and the number of wells on the particular site. Additionally, the Department does not currently provide easily understandable information related to the severity of potential environmental harm from violations. We believe the Department should invest in improvements to their database so violations would be better categorized to allow for understanding of the nature of the violation, its actual or potential severity of impact, DEP's enforcement actions, and the operator's response to violation if any. Some of these informational points are now required by Act 13, but have not yet been fully implemented by the Department.

Center for Sustainable Shale Development

I would like to bring one other item to the Committee's attention. PEC is a participant in the Center for Sustainable Shale Development (CSSD) – an independent, collaborative effort that seeks to support continuous improvement and innovative practices for the shale gas industry through public performance standards and third-party certification. I have included a complete copy of CSSD's initial Performance Standards with my written remarks for your review.

CSSD is certainly not meant to displace regulation, but it can serve as an important guidepost for evolving best practices and standards that have been developed by certain members of the industry and environmental community. Many of my comments made here today include principles reflected in the CSSD standards.

²⁴ http://www.auditorgen.state.pa.us/departments/press/WaterAuditEngagementLetter_011513.pdf

Conclusion

In conclusion, I thank you again for the opportunity to comment before the Committee.

John Walliser, Esq.
Vice President, Legal & Government Affairs
Pennsylvania Environmental Council
(412) 481-9400
jwalliser@pecpa.org
www.pecpa.org

ATTACHMENTS:

- University of Pittsburgh Institute of Politics
Report of the Shale Gas Roundtable – Executive Summary (August 2013)
- Center for Sustainable Shale Development – Performance Standards (March 2013)

**Attachment: Report of the Shale Gas Roundtable – Executive Summary
University of Pittsburgh Institute of Politics (August 2013)**



Shale Gas ROUNDTABLE:

Deliberations, Findings,
and Recommendations

AUGUST 2013



Shale Gas

ROUNDTABLE: Deliberations, Findings, and Recommendations

The Shale Gas Roundtable cochairs and staff worked thoughtfully and diligently to assemble a high-level, diverse membership including 26 individuals from relevant, interested constituencies. Roundtable members were recruited to serve because of the unique perspectives and contributions each could bring to the effort. A full listing of Roundtable members can be found on page 2.

In adopting this document, the Roundtable members endorse that the final report was built on constructive dialogue, was informed by sound research and information, and that the included recommendations merit consideration by policymakers at all levels as they seek to effectively and safely manage unconventional oil and gas development.

While the Roundtable has achieved general agreement on the report's value in informing decision makers, individual Roundtable members may not agree on the details of every recommendation. The final report reflects the careful deliberations and findings of the Shale Gas Roundtable; it does not necessarily reflect the views of the members' affiliated organizations or of the Institute of Politics.

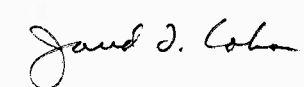
The Shale Gas Roundtable was created in the fall of 2011 to explore natural gas development in Southwestern Pennsylvania. The Roundtable operated by building and sustaining relationships among relevant regional stakeholders; identifying critical focus areas through dialogue, research, and collaboration; assessing those focus areas; and developing recommendations that promote responsible regional shale gas development. Twenty-four civic leaders from the private, nonprofit, and public sectors served with us on the Roundtable. From the beginning, our process relied on broad stakeholder consultation, in-depth research, education on important issues, and respectful consensus building among our diverse members.

Our central question was this: As a region, how can we most effectively and responsibly safeguard our communities and environment, grow our economy, and manage unconventional oil and gas development? Our members recognized the value judgments and trade-offs inherent in attempting to answer this question and the balancing act that would be necessary to make progress. Issues such as the use of natural gas, water resources management, air quality impacts, infrastructure maintenance, housing, and community quality of life quickly entered our conversations. Through a process of careful review and thoughtful prioritization, we selected four areas for the Roundtable's attention: water management, conservation and unitization, research, and midstream development.

This final report represents the culmination of our work. It contains eight core, overarching recommendations that emerged from our overall effort and specific recommendations within each of the four focus areas. The report also includes substantial background and educational information in both the main text and appendices.

In adopting this report, the Roundtable endorses its fact-based and consensus-driven process and the benefit of the resulting ideas, particularly in terms of informing the ongoing public policy discussion in this region and in the Commonwealth. We believe that the included ideas and recommendations deserve consideration from leaders at all levels as they evaluate and make decisions about Pennsylvania's ability to effectively and safely manage unconventional oil and gas development.

As cochairs, we thank the members of the Roundtable for their valuable and significant contributions of time, energy, and knowledge. We commend their willingness to passionately represent their values and perspectives while always striving for common ground and achievable progress. We also extend our appreciation to the many regional, state, and national stakeholders and leaders who shared their experience and insights with us. Finally, we thank the Roundtable staff members for their outstanding support and guidance.



Jared Cohon, *Cochair*
President Emeritus
Carnegie Mellon University



James Roddey, *Cochair*
Principal
ParenteBeard LLC

Shale Gas

ROUNDTABLE MEMBERS

William Bates
Senior Vice President, Facilities
Eat'n Park Hospitality Group, Inc.

Cynthia Carrow
Vice President
Government and Community Relations
Western Pennsylvania Conservancy

Jared Cohon, Cochair
President Emeritus
Carnegie Mellon University

Kevin Colosimo
Managing Partner, Pittsburgh
Burleson LLP

Caren Glotfelty
Senior Program Director,
Environment Program
The Heinz Endowments and
Cochair, Environment Committee
Institute of Politics

Tori Haring-Smith
President
Washington & Jefferson College

Patrick Henderson
Energy Executive
Pennsylvania Office of the Governor

Norman Hipps
President
Saint Vincent College

Scott Izzo
Director
Richard King Mellon Foundation

Nels Johnson
Deputy State Director
The Nature Conservancy,
Pennsylvania Chapter

George Jugovic Jr.
President and CEO
PennFuture

Jeffrey Kupfer
Senior Advisor,
Policy and Government Affairs
Chevron

Grant Oliphant
President and CEO
The Pittsburgh Foundation

Barry Osborne
Vice President
Range Resources Corporation

Scott Perry
Deputy Secretary
Office of Oil and Gas Management
Pennsylvania Department of
Environmental Protection

Andrew Place
Corporate Director
Energy and Environmental Policy
EQT Corporation

Phil Poux
Director of Development, Mid-Atlantic
Ducks Unlimited, Inc.

James Roddey, Cochair
Principal
ParenteBeard LLC

Rod Ruddock
Commissioner
Indiana County

Kurt Salvatori
Vice President
CONSOL Energy Inc.

Edith Shapira
Psychiatrist/Community Volunteer

Pam Snyder
Member
Pennsylvania House of Representatives
and Cochair, Economic
Development Committee
Institute of Politics

Richard Taylor
Chief Executive Officer
Imbue Technology Solutions, Inc.
and Cochair, Economic
Development Committee
Institute of Politics

William Thompson
Executive Director
Westmoreland-Fayette Workforce
Investment Board

Elder Vogel
Member
Pennsylvania State Senate

Davitt Woodwell
Executive Vice President
Pennsylvania Environmental Council

EXECUTIVE SUMMARY

Pennsylvania is several years into unconventional oil and gas development—the early years of what some are calling a multi-decade shale energy boom. The regulatory environment is shifting, laws are being updated, and media and public attention are high. The issues related to accessing this resource have become politically and emotionally charged, with a significant amount of misinformation in the marketplace. While shale gas development presents a unique economic and energy opportunity for Pennsylvania and its surrounding states, development of these resources also presents substantial challenges for our region in the areas of water resources management, air quality, infrastructure maintenance, housing, and community quality of life, along with other environmental and public health impacts.

Shale formations such as the Marcellus, Utica, and Burket are referred to as unconventional resources due to the nontraditional methods utilized in producing oil and gas from them. Unlike conventional gas formations, shale gas is released from deep deposits using techniques that include multi-well pads, directional drilling, and hydraulic fracturing. In 2010, estimates of Pennsylvania’s accessible natural gas reserves doubled as a result of the application of these technologies to the Marcellus Shale formation. The increase in Pennsylvania was a significant contributor to the rise in total U.S. accessible reserves, accounting for about 20 percent of the overall increase that year. Although hydraulic fracturing has been used since the middle of the last century, it was only a decade ago when its coupling with horizontal drilling and use in accessing deep shale deposits were piloted in Texas’s Barnett Shale and more recently applied to the Marcellus Shale.

