

Appalachian Shale Recommended Practices Group

Recommended Standards and Practices

April 2012

Appalachian Shale Recommended Practices Group has the following aspirational and recommended standards and practices for exploring for and producing natural gas and oil from Appalachian shales that we believe provide a framework for protecting workers, the environment and the communities in which we operate.

General Principles for Operators Exploring for and Producing Natural Gas and Oil from Appalachian Shales:

- Operators often choose to conduct their operations using standards and practices that exceed regulatory requirements, recognizing that regulations and standards are not static, but evolve and improve as new information and technologies become available.
- Operators will comply with all applicable Federal, State, and local laws, and regulations.
- Operators seek to follow industry standards and practices in all aspects of oil and natural gas operations. These standards are based upon generally accepted scientific and engineering principles, as well as historical and local operating experience, and should be applied with consideration for site specific conditions, consistent with an operator's primary objective, which is to conduct its operations in a safe and environmentally sound, and socially responsible manner.
- Operators strive to be ethical, open and transparent about how they operate and the impacts of their activities.
- Operators empower workers with the authority to stop work when they observe operations that are potentially unsafe or that may pose a significant environmental threat.
- Operators encourage the development and practical use of natural gas powered equipment.
- Operators emphasize the importance of developing and employing a qualified local work force, and utilizing local sourcing of equipment and supplies.

Responsible Standards and Practices for Exploring for and Producing Natural Gas and Oil from Appalachian Shales:

Pre-Operational Planning

- Towards the aim of being open and transparent about how they operate, Operators should:
 - Engage the local communities to provide information about the nature of the planned operations and to receive input regarding local concerns.
 - Conduct local engagement meetings to enhance environmental, health and safety planning.

- Contact Local Emergency Planning Committees to learn about their needs so as to support the development of local emergency response capacities and capabilities.
 - Identify and consider alternate transportation routes in order to reduce traffic impact on communities.
 - Work with local and regional road departments to learn about the condition of roads on preferred routes and to coordinate maintenance and repairs, as necessary.
 - Identify local reporting and contact needs and requirements.
- Operators should evaluate potential water management options prior to the start of drilling. Towards that end, Operators should:
 - Obtain all required permits and seek to identify water sources.
 - Prepare and implement a water management plan designed to:
 - Maximize efforts to recycle/reuse recovered water as reasonably practicable.
 - Develop procedures designed to treat or dispose of non-recycled water and wastes in compliance with applicable regulations.
 - Evaluate transportation systems with a goal of minimizing truck traffic and encouraging use of centralized storage, distribution, and treatment facilities.
- Operators should consider use of alternative water sources as reasonably practicable (e.g. acid mine drainage, saline ground water, industrial effluent, municipal effluent).
- Work with local water boards and/or other appropriate regulatory agencies to identify suitable water sources.

Site Selection and Assessment

- After potential well pad sites or other facilities are identified, Operators should implement measures designed to reduce its operational footprint such as the following:
 - Conduct “on the ground” assessments with the goal of minimizing impacts to the surface and environment. These impacts may be minimized through:
 - The use of unforested land, brownfield, or industrial areas as reasonably practicable.
 - Evaluating options for placing well/facility sites when workable alternatives are available.
 - Engaging with land/surface user in evaluating site selection and working with public agencies to encourage responsible and efficient development on public lands.
 - Designing the Operator’s infrastructure in coordination with its other oil and gas activities with the goal of minimizing surface disturbance (e.g. flow lines following lease roads, use of flow line/pipeline corridors, shared right of ways).
 - Considering subsurface hydrogeology in selecting well pad and facility sites.

- Operators should consider the use of setbacks or other operational practices that balance their needs and seek to minimize the potential impacts to neighboring property owners.
 - Operators should consider overall development needs with the aim to minimize habitat fragmentation and/or surface disturbance.
 - Supporting consideration of unitization/pooling as a means to reduce the environmental footprint of our operations and promote more efficient development.
- Operators should conduct their operations in a manner that protects water and consider the following guidelines:
 - Surface water baseline sampling should include perennial sources used for domestic or agricultural purposes within 2,500 feet of the well pad site, taken prior to the start of construction.
 - Baseline groundwater sampling should be conducted at private and public water wells, as permitted, within 2,500 feet of the well pad site.
 - All water sampling and analysis should be conducted by qualified third parties using recognized sampling and analytical methods.
 - All relevant final testing results should be provided to the applicable landowner(s).