From 2002 through 2012, 6,283 unconventional oil and gas wells were drilled in Pennsylvania on more than 2,700 well pads. These wells produced a total of 3.7 trillion cubic feet of natural gas in that decade, with 85 percent of that total produced in 2011 and 2012. Approximately 35 percent of these wells are located in the 10-county Southwestern Pennsylvania region.

In 2012, 57 percent of all wells drilled in Pennsylvania and 90 percent of all wells drilled in Southwestern Pennsylvania were unconventional. At the end of 2012, 57 percent of all drilled unconventional wells in Pennsylvania were producing natural gas for market. Though unconventional wells represented only 5 percent of the total producing wells in the Commonwealth, they accounted for 90 percent of Pennsylvania’s total gas production in 2012.

The Commonwealth’s Department of Environmental Protection (DEP), through its Office of Oil and Gas Management, is the state agency primarily responsible for oversight of this sector. DEP issues permits; regulates water, air, and solid waste impacts; responds to complaints; and enforces compliance with relevant state laws and regulations. While DEP has the largest responsibility, the Pennsylvania Public Utility Commission, Pennsylvania Department of Conservation and Natural Resources, the U.S. Environmental Protection Agency, and several other state and federal agencies have roles in the management of various aspects of the oil and gas industry.

Over the last several years, Pennsylvania has made substantial efforts to improve the management of unconventional oil and gas development, including, but not limited to, updating water standards for total dissolved solids, increasing permit fees to support regulatory staffing needs, adopting the first comprehensive update of its Oil & Gas Act through Act 13 of 2012, and promulgating updated Chapter 78 environmental regulations to implement Act 13.

SHALE GAS ROUNDTABLE OVERVIEW

In response to the desire of regional, multi-sector leaders to elevate and inform the regional energy dialogue, the Shale Gas Roundtable was created in the fall of 2011 to fulfill a three-part mission related to unconventional oil and gas production, transport, and use:

- Building and sustaining relationships among relevant cross-sector stakeholders to better support diverse regional environmental protection, community quality of life, and economic development goals
- Identifying high-priority focus areas through consensus-building dialogue, extensive research, and shared goals for the region
- Assessing the focus areas and developing ideas and recommendations that promote the improved management of and outcomes from regional unconventional oil and gas development

The principles used to guide the Roundtable’s deliberations and activities were as follows:

- Operating with integrity, inclusiveness, and accountability
- Seeking the best possible balance between environmental/community protection and shale gas development/economic growth
- Conducting a thorough and objective study of issues

- Seeking the best available data to guide fact-based dialogue
- Incorporating stakeholder input with the help of members
- Working closely with diverse decision makers to seek input and counsel

The Shale Gas Roundtable cochairs and staff worked thoughtfully and diligently to assemble a high-level, diverse membership of 26 individuals from relevant, interested constituencies. Roundtable members were recruited to serve because of the unique perspectives and contributions each could bring to the effort. The Roundtable’s geographic scope included the 10 counties of Southwestern Pennsylvania—Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Westmoreland, and Washington. These counties represent approximately one-third of the unconventional oil and gas permits issued, wells drilled, and gas produced in the Commonwealth over the last 10 years. The 10-county Roundtable focus does not imply that unconventional oil and gas development is only a regional issue. Rather, the region was selected to maintain a manageable geography for frequent in-person member interaction on these issues.

The Roundtable members collectively determined their direction, process, and recommendations. In this work, they were supported by the Institute of Politics at the University of Pittsburgh. The Institute staff team, through neutral facilitation and unbiased research, established a productive framework for members to develop, discuss, and evaluate policy ideas and options. The activities of the Shale Gas Roundtable and the services of the Institute of Politics were generously supported by the Pittsburgh Foundation, the Heinz Endowments, and the Richard King Mellon Foundation.

In adopting this document, the Roundtable members endorse that the final report was built on constructive dialogue, was informed by sound research and information, and that the included recommendations merit consideration by policymakers at all levels as they seek to effectively and safely manage unconventional oil and gas development.

While the Roundtable has achieved general agreement on the report’s value in informing decision makers, individual Roundtable members may not agree on the details of every recommendation. The final report reflects the careful deliberations and findings of the Shale Gas Roundtable; it does not necessarily reflect the views of the members’ affiliated organizations or of the Institute of Politics.

BUILDING A COMMON UNDERSTANDING (2011–12)

At the inaugural meeting of the Shale Gas Roundtable in September 2011, members crafted a work plan to guide their collective efforts. That work plan was then implemented over the subsequent six months. It included the following components:

- Completing an extensive literature review of laws, policies, regulations, scientific studies, and advocacy materials related to unconventional oil and gas development in the region
- Conducting and summarizing more than 120 benchmarking interviews with environmental organizations, industry associations, landowner groups, researchers, and regulators and elected officials from the local, county, state, and federal levels. These interviews were completed through site visits to Colorado, New York, Ohio, Texas, and West Virginia. Interviews also were held with multi-sector leadership in Harrisburg and Washington, D.C.
- Continuing outreach to individual Roundtable members and to key stakeholders in Southwestern Pennsylvania to collect as much information as possible about regional unconventional oil and gas development
- Implementing a “Shale Gas University” to allow Roundtable members to participate in shared learning experiences. Educational modules featured expert guest speakers on topics ranging from water management to utility regulation to the full life cycle of natural gas production, transport, and use. Also included were field tours of a compressed natural gas fueling station, a centralized water treatment facility, a drilling site, and areas of the region most impacted by oil and gas development. The Shale Gas University sessions also provided opportunities for relationship building and education on critical issues and were held as needed throughout the entire course of the Roundtable’s work.

The Roundtable met regularly to share the findings and results from the above activities.

“GETTING IT RIGHT” FRAMEWORK AND RECOMMENDATIONS DEVELOPMENT (2012–13)

The economic benefits of unconventional resource development are often described as worthwhile as long as that development is done right. Roundtable members agree, but “done right” often is not well-defined. Through extensive review and in-depth discussion of the data that resulted from the activities outlined above, the Roundtable concluded that the necessary ingredients for a “getting it right” framework are:

- a strong, adaptive legal and regulatory system with adequate implementation staff and resources;
- aggressive development and industry adoption of best management practices and other operational performance standards;
- investments in technological and operational innovation; and
- carefully targeted and balanced research to inform the continual improvement of statutes, regulations, best management practices, standards, and technology.

If Pennsylvania and its surrounding states pursue excellence in these four areas, the Appalachian Basin could serve as a national model for getting unconventional upstream, midstream, and downstream development right. Specifically, the Roundtable believes that Pennsylvania could best implement this framework by aiming progress at three interrelated goals:

- Minimizing the acute and cumulative impacts of oil and gas activity on the environment, public health, and local communities
- Minimizing surface disturbance from oil and gas activity and maximizing the efficiency of resource recovery and transport
- Enhancing the regional use of natural gas and supporting opportunities for regional economic growth based on the full natural gas value chain

In early 2012, the Roundtable agreed that its attentions would best be concentrated in the legislative, regulatory, and research aspects of this framework. This decision was based largely on the degree to which other organizations and efforts were already focused on creating best management practices and driving innovation.

With the above framework and goals in mind, the Roundtable decided to select a small number of areas for comprehensive exploration and focused recommendations. After considerable deliberation over 30 potential areas, the members prioritized four areas for targeted attention:

Policy-relevant research: increasing the amount and enhancing the perception of research on the impacts of unconventional oil and gas development and ensuring that the resulting knowledge is used for the improvement of regulations and best practices

Conservation and unitization: developing a balanced proposal for modernizing the 1961 Pennsylvania Oil and Gas Conservation Law to account for modern technologies and approaches, limit surface disturbance, avoid wasted oil and gas resources, and move toward uniform conservation rules for all unconventional shale formations

Water management: protecting water resources by identifying improvements in management and regulation in the areas of water sourcing, hydraulic fracturing chemical disclosure, erosion and sedimentation, impoundments, vehicle traffic for water transport, wastewater treatment and disposal, groundwater protection, water related violations, regional water management, and water monitoring

Midstream development (pipelines and related infrastructure): developing recommendations that minimize the environmental and surface footprints of midstream construction, improve pipeline safety, enhance coordination and planning of siting decisions, and provide increased opportunity for economic and community development

The Roundtable’s full report contains extensive background information and recommendations for each of these four areas along with a set of core recommendations that emerged from the Roundtable’s discussions. All of the recommendations were constructed using a thorough and deliberative process to prioritize and address critical issues for Southwestern Pennsylvania.

CORE RECOMMENDATIONS

Through examination of the four focus areas, the Roundtable also identified a set of broader, overarching recommendations that fit within its framework:

The Commonwealth of Pennsylvania should increase investments in improving the accuracy, functionality, and transparency of its oil and gas data infrastructure. DEP has made significant progress in its management of oil and gas data over the last several years, but additional investments in innovation and data transparency and utility are necessary. Increased investment in user-friendly, accurate, and real-time systems will improve the efficiency of DEP-industry interactions, enhance research and data analysis capabilities, facilitate public access to information, and build public trust.

The Commonwealth should develop regulatory staffing parameters and oil and gas annual reports. DEP also should report annually—and publicly—on its oil and gas activities, including information about the prior year’s progress and priorities for the upcoming year. The inclusion of transparent staffing parameters (possibly including minimum inspector-to-well ratios, frequency and number of well inspections, time frame required for permit review and action, expectations for timely responses to public and stakeholder complaints and inquiries, and other critical metrics) in this annual report would provide a clearer picture of DEP’s additional staffing needs, if any, and demonstrate its continued ability to fully implement the state’s oil and gas regulations.

The Commonwealth should restructure the Oil and Gas Technical Advisory Board. While most DEP advisory committees are diverse and provide opportunities for cross-sector dialogue on policy and technical issues, the existing Oil and Gas Technical Advisory Board (TAB) has five members, all with geologic and petrochemical backgrounds and most with industry ties (this structure is statutorily mandated in the current Pennsylvania Oil & Gas Act). The administration and the legislature should expand the Advisory Board’s scope beyond technical issues and diversify the membership at the earliest possible time.

The Commonwealth should continue to regularly evaluate the ability of existing budget support and permit fees to support oil and gas regulation. As the administration and legislature consider future DEP budgets, they should regularly evaluate the ability of budget support and permit fees to adequately support DEP oil and gas operations. Currently, the oil and gas program is entirely funded by a combination of new permit fees, impact fee revenue, fines, and civil penalties. With current low natural gas prices and slowed drilling, it is unclear if new permit fees will be able to sustain the necessary oil and gas regulatory staffing level.

The Commonwealth should participate in regular, comprehensive STRONGER reviews. DEP should regularly participate in State Review of Oil and Natural Gas Environmental Regulations, Inc. (STRONGER) reviews in order to benefit from independent assessments of the state’s oil and gas regulations and to identify opportunities for additional improvement. A STRONGER review already is underway in 2013–14, and it may take into account proposed regulations based on Act 13.

The federal government, state government, and stakeholder groups should support efforts to increase balanced research on and rigorous monitoring of the possible impacts of unconventional oil and gas development. The Roundtable’s recommendation for an independent research

fund, described below, represents a particularly compelling opportunity for progress in the understanding of oil and gas development impacts.

Government, industry, and regional universities should support NETL as the premier national unconventional oil and gas technology research hub and, through NETL, continue to advance technology and operational innovations. The Appalachian Basin states are well-positioned to lead on oil and gas technology and operational innovations with the excellent capabilities of local research universities and with the U.S. Department of Energy’s National Energy Technology Laboratory (NETL) headquartered in Southwestern Pennsylvania. The federal and state governments, along with diverse stakeholders throughout the basin, should seek stronger relationships with NETL in order to continue developing innovations that can diminish the environmental risks of unconventional resource extraction, transport, and use.

DEP should strengthen engagement with and support of various cross-sector and industry efforts to develop Best Management Practices. DEP should continue its engagement with and support of various multi-stakeholder and industry efforts to develop best management practices (BMPs) and high-level performance standards. As appropriate, these practices/standards should be considered for incorporation into future revisions of relevant regulations and guidance documents to ensure continual improvement of industry operations.

UNCONVENTIONAL OIL AND GAS RESEARCH FUND PROPOSAL

Shale gas development is complex and multi-faceted, with economic, environmental, public health, social, and technological components. Robust and trustworthy research should be one of the critical ingredients in decision making by the state and federal governments and other important stakeholders.

The Roundtable used various tools and approaches to explore the research focus area, including a higher education survey, interviews with key government policymakers, outreach to relevant stakeholders, and media/literature reviews. The findings indicated that:

1. While substantial research has been completed or is under way, the amount of research activity on shale gas is lacking relative to the knowledge needs of policymakers and the public. Further, this mismatch between needs and actual research often is due to a dearth of funding.

2. Research that has been completed or is underway often is perceived as biased due to the funding source or review processes used.
3. Research has not been well aligned with the information or timing needs of regulatory staff, elected decision makers, or other civic leaders.

The Roundtable also investigated possible models to address the identified research deficiencies. Most potential models proved inadequate to overcoming the particular barriers of enhanced shale gas research. The one exception, however, was the Health Effects Institute (HEI), based in Boston. To a significant degree, HEI’s nonpartisan approach, independent structure, history, and activities informed the Roundtable members’ thinking on unconventional oil and gas research issues and aided in the development of the proposal below.

Based on the demonstrated need for additional balanced research, the investigation of models, stakeholder input, and the other information gathered, the Roundtable recommends that a fund be created to support rigorous and enhanced research to guide unconventional oil and gas development. The fund would have the following characteristics:

- diverse funding streams (state and federal governments, industry, and private philanthropy)
- regularly updated multi-year strategic research plan
- scientifically rigorous (competitive funding awards and peer review)
- transparency of funding and of research outcomes
- strong government and stakeholder relationships
- supportive of informed policy and practice based on state-of-the-art science
- able to synthesize existing research for shorter-term consumption by decision makers
- adequacy of funding support and staffing to implement a multi-year strategic research plan

In combination, these characteristics will help the research fund to maintain its ability to be nimble and responsive while being deliberative, strategic, and scientifically rigorous.

FUND GEOGRAPHY

While the fund could grow into a national effort, the best interim start-up strategy is to focus specifically on geologic formations found in the Appalachian Basin. Exact geographic dimensions of the basin vary, but the most commonly included states are New York, Pennsylvania, Ohio, and West Virginia.

These states share unconventional resources in the Marcellus, Utica, and other shale formations. They have a shared historical experience with resource extraction and, in many ways, similar regulatory regimes.

At the end of 2011, the U.S. Secretary of Energy Advisory Board’s Natural Gas Subcommittee endorsed the creation of Regional Centers of Excellence that would involve public interest groups, state and local agencies, colleges and universities, and industry in basin-specific best practice development. While this research fund would have a slightly different mission, an Appalachian Basin scale would be consistent with the U.S. Department of Energy’s emphasis on regional, shale-basin defined, and cross-sector approaches.

FOCUS OF RESEARCH ACTIVITIES

A multi-sector fund appears particularly well suited to support research on the acute and cumulative environmental, ecological, public health, social, and community impacts of unconventional oil and gas extraction, production, transport, and use. These are the most contentious areas that require increased attention and skilled, impartial investigation.

FUND IMPLEMENTATION STRATEGY

In order to begin the implementation of the research fund proposal, planning already is under way for a process to establish a multi-year unconventional oil and gas research agenda that will include targeted, carefully timed, and policy-relevant research questions. This initial process and resulting agenda will, to the highest degree possible, conform to the characteristics of the fund itself.

It will be essential for diverse stakeholders to be able to trust the rigor and independence of the process and the resulting agenda. The agenda cannot be viewed as being driven by one sector or one institution. Expert scientific staff with experience in collaboratively identifying research questions, setting priorities, and establishing strategic research plans will be essential ingredients in the process. A scientifically credible, impartial facilitator with a track record in this type of work and with experienced staff would heighten the chances of successfully crafting an agenda that can attract implementation funding.

In parallel with the agenda-setting process, a detailed plan for the implementation of the agenda through a multi-year, cross-sector fund will be constructed. Longer-term emphasis will be on securing stability and predictability for the research fund through multi-year funding commitments, regular stakeholder communications, hiring full-time staff, establishing research and review committees, and eventually drafting requests for proposals based on the strategic research agenda.

MODERNIZATION OF THE OIL AND GAS CONSERVATION LAW

In long-standing Pennsylvania law, the “rule of capture” provides that ownership of a natural resource is determined by who “captures” the resource first. This legal paradigm resulted in the early, inefficient extraction of Pennsylvania’s oil reserves. Through over-drilling to capture the oil resource, well operators depressurized oil reservoirs, stranded numerous barrels of oil, and littered the landscape with wells. The Oil & Gas Conservation Law, which was originally adopted to satisfy Pennsylvania’s membership requirements for the Interstate Oil & Gas Compact Commission, was designed to more effectively and efficiently manage oil and gas reservoirs.

However, the Conservation Law has not been updated since 1961. It is the last portion of a three-part Pennsylvania oil and gas legal structure to be updated—both the Oil & Gas Act (Act 13) and the Coal & Gas Resource Coordination Act have been revised within the last several years. The 1961 Pennsylvania Conservation Law uses outdated depth restrictions, which in turn generate distinct regulatory systems for the Utica, Marcellus, and other shale formations.