Site Design and Construction

- Well pads should be designed to minimize erosion and to contain a spill or release, and Operators should consider the following approaches:
 - Maximizing consolidation of operations on multi-well pads.
 - Having pad designs and erosion and sediment controls certified by professional engineers in accordance with local regulation.
 - The use of an impermeable material (natural or manmade) under critical well pad areas.
 - The use of secondary containment for tankage containing fluids (excluding fresh water).
 - The use of diversionary structures to manage storm water flow around a well pad.
- Operators should prepare a regional spill and emergency response plan that includes access to key equipment and material readily accessible in a timely manner.
 - Response plans should identify the Operator's internal reporting processes and contacts, along with the external processes and contacts.
 - Operators should evaluate the creation of regional spill response co-op agreements.
- Operators should use best management practices designed to minimize tracking of mud by vehicles from well pad sites or other facilities onto public roads.
- Operators should maintain lease roads to minimize the movement of excessive dust around occupied structures and public roads.
- Operators should use reasonable sound abatement strategies in congested settings, near potentially sensitive receptors, or when near occupied buildings. Operators should:
 - As reasonably practicable, consider the use of natural features designed to minimize noise and visual concerns.

- Consider well pad site equipment layout, equipment orientation, and use of onsite equipment as tools for noise mitigation.
- Operators should have procedures designed to evaluate and implement site security needs on a case specific basis in cooperation with local authorities and landowners.
- Operators should have procedures to use One Call systems to identify subsurface hazards prior to any ground disturbance that could reasonably be expected to impact buried equipment.

Drilling Operations

- Prior to drilling, Operators should seek to identify the following information:
 - The existence of coal mines or workable coal seams.
 - Depths of usable groundwater correlated back to the pad elevation.
 - Shallow oil or gas wells (active, idle, or plugged) within 1,000' of the surface location.
- Operators should drill through fresh ground water only with air, water, or water based drilling fluids, to the extent reasonably practicable
- Operators should implement a comprehensive training certification and competency assurance program for their well engineers, rig foremen and service contractors.
 - Operator representative and critical contractor supervisory representatives on site should have International Association of Drilling Contractors or International Well Control Forum well control certification.
- Operators should provide the appropriate Safety, Health and Environment and equipment based training and certification, as applicable to the position held by personnel. Operators should seek to establish common, basin-wide minimum safety training programs and competency expectations for contractors.
- In an effort to minimize surface impacts, Operators should consider the use of closed loop drilling fluids management systems.
- Operators should encourage development and use of more environmentally benign ingredients in drilling fluids.
- Operators should develop and implement procedures designed to utilize casing that is properly centralized, and cement that is designed to meet the anticipated conditions of the well, in order to protect groundwater and to provide sound zonal isolation.
- The industry should seek opportunities for collaboration designed to further develop regionally based casing design and cementing practices and standards.

Completion/Stimulation Operations

- In selecting additives for use in hydraulic fracturing fluids, Operators should consider the environmental characteristics of those components, balanced with the operational needs of the project.
 - Operators should:
 - Strive to minimize the volume and concentration of Material Safety Data Sheet listed hydraulic fracturing fluid additives.