The Shale Gas Roundtable has developed a balanced proposal for modernizing the Conservation Law and ensuring a standardized regulatory structure through all unconventional formations. This framework can be used to inform a comprehensive update of the Conservation Law or, in the interim, components of the framework could be legislated separately.

The Roundtable’s considerations in crafting this proposal included the following:

- The Commonwealth should not have different conservation rules for different shale layers.
- The 1961 law did not anticipate horizontal drilling, multi-well pads, or large-volume hydraulic fracturing, and any update should take these advances into account.
- It is in the best interest of the Commonwealth to limit the density of well pad development. Fewer pads equal fewer acres of surface disturbance, less infrastructure build out including gathering pipelines, and likely fewer potential environmental impacts.
- Land and mineral rights owners have complicated relationships with each other and with the natural gas resource. The Commonwealth should approach any update with careful attention paid to the ability of all stakeholders to constructively participate in the unitization process.

- Natural gas is an important economic asset of the Commonwealth. With substantial extraction already under way, the Commonwealth should make every effort to increase the efficiency of resource recovery and to prevent waste through stranded gas/acreage.

The framework below aims to provide uniform conservation rules that account for modern oil and gas development approaches and that prevent unnecessary environmental impacts and wasted resources.

APPLICABILITY AND ADMINISTRATION OF THE CONSERVATION LAW

Modernized provisions in the Conservation Law should apply to all unconventional reservoirs as defined by Act 13. Given that the original act will likely be amended instead of replaced, 1961 provisions that remain relevant to either conventional or unconventional gas development should be retained.

The Department of Environmental Protection (DEP) would carry out the functions outlined in these recommendations, including the review of proposed units and integration requests. Operators are accustomed to state unit review and approval processes in many other oil and gas-producing states. The aim is not to create new bureaucracy but to enable DEP to ably manage the additional Conservation Law responsibilities in strong alignment with existing environmental regulations. DEP would be required to design a unit filing process that enables operators to clearly demonstrate their fulfillment of the established requirements and facilitates timely decisions. Recently instituted state permit review and decision guarantees (assuming accurate/complete applications) would apply to DEP unit reviews. In order to pay for the additional staff necessary to conduct unit and integration reviews, DEP would be enabled to charge fees for integration requests and unit proposal filings.

RATIONALIZATION OF DRILLING UNITS

The Conservation Law should govern the logical organization of drilling units in order to minimize surface disturbance and maximize the efficiency of extraction and transport of oil and natural gas.

The Commonwealth should not legislatively define minimum and maximum unit sizes, number of pads per unit, or number of wells per unit. Instead, DEP would be charged with developing a maximum ratio of surface disturbance to unit size and requirements that the unit be effectively drained. For example, if the legislation required exactly 400-acre units with one pad per unit, the operator would need three pads to drain 1,200 acres. What if, instead, the operator could design a 1,200-acre unit and drain it with two pads? Or, what if the operator could drain an

800-acre unit with one pad and drain the adjacent 400-acre unit from a pad on the 800 acres? A ratio tool and requirements for effective drainage would allow flexibility to DEP and operators in effectively managing the gas reservoir, avoiding stranded gas, adapting to technological and best practice advances, rationalizing units, and limiting surface disturbance. These unit parameters should be evaluated for revisions every three years to account for advancing technology and operational practices.

Operators would be encouraged to propose multiple units to DEP in one filing. Such an approach would allow for more comprehensive conservation by allowing industry and the Commonwealth to work toward development that limits surface impact and improves efficiency over multiple units covering a larger geographic area.

Based on fracture propagation data and area geology, operators should be required to propose setback distances between the unit boundary (boundary with leases/land not included in that unit) and any well laterals. This approach prevents subsurface trespass and protects adjacent mineral rights owners. It also protects operators from cross-fracturing each other’s laterals.

INTEGRATION OF UNITS

In most cases, operators would control all leases in a proposed unit. DEP would not have jurisdiction over which leases or acreage are included in the proposed unit, only over whether the operators are meeting surface disturbance and effective drainage requirements.

In many other oil and gas-producing states, when operators are not able to secure leases for all of the acreage in a proposed unit, compulsory integration of non-consenting rights owners is an important component of conservation law. In Pennsylvania, full compulsory integration is currently available below the Onondaga Limestone via the 1961 Oil & Gas Conservation Law. Given the aim of minimizing surface impacts and avoiding waste, such compulsory integration does efficiently and effectively serve these goals. At a minimum, Pennsylvania should consider enabling company integration and existing lease integration:

- Company-on-company compulsory integration: The capability to request integration should be available to “persons” defined as operators. This will provide a remediation tool in the event that operators are effectively blocking the integration of efficient units.
- Existing lease integration: If an operator has the right to develop multiple, contiguous, held-by-production leases

separately, the operator should be able to request integration of those leases into a unit for the purposes of oil and gas development via horizontal drilling (unless expressly prohibited by an existing lease). A similar provision is found within Pennsylvania Senate Bill 259, which passed the Senate and the House of Representatives in June 2013.

Seventy percent of the acreage in a proposed unit should be under the control of the operator before any type of integration request can be filed. The operator should demonstrate and document its attempts at good faith negotiation before a request can be considered. A fee would be associated with filing any type of integration request, which would serve to discourage such requests and provide additional revenue to support DEP’s unit review functions.

AVAILABILITY OF UNIT INFORMATION

DEP should develop requirements for formatting and data inclusions in unit proposal and final unit filings. A statewide electronic filing system for unit proposals and declarations should be designed and implemented. The resulting maps and data should be publicly accessible via an online portal. There would be a need to ensure that the new filing system integrates with other DEP, Department of Conservation and Natural Resources, Pennsylvania Natural Diversity Inventory (PNDI), and Pennsylvania Spatial Data Access (PASDA) data systems. The current county-level paper filing system for final unit declarations should be retained to remain consistent with Pennsylvania title practices.

OIL AND GAS LEASE RELEASE REQUIREMENT

Upon the expiration of an oil and gas lease, the operator should, within 30 days after a request by the rights owner, execute, acknowledge, and deliver or cause to be recorded, a quitclaim of all interest in and to the resources covered by the oil and gas lease. Such a request can only be filed and only requires a response if the lease is no longer in the primary term and the lease is not held by production. This requirement facilitates the cleaning of title upon lease expiration and improves the marketplace for acreage then available to be included in future units.

TEMPORARY REGULATIONS

DEP should be allowed to issue temporary regulations to speed implementation of the modernized Conservation Law until permanent regulations can be promulgated and approved. Temporary regulations should be in place a maximum of two years.

WATER AND UNCONVENTIONAL OIL AND GAS RECOMMENDATIONS

In the spring of 2012, the Shale Gas Roundtable began to collect and analyze data for a regional scan of water-related issues relevant to shale gas extraction, transport, and use. Based on the information gathering and stakeholder dialogue processes, the Roundtable also was able to construct a set of recommendations focused on preventing potential water-related impacts of unconventional oil and gas development. The Roundtable developed recommendations in the categories provided below, with a risk-based life-cycle approach to managing water impacts.

WATER SOURCING

- Pennsylvania should sign the pending memorandum of understanding that supports the Ohio River Valley Water Sanitation Commission’s (ORSANCO) study of water quantity regulation in the Ohio River Basin and also actively engage in the Commission’s forthcoming studies.
- DEP should incorporate the recommendations in the Upper Ohio Basin flow study into its water management programs and update its policy to reflect this recent research. The Susquehanna River Basin Commission’s new policy, based on a similar study, creates classes of streams based on their sensitivity to water withdrawals and limits withdrawals when they are likely to have ecological impacts. DEP should consider similar factors when managing water in the Upper Ohio Basin.
- The potential benefits of using abandoned mine water for hydraulic fracturing operations are well documented. The technology necessary to use this water largely exists, and the most significant barrier remains potential liability. As such, the General Assembly should adopt Pennsylvania Senate Bill 411, or similar legislation, to encourage the use of abandoned mine water in well development. The U.S. Environmental Protection Agency (EPA) and possibly the U.S. Congress should consider also addressing operator liability concerns under federal law.
- A water quantity life-cycle analysis for shale gas development should be supported and conducted at the earliest possible time to inform the public and future water quantity regulation.
- The draft Chapter 78 Water Management Plan (WMP) provisions should be enacted, including the extension of certain existing Susquehanna River Basin Commission water withdrawal rules to the Ohio River Basin. DEP should fully leverage the expertise of department water staff in WMP reviews, compliance monitoring, and enforcement (in collaboration with oil and gas staff).

HYDRAULIC FRACTURING CHEMICALS

- The Roundtable recognizes DEP for its strong efforts at facilitating public transparency of fracturing chemicals and its pressure to update the FracFocus.org platform to more adequately communicate needed information. DEP should continue to evaluate methods for improving the accessibility and utility of collected chemical information, with commensurate pressure on FracFocus.org to improve and innovate in order to meet Pennsylvania’s needs in this regard.
- Industry, federal and state governments, and academia should prioritize the development of biodegradable “green” fracturing fluids. A green fracturing fluid would minimize the potential harm to natural gas workers and the potential environmental damage that could result from surface spills or underground migration of fracturing chemicals or flow back water. In the interim, the use of DNA or isotopic tracers in the fracturing fluid mixture may improve the ability to monitor underground fluid migration.

EROSION AND SEDIMENTATION

- In the design and review of oil and gas Post-Construction Stormwater Management Plans, DEP should require “whole-site” plans that take into account not only the well pads but the access roads and pipelines that service a particular development location.

IMPOUNDMENTS AND CONTAINERS

- DEP should evaluate various natural gas wastewater storage techniques, including mobile containers and centralized impoundments, to determine best practices for management of these fluids. This evaluation should use a life-cycle approach that estimates potential environmental and safety risks associated with each of the available storage technologies. In particular, DEP should continue to monitor potential acute emissions problems with open impoundments.

VEHICLE TRAFFIC/WATER TRANSPORT

- In addition to the new uniform rules in the draft Chapter 78 revisions, DEP should continue to seek methods that facilitate and incentivize the use of fresh water pipelines for water transport (possibly including a requirement that water transportation plans be included in the Water Management Plan).
- While Excess Maintenance Agreements (EMA) typically have been sufficient tools to ensure infrastructure repairs, the Commonwealth should evaluate whether the 30-year-old bonding rates should be increased to better protect local municipalities from EMA default.

WASTEWATER TREATMENT AND DISPOSAL

- The Commonwealth should transparently define and codify the categories of waste produced by unconventional oil and gas development and the differences among drilling, flow back, and produced waters. The lack of formal definitions adds unneeded complexity and uncertainty to disposal data and should be remedied through future legislation and regulation.
- DEP should consider requesting that operators include their water manifest tracking data in their biannual waste reporting and that the resulting data be made available for public consumption. The ability to follow all wastewater from well site to disposal location could improve public faith in the handling of these materials.
- Many wastewater treatment technologies leave residual by-products after the water is reclaimed. Additional government attention and industry/academic research should be aimed at the appropriate disposal and/or beneficial reuse of these by-products.
- DEP should evaluate current and future wastewater regulations by their ability to move toward zero discharge of natural gas-related wastewater in favor of recycling, reuse, and underground injection.
- DEP should proactively engage with U.S. EPA in a dialogue about the effectiveness and management of the Underground Injection Control and Wastewater Pre-Treatment programs, which are currently administered by EPA. Also, EPA recently completed a comprehensive risk analysis for Class 1 hazardous materials injection wells. EPA and/or the Commonwealth should consider conducting a similar analysis for Class 2 oil and gas brine disposal injection wells.

GROUNDWATER PROTECTION

- Enhanced research and monitoring are needed to establish baseline groundwater conditions and gauge possible cumulative impacts of unconventional oil and gas development on groundwater. Act 13 provided impact fee monies to the Commonwealth Financing Authority in order to fund state-wide initiatives that can help to collect baseline water quality data on private water supplies. This program and others should be supported and expanded.
- The Pennsylvania General Assembly should pass House Bill 343, or similar legislation, which would establish construction standards for new private water wells. Legislators also should consider adding technical and financial assistance provisions that aid homeowners in the evaluation, maintenance, and refurbishment/replacement of existing private water wells.

- DEP should undertake efforts to standardize rigorous pre-drilling water testing parameters, methodologies, land owner notification procedures, and reporting requirements. Consistent parameters for post-drilling monitoring and sampling processes also should be developed.
- Regular inspection of sites is necessary to ensure industry compliance with DEP cementing and casing standards. In anticipation of future well re-stimulation activities, the Commonwealth should develop requirements for checking the continued strength and stability of the original cementing and casing. As noted in the Core Recommendations, it will be essential that DEP sets transparent goals and possesses the resources and staff to meet its inspection obligations.
- Due to groundwater infiltration concerns, Chapter 78 should be amended to prohibit on-site disposal of drill cuttings from the horizontal phase of drilling operations or solid wastes from hydraulic fracturing of unconventional wells.

WATER-RELATED VIOLATIONS

- DEP should invest in improvements to the violation database systems. Violations should be better categorized to improve understanding of the nature of the violation, its actual or potential severity of impact, DEP’s enforcement actions, and the operator’s response to the violation (as required by Act 13). DEP should consider annually summarizing and reporting on violation activity—and progress in remediating violations and preventing future incidents.
- DEP also should remove redundant violation records for single incidents so that the public and policymakers can more clearly evaluate violations activity.

REGIONAL WATER MANAGEMENT

- As delineated in the water sourcing section, the Commonwealth should support and actively engage in the ongoing ORSANCO water quantity studies.
- In 2009, a regional effort led by the Regional Water Management Task Force endorsed the creation of a water planning division at the Southwestern Pennsylvania Commission (SPC). That effort, which is under way, is designed to improve the cohesion of water monitoring, planning, investment, and technical assistance within a 10-county Ohio River Basin area. While SPC plans to initially focus its primary attention on stormwater, shale gas water management issues provide further impetus for this work. The region should support the growing role of SPC in planning for the future of Southwestern Pennsylvania’s water resources.

- The Chapter 78 draft rulemaking states that DEP will collaborate with the Susquehanna River Basin Commission, the Delaware River Basin Commission, and the Great Lakes Commission on water monitoring and regulation of oil and gas activities. While Southwestern Pennsylvania does not have a direct corollary agency, DEP should consider outreach to and partnership with both ORSANCO and SPC on Ohio River Basin water resources management. Such collaborations would allow DEP to have natural water partners within this region of a similar type to those that already exist in Central and Eastern Pennsylvania.
- Local communities should consider the potential benefits of developing and maintaining a Source Water Protection Plan for drinking water sources. DEP should continue to encourage local jurisdictions to complete such plans and provide technical assistance to support the planning processes.

MIDSTREAM DEVELOPMENT
RECOMMENDATIONS

Midstream infrastructure includes pipelines, processing facilities, compressor stations, and related infrastructure for transporting natural gas from well sites and preparing that gas for market. As of December 2012, 57 percent of Pennsylvania’s spud unconventional wells were producing gas, a number that at least partially reflects the lack of adequate pipeline infrastructure to bring these wells into production. In the last six months of 2012, 683 wells were producing that had not been in the previous six-month period, possibly indicating the scale of recent midstream investment.

This ongoing development of a gathering and transmission network for Pennsylvania’s unconventional wells caught the Roundtable’s attention for multiple reasons:

- Building pipelines includes both substantial surface disturbance (both temporary and permanent) and construction activities that have environmental risks such as erosion and sedimentation, invasive species introduction, forest fragmentation, and stream crossings and encroachments.
- While incidents have been rare, the safety of pipeline systems will continue to be a public concern.
- Air quality and climate change impacts from compressor stations and methane leakage are possible.
- The pipeline system is a delivery mechanism to get shale resources from production to end users. As the markets for these resources continue to develop within the Commonwealth, the locations of midstream infrastructure can, at times, be either a help or a hindrance to users’ cost-effective access.

- Pipeline rights of way become fairly permanent aspects of the landscape, and midstream planning will continue to interact with other local economic and community development planning.
- Any development inefficiencies that add to the costs of the overall system could possibly be passed on to consumers/ratepayers.

The natural gas midstream system has a wide range of potential impacts on landowners, the environment, public health, the local and state economy, and the individual consumer. As midstream infrastructure in Pennsylvania continues to expand to serve new producing wells, the short-term and long-term consequences of this development will require careful monitoring and management with the best interests of the public in mind.

In order to promote midstream development, which is environmentally protective and economically beneficial, the Roundtable recommends that the Commonwealth and interested stakeholders pursue a suite of important goals, including the following:

Crafting legislative and regulatory provisions that, in the public interest, encourage the efficient development of intrastate midstream infrastructure

The Commonwealth should actively seek opportunities to improve the efficiency of intrastate midstream infrastructure development, possibly including the sharing of pipeline capacity to transport produced gas. In addition to sharing infrastructure, such coordinated systems could jointly take advantage of existing rights of way that may be available and even co-locate with other utilities or natural gas-related infrastructure.