- Encourage development and use of more environmentally benign hydraulic fracturing fluid additives.
 - Commit to transparency in their operations by disclosing composition of hydraulic fracturing fluid additives (e.g. Frac Focus) to the extent permitted by suppliers, while respecting related intellectual property rights, and proprietary and confidential business information.
- For on-site storage of hydraulic fracturing additives, Operators should store liquid additives with secondary containment and dry additives with weather protection as required.
- Operators should design water transfer systems to site specific conditions and these systems should be tested and monitored at reasonable times during operations.
- Operators should implement measures designed to routinely test the integrity of all high pressure surface equipment (fracturing wellhead, flowlines, manifolds, piping, and pump equipment).
 - Testing and inspecting all high pressure equipment and piping on a regular basis in accordance with recognized industry practices.
 - In cold weather operations, winterize equipment in accordance with recognized industry practices.
 - Pressure relief and control systems should be designed for maximum anticipated flows, safe management, and proper containment of fluids.
 - Using restraint and/or anchoring systems on all temporary piping that meet industry standards.
 - Testing the emergency shut down and/or pressure safety valve system prior to the start of the first fracturing stage.
- Equipment fueling operations should be designed to minimize the risk of accidental spillage.
 - Operators should consider the use of portable containment equipment.
 - Operators should have appropriate amounts of sorbent materials (spill kits) readily available on the well site.
 - Operators should develop reasonable methods to monitor fuel transfer hoses, use hose/nozzle covers, and monitor all fuel transfers for system integrity.
- On multi-well pads, Operators should develop procedures to monitor adjacent oil and gas wells for pressure on the production string and all well annuli as needed. Procedures to monitor oil and gas wells on neighboring well pads may also be appropriate depending on the subsurface orientation of the wells.
- Operators should develop fluid recovery systems for all equipment breakdown operations including perforator/logging tool lubricators, flowlines, piping, and manifold disconnections.
- All operating personnel should receive training regarding the need for, use of, and expectations regarding appropriate job specific Personal Protective Equipment.
- Prior to the start of pumping operations, personnel should be required to hold a safety and operations meeting to provide personnel with information regarding anticipated operating conditions, risks, and hazards.

- Because clarity in assignment of responsibilities is critical, procedures should require that the on-scene person-in-charge be clearly identified.
 - Personnel should receive training in emergency or event response planning and procedures and individual responsibilities.
 - Communication and notification procedures should be available to all personnel.
 - An Operator representative should be present throughout this phase of the operations.
- During injection operations, there should be a procedure to monitor critical parameters for any significant deviations or abnormal conditions. The hydraulic fracturing operator should be authorized to take appropriate action including shutting down fracturing operations.
- Operators should maintain current Material Safety Data Sheets for all chemicals, materials, and additives used on a site at a single location.^(1,3)

Flow Back

- The process of initiating production should be designed to minimize releases of produced gases and contain produced liquids.
 - Production should be designed to reduce emissions through capture (preferred method where reasonably practicable) or temporary flaring. Venting is discouraged.
- When operating in crude, condensate or wet gas areas, Operators should prepare a crude or condensate management plan designed to facilitate safe operations.
 - Operators should implement procedures that require a comprehensive review of all equipment placement and spacing and location of potential ignition sources, and which designate safe loading areas and safe handling procedures.
- The on-site facilities should be designed to include secondary containment and management systems to monitor tank levels.
- Operators should have procedures to use One Call systems to identify subsurface hazards prior to any ground disturbance that could reasonably be expected to impact buried equipment.
- Site procedures should require that the emergency shut-down controls be tested periodically.

Production Operations

- When operating in crude, condensate, or wet gas areas, Operators should prepare a management plan addressing the safe handling and management of liquid hydrocarbons at all times.
 - The management plan should include:
 - The conducting of a comprehensive review of equipment placement and the spacing and location of potential ignition sources.
 - The designation of safe loading areas and development of safe handling procedures.
 - In addition, the management plan may also consider the use of vapor recovery/destruction equipment to reduce emissions from tank batteries that are above de minimis levels.

- Production operation designs should include low or no vent controllers for equipment.
- The design for permanent facilities should include secondary containment and equipment to monitor tank levels.
- Production operation procedures should include periodic testing of emergency shut-down controls.

Measurement and Metrics

- Operators should use a corporate reporting standard, such as that offered by the International Petroleum Environmental Conservation Association (IPIECA), for reporting key environmental performance metrics.
- Operators should develop teams tasked with developing reporting criteria. Reporting should be implemented in a phased approach. The first phase of reporting should include the following categories:
 - Water consumption – breakout reuse/recycling.
 - OSHA reportable safety statistics.
- The second phase of reporting should include the following categories based on the development of detailed reporting criteria.
 - Waste management – volumes, characteristics, disposal methods. Waste categories and characterization should be guided by the IPIECA reporting standard.
 - Spills – number, volume and material. Environmentally significant spills should be reported, e.g., spills above regulatory reportable quantities.
 - Air emissions –GHG and EPA hazardous or criteria pollutants. Air emissions should be estimated using regulatory methods