While joint efforts could be challenging because the new transmission would have to account for the diverse needs and lease-holdings of multiple operators, approaches such as these could serve the public interest by limiting surface disturbance and preventing the construction of unnecessary or duplicative lines. Identifying opportunities for increased efficiency also could decrease the total costs of infrastructure development, in turn positively influencing consumer rates.

Creating and leveraging opportunities for enhanced communication between midstream operators and other key stakeholders

In the near future, the Public Utility Commission (PUC) and DEP should consider partnering to convene three in-depth workshops to guide thinking on midstream issues in the Commonwealth:

1. Environmental and community impacts: A targeted discussion on present and future potential issues of concern regarding pipeline infrastructure. Industry; landowners; municipal and county officials; and environmental, conservation, and sportsmen’s groups would be natural participants. What are the high-priority concern areas? How are companies proactively

addressing them? Are the appropriate state regulatory tools available to manage those areas of concern?

2. Economic and regulatory efficiency: A multi-part dialogue with an initial focus on supporting increased efficiency of infrastructure development. The multiple state and federal agencies that regulate aspects of midstream development should participate to discuss their own efforts at collaborative oversight and at improving the efficiency of interactions with industry.

3. Building midstream and downstream connections: A unique effort to create a dialogue among those who produce, transport, and use natural gas and related products in Pennsylvania. An initial conversation could include participants such as exploration and production companies, midstream operators, local distribution utilities, power generation companies, transportation sector representatives, and manufacturing companies. The goal would be to identify points of agreement and disagreement that have implications for Pennsylvania’s management of its energy portfolio.

These conversations would be aimed at cross-sector relationship building and the identification of critical opportunities and challenges in the improvement of midstream policy and regulation. Due to the diverse interests and aspirations of the participants, the Commonwealth agencies are particularly well suited to serve as neutral conveners. If any or all of the discussions prove useful, additional follow-up sessions focused on more specific issues are possible.

Ensuring the availability of the necessary expertise and resources for state midstream permitting, planning, and inspection agencies

Staffing and resource issues for DEP are addressed at length in the Core Recommendations. As midstream activity increases, the PUC also should regularly monitor and report on the sufficiency of its resources, staff, and technical capabilities to meet federal and Pennsylvania public safety regulation and inspection requirements for midstream development.

Maintaining the protective adequacy of pipeline safety regulations, especially as larger volume, higher pressure gathering and transmission systems are being constructed

Current Pennsylvania law incorporates federal pipeline safety regulations by reference and enables the PUC to implement them. Any changes to those federal regulations, then, will automatically transfer to Pennsylvania as well. Given this arrangement, Pennsylvania should continue to proactively engage with other states and with the federal government to aid in shaping and strengthening any potential safety updates.

Minimizing and avoiding surface disturbance, forest fragmentation, and other impacts on sensitive ecological areas

Most states, including Pennsylvania, lack regulatory power for the review of intrastate pipeline siting determinations. However, since intrastate lines cannot be sited using eminent domain power, individual property owners can impact siting decisions through easement negotiations with midstream operators. In the absence of state review, multiple avenues are available to the Commonwealth and to operators in minimizing the environmental footprint of midstream infrastructure:

- The Roundtable’s proposed modernization of the Oil & Gas Conservation Law could be one of the strongest tools available to the Commonwealth in avoiding surface disturbance and forest fragmentation. The Conservation Law framework is designed to rationalize units and prevent the construction of unnecessary well pads to extract the resource. Fewer pads should translate to less pad-related infrastructure, including gathering lines and access roads.
- DEP and other relevant state and federal regulatory agencies should consider creating a voluntary pre-construction consultation process, wherein developers would have the ability to discuss the proposed placement of new midstream infrastructure, particularly large transmission pipelines, and plans to minimize the impacts of that development. The utility and mechanics of such a process could be one of the discussion points for the second workshop outlined above.
- Ecological impacts also can be reduced through the increased use of siting decision support tools, which some operators already employ to great effect. These tools include mitigation banking and the identification and use of low-impact utility corridors where infrastructure can be clustered to avoid other more sensitive areas.
- The first recommendation in this section, regarding improved efficiency to avoid unnecessary infrastructure, also could be an important method for minimizing the surface footprint of the pipeline system.

Monitoring and responding to the implications of cumulative pipeline placement decisions on the needs of communities and citizens, on the potential for Pennsylvania consumers to use gas produced within the state’s borders, and on the future use and value of land

County commissioners and other local government officials, while having limited midstream regulatory power, should be consulted throughout the midstream development process as important partners in protecting public safety and ensuring that operators are aware of and can adapt to local economic, land use, and community plans.

During these consultations, operators and local officials also should review economic development considerations related to pipeline placement. Opportunities may exist for innovative supply approaches along pipeline paths to feed various downstream users of natural gas, oil, and natural gas liquids. In a related vein, midstream operators could have an important role in supporting the expansion of consumer access to affordable natural gas service, particularly in rural and underserved areas.

CONCLUSION

The Roundtable recognizes that enacting these core and focus area (research, conservation and unitization, water, and midstream) recommendations will require serious consideration and action by a broad group of decision makers. Some recommendations will need legislative action for full implementation; others can be addressed through policy or regulatory actions by federal, state, and local agencies; and some can even be voluntarily pursued by regional stakeholders. In most cases, specific Roundtable recommendations identify which actors can pursue implementation.

A primary goal of this report is to inform the ongoing public policy discussion in this region and in the Commonwealth. As such, the Roundtable will continue to share its recommendations with state and federal officials, local civic leaders, and other relevant regional stakeholders to spread awareness of the report’s contents and key findings—findings that can assist Pennsylvania in improving environmental, public health, and economic outcomes for local communities impacted by unconventional oil and gas development. ■

The University of Pittsburgh Institute of Politics convened and provided neutral facilitation and research support to the Shale Gas Roundtable.

SHALE GAS ROUNDTABLE STAFF

Project Director

D. Tyler Gourley

Policy Strategist

Kim Bellora

Project Policy Analysts

Aaron Lauer

William Schlachter

Director, Institute of Politics

Terry Miller

INSTITUTE OF POLITICS

Director

Terry Miller

Deputy Director, Finance

Marie Hamblett

Senior Policy Strategist

Briana Mihok

Policy Strategist

Kim Bellora

Executive Assistant

Tracy Papillon

Vice Chancellor

G. Reynolds Clark

Director Emeritus

Moe Coleman

Undergraduate Intern

Hans Kessler

DEPARTMENT OF UNIVERSITY MARKETING COMMUNICATIONS

Communications Manager

Jolie Williamson

Art Director

Rainey Opperman-Dermond

Production Manager

Chuck Dinsmore

Editorial Assistant

Sarah Jordan Rosenson

**Attachment: Center for Sustainable Shale Development – Performance Standards
(March 2013)**

PERFORMANCE STANDARDS
(March 2013)

GEOGRAPHIC SCOPE AND APPLICABILITY OF CSSD PERFORMANCE STANDARDS

These standards apply to unconventional exploration, development, and gathering activities including site construction, drilling, hydraulic fracturing and production in the Appalachian Basin. These regional standards consider geology, topography, population density, infrastructure, surface water, ground water and other issues of particular concern in the Appalachian Basin. Accordingly, until such time as the scope of these standards may be amended, these standards and the CSSD evaluation and certification process will be limited to operators' unconventional activities in the Appalachian Basin.

WATER PERFORMANCE STANDARDS

Goal of Water Standards: The goal of the water standards is that there be zero contamination of fresh groundwater¹ and surface waters.

Wastewater Performance Standards

Performance Standard No. 1: Operators shall maintain zero discharge of wastewater (including drilling, flowback and produced waters) to Waters of the Commonwealth of Pennsylvania and other states until such time as CSSD adopts a standard for treating shale wastewater to allow for safe discharge. Such standard will be adopted by September 1, 2014.

Note: This standard does not apply to nor prohibit disposal of wastewater by deep well injection.

Performance Standard No. 2:

1. Operators shall maintain a plan to recycle flowback and produced water, for usage in drilling or fracturing a well, to the maximum extent possible.
2. Within two (2) years following implementation of these standards [or for each new well that obtains an ESCGP-1 permit, or other earth disturbance permit, following implementation of these standards] Operators must recycle a minimum of 90% of the flowback and produced water, by volume, from its wells in all core operating areas in which an Operator is a net water user.

¹ "Fresh groundwater" is "water in that portion of the generally recognized hydrologic cycle which occupies the pore spaces and fractures of saturated subsurface materials."

3. CSSD will consider a recycling standard for a net water producer within one year. Operators will maximize the use of recycled water to the extent possible during this time.

Pits/Impoundments Performance Standards

Performance Standard No. 3:

1. After the promulgation date of these standards, any new pits designed shall be double-lined and equipped with leak detection.
2. Operators, within 12 months of implementation of these standards, shall contain drilling fluid, when using oil-containing drilling fluids to drill a well, in a closed loop system at the well pad (e.g. no ground pits).
3. Operators, within 24 months of implementation of these standards, shall contain drilling fluid and flowback water in a closed loop system at the well pad, eliminating the use of pits for all wells.²

Performance Standard No. 4:

1. When utilizing centralized impoundments for the storage of flowback and/or produced waters, Operators shall ensure that free hydrocarbons are removed from the water prior to storage and that new impoundments are double-lined with an impermeable material, equipped with leak detection and take measures to reasonably prevent hazards to wildlife. Total hydrocarbons should be substantially removed.
2. Additionally, CSSD will facilitate research designed to determine the extent of hydrocarbon emissions from these waters so that by September 1, 2014, a decision can be made as to whether, and to what extent, this standard should be amended.

Groundwater Protection Performance Standards

Performance Standard No. 5: Operators shall establish an Area of Review (AOR), prior to drilling a well, which encompasses both the vertical and horizontal legs of the planned well. Within the AOR, the operator must conduct a comprehensive characterization of subsurface geology, including a risk analysis, that demonstrates the presence of an adequate confining layer(s) above the production zone that will prevent adverse migration of hydraulic fracturing

² For guidance document:

Pit – any in-ground impression constructed on a well site that is used for the storage and disposal of residual waste from the development of a natural gas well and subject to 25 Pa. Code, Chapter 78.

Centralized Impoundment – any in-ground impression constructed off of the well site which is used to store and aggregate flowback water for use in the hydraulic fracturing process and subject to 25 Pa. Code, Chapters 78 and 105.

fluids. As part of the risk analysis, and before proceeding with hydraulic fracturing, the operator must also conduct a thorough investigation of any active or abandoned wellbores within such area of review or other geologic vulnerabilities (e.g., faults) that penetrate the confining layer and adequately address identified risks.

Performance Standard No. 6:

1. Operators shall develop and implement a plan for monitoring existing water sources, including aquifers and surface waters [terms to be defined in guidance document] within a 2,500 foot radius of the wellhead (or greater distance, if a need is clearly indicated by geologic characterization), and demonstrate that water quality and chemistry measured during a pre-drilling assessment are not impacted by operations.
2. Operators must conduct periodic monitoring for at least one year following completion of the well. Such monitoring must be extended if results indicate potentially adverse impacts on water quality or chemistry by operations.
3. In the event that monitoring establishes a possible link between an Operator's activities and contamination of a water source, the Operator shall develop and implement an investigative plan and, if a positive link is established, implement a corrective action plan.
4. The testing and monitoring plan should provide for additional monitoring in the event a well is re-stimulated.

Performance Standard No. 7:

1. Operators shall design and install casing and cement to completely isolate the well and all drilling and produced fluids from surface waters and aquifers, to preserve the geological seal that separates fracture network development from aquifers, and prevent vertical movement of fluids in the annulus.
2. Operators will not use diesel fuel in their hydraulic fracturing fluids.
3. Operators will publically disclose the chemical constituents intentionally used in well stimulation fluids. Disclosures will include: information identifying the well, the operator and the dates of the well stimulation; the type and total volume of the base fluid; the type and amount of any proppant; all chemical additive products used in a well stimulation, including the name under which the product is marketed or sold, the vendor, and a descriptor of additive's purpose or purposes (e.g. biocide, breaker, corrosion inhibitor, etc.); the common name and Chemical Abstracts Service registry number for each chemical ingredient used in a stimulation fluid; the actual or maximum concentration of each chemical ingredient, expressed as a percent by mass of the total stimulation fluid. Chemical ingredients should be disclosed in a manner that does not link them to their respective chemical additive products. Disclosure of the above information will be offered to the relevant state agency and will also be posted on FracFocus.org. If an operator, service company or vendor claims that the identity of a chemical

ingredient is entitled to trade secret protection, the operator will include in its disclosures a notation that trade secret protection has been asserted and will instead disclose the relevant chemical family name. Operators will implement measures consistent with state law to assist medical professionals in quickly obtaining trade secret information from the operator, service company or vendor holding the trade secret that may be needed for clinical diagnosis or treatment purposes.

4. CSSD will develop a standard relating to the public disclosure of chemicals other than well stimulation fluids by September 1, 2013.

5. Operators will also work toward use of more environmentally neutral additives for hydraulic fracturing fluid. Mechanical integrity tests shall be performed when refracturing an existing well.

Performance Standard No. 8:

1. Operators shall design each well pad to minimize the risk that drilling related fluids and wastes come in contact with surface waters and fresh groundwater³.

2. In preparation for any spill or release event, Operators shall prior to commencement of drilling, develop and implement an emergency response plan, ensure local responders have appropriate training in the event of an emergency, and work with the local governing body, in which the well is located, to verify that local responders have appropriate equipment to respond to an emergency at a well.

3. In addition, in the event of spill or release, beyond the well pad, Operators shall immediately provide notification to the local governing body and any affected landowner.

AIR PERFORMANCE STANDARDS

Performance Standard No. 9

1. Beginning on January 1, 2014, in accordance with the conditions set forth in Paragraphs 3 and 4 below, an Operator must direct all pipeline-quality gas during well completion of development wells⁴, and re-completion or workover of any well into a pipeline for sales.

³ Fresh groundwater is defined as water in that portion of the generally recognized hydrologic cycle which occupies the pore spaces and fractures of saturated subsurface materials.

⁴ Development wells are wells that are not exploratory or extension wells, as those terms are defined and restricted in Paragraph 6.

2. Any gas not captured and put in the sales pipeline may not be vented⁵ and must be flared in accordance with Standard No. 10 below.
3. Acceptable reasons for sending gas to a flare and not directing gas into the sales line include:
 - (a) Low content of flammable gas. Such low-flammability gas must be directed through a flare, past a continuous flame, to insure combustion begins when gas composition becomes flammable.
 - (b) For safety reasons.
4. Circumstances unacceptable for sending gas to flare, instead of directing it into a sales line, are:
 - (a) Beginning on January 1, 2014, a lack of a pipeline connection except for wells that are designated as either exploratory or extension wells using SEC definitions (however, companies should minimize flaring and maximize the use of reduced emissions completions on exploratory or extension wells, where possible);
 - (b) Inadequate water disposal capacity;
 - (c) Undersized flow back equipment, lack of flow back equipment or lack of equipment operating personnel.
5. Any upset or unexpected condition that leads to flaring of gas, instead of directing it into a sales line, must be documented and records maintained by the Operator, including a description of the condition, the location, date, and quantity of gas flared.
6. Using the SEC definitions, an exploratory well is a well drilled to find a new field or to find a new reservoir in a field previously found to be productive of oil or gas in another reservoir. An extension well is a well drilled to extend the limits of a known reservoir. Wells with these designations must be consistent with Operator reporting of such designations to the SEC, if applicable.

Performance Standard No. 10

1. When flaring is permitted during well completion, re-completions or workovers of any well, pursuant to Standard No. 9 above, Operators must adhere to the following requirements:

⁵ For purposes of this standard, venting does not include the de minimis fugitive emissions from gas busters (i.e. that may occur from separator vessels during the initial cleanup period of the well). Immediately upon detection of gas in the flowback, operators must divert the flowback into reduced emission completion (“REC”) equipment.

(a) Operators must either use raised/elevated flares or an engineered combustion device with a reliable continuous ignition source, which have at least a 98% destruction efficiency⁶ of methane. No pit flaring is permitted.

(b) Flaring may not be used for more than 14-days on any development well (for the life of the well). Flaring may not be used for more than 30-days on any exploratory or extension wells (for the life of the well), including initial or recompletion production tests, unless operation requires an extension.⁷ If flaring continues beyond 30-days for an exploratory or extension well, Operators must document the extent of additional flaring and reasons requiring flaring beyond the 30-days.

(c) Flares shall be designed for and operated with no visible emissions, except for periods not to exceed a total of five minutes during any two consecutive hours.

Performance Standard No. 11

1. The following standard applies only to nonroad dedicated diesel horizontal drilling rig engines at the wellpad. CSSD encourages and supports the conversion of drilling rig engines to either dual-fuel, electricity or natural gas. The following emissions standards apply to the nonroad dedicated diesel drilling rig engines:

⁶ Certification of the 98% destruction efficiency may be obtained through either of the following options: (1) a manufacturer's certification and where operation is in accordance with the manufacturer's specifications and parameters; or (2) where the flares are designed and operated in accordance with the following: (a) meet specifications for minimum heating values of waste gas, maximum tip velocity, and pilot flame monitoring found in 40 CFR § 60.18; (b) if necessary to ensure adequate combustion, sufficient gas shall be added to make the gases combustible; (c) an infrared monitor is considered equivalent to a thermocouple for flame monitoring purposes; (d) an automatic ignition system may be used in lieu of a continuous pilot; (e) flares must be lit at all times when gas streams are present; (f) fuel for all flares shall be sweet gas or liquid petroleum gas except where only field gas is available and it is not sweetened at the sites; and (g) flares shall be designed for and operated with no visible emissions, except for periods not to exceed at total of five minutes during any two consecutive hours.

⁷ For performance standard 10, the 30-day time limit for flaring was based on West Virginia's rules which allow 30-days of temporary flaring before a permit is required. W. Va. CSR § 45-6-6.1a. Additionally, because all states that have developed a flaring time-limit allow flaring to continue longer than the time limit with approval, certain exceptions to the 30-day time limit were provided in performance standard 10 for emergency and upset conditions and well purging and evaluation tests. These exceptions were based on Wyoming's rules. WOGCC Rules and Regulations, Chapter 3, Section 40. Pennsylvania currently has no regulations addressing flaring directly.

(a) By the promulgation date of these performance standards, operator and contractor nonroad engines shall achieve horse power-hour weighted average⁸ site emissions equivalent to U.S. EPA Tier 2 nonroad diesel engine standards or better.

(b) Within 30 months of the promulgation date of these performance standards, 25% of all operator and contractor engine utilization (hp) shall comply with U.S. EPA Tier 4 emissions standards for particulate matter (PM).⁹

(c) Within 3-years of the promulgation date of these performance standards, 75% of all operator and contractor engine utilization (hp) shall comply with U.S. EPA Tier 4 emissions standards for particulate matter (PM).¹⁰

(d) Within 4-years of the promulgation date of these performance standards, 95% of operator or contractor engine utilization (hp) shall comply with U.S. EPA Tier 4 emissions standards for particulate matter (PM).¹¹

(e) All nonroad equipment must use Ultra-Low Sulfur Diesel fuel (15 ppm of sulfur) at all times.

2. The following standard applies only to dedicated diesel fracturing pump engines at the wellpad. CSSD encourages and supports the conversion of fracturing pump engines to either dual-fuel, electricity or natural gas.

⁸ Weighted average emissions are based on an annual weighted average using the certified emissions level of each engine (g/bhp-hr), the rated power of each engine (HP), and the run time (hrs) of each engine over the course of the year.

⁹ Meeting U.S. EPA Tier 4 emissions standards for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.

¹⁰ Meeting U.S. EPA Tier 4 emissions standards for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.

¹¹ Meeting U.S. EPA Tier 4 emissions standards for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.

(a) If the fracturing pump is a nonroad dedicated diesel engine powered solely by diesel fuel, then the following emissions standards apply:

(i) Within 1-year of the promulgation date of these performance standards, operator and contractor nonroad engines shall achieve horse power-hour weighted average¹² site emissions equivalent to U.S. EPA Tier 2 nonroad diesel engine standards or better.

(ii) Within 3-years of the promulgation date of these performance standards, 25% of all operator and contractor engine utilization (hp) shall comply with U.S. EPA Tier 4 emissions standards for particulate matter (PM).¹³

(iii) Within 4-years of the promulgation date of these performance standards, 75% of all operator and contractor engine utilization (hp) shall comply with U.S. EPA Tier 4 emissions standards for particulate matter (PM).¹⁴

(iv) Within 5-years of the promulgation date of these performance standards, 95% of all operator and contractor engine utilization (hp) shall comply with U.S. EPA Tier 4 emissions standards for particulate matter (PM).¹⁵

¹² Weighted average emissions are based on an annual weighted average using the certified level of each engine (g/bhp-hr), the rated power of each engine (HP), and the run time (hrs) of each engine over the course of the year.

¹³ Meeting U.S. EPA Tier 4 emissions standards for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.

¹⁴ Meeting U.S. EPA Tier 4 emissions standards for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.

¹⁵ Meeting U.S. EPA Tier 4 emissions standards for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.

(v) These engines must use Ultra-Low Sulfur Diesel fuel (15 ppm of sulfur) at all times.

(b) If the fracturing pump is powered by a dedicated diesel heavy-duty vehicle engine, then the following emissions standards apply:

(i) By the promulgation date of these performance standards, 50% of the heavy-duty vehicle engines used to power fracturing pumps, must meet U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter (PM) emissions.¹⁶

(ii) Within two years of the promulgation date of these performance standards, 80% of the heavy duty vehicle engines used to power fracturing pumps, must meet U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter (PM) emissions.¹⁷

(iii) These engines must use Ultra-Low Sulfur Diesel fuel (15 ppm of sulfur) at all times.

3. Within 1-year of the promulgation date of these standards, CSSD will develop a standard and implementation date for all other engines located at the wellpad.

Performance Standard No. 12

The following standard is only applicable to compressor engines dedicated to unconventional activities:

¹⁶ Meeting U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.

¹⁷ Meeting U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.

1. Within one-year of the promulgation date of these standards, existing compressor engines greater than 100 horsepower may not emit more than 1.5 grams of NO_x per horsepower-hour.
2. Any new, purchased, replacement, reconstructed, or relocated lean-burn engines greater than 100 horsepower may not emit more than 0.5 g/hp-hr for NO_x; 2.0 g/hp-hr for CO; 0.7 g/hp-hr for VOCs.
3. Any new, purchased, replacement, reconstructed, or relocated rich-burn engines greater than 100 horsepower may not emit more than 0.3 g/hp-hr for NO_x; 2.0 g/hp-hr for CO; 0.7 g/hp-hr for VOCs. Note: This standard will be updated to reflect any future determinations from regulatory agencies with regard to the NO_x limitation.

Performance Standard No. 13

By October 15, 2013, all (existing or new) individual storage vessels at the wellpad with VOC emissions equal to or greater than 6 tpy must install controls to achieve at least a 95% reduction in VOC emissions.

Performance Standard No. 14

This standard is applicable to new and existing equipment dedicated to unconventional activities unless stated otherwise.

1. Change rod packing at all reciprocating compressors (both existing and new), including those at the wellhead, either every 26,000 hours of operation or after 36 months.
2. By October 15, 2013, pneumatic controllers (both existing and new) must be low – bleed, with a natural gas bleed rate limit of 6.0 scfh or less, or zero bleed when electricity (3-phase electrical power) is on-site.
3. New centrifugal compressors may not contain wet oil seals. Operators must replace worn out wet seals on existing centrifugal compressors with dry seals.
4. Within 1-year of the promulgation date of these standards, Operators will implement a directed inspection and maintenance program (DI&M) for equipment leaks from all existing and new valves, pump seals, flanges, compressor seals, pressure relief valves, open-ended lines, tanks and other process and operation components that result in fugitive emissions. Process components subject to DI&M are monitored by a weekly visual, auditory, and olfactory check, and once a year by a mechanical or instrument check to detect leaks. Once significant leaks are detected, they are required to be repaired in a timely manner.
5. Eliminate VOC emissions associated with the prevention of well-bore freeze-up (only de minimis emissions are permitted).

6. Existing and new compressors are required to be pressurized when they are off-line for operational reasons in order to reduce blowdown emissions.

Performance Standard No. 15

1. Within one-year of the promulgation date of these performance standards, 80% of all trucks used to transport fresh water or well flowback water must meet U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter (PM) emissions.¹⁸
2. Within 3-years of the promulgation date of these performance standards, 95% all trucks used to transport fresh water or well flowback water must meet U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter emissions.¹⁹
3. All on-road vehicles and equipment must limit unnecessary idling to 5 minutes, or abide by applicable local or state laws if they are more stringent.
4. All on-road and non-road vehicles and equipment must use Ultra-Low Sulfur Diesel fuel (15 ppm of sulfur) at all times.

¹⁸ Meeting U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.

¹⁹ Meeting U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter (PM) emissions may be accomplished by retrofitting with technology on the current Verified Retrofit Technologies List for U.S. EPA or the California Air Resources Board (CARB), which is capable of achieving at least an 85% reduction in PM emissions, and which is installed and operated according to the conditions of the U.S. EPA or CARB verification protocols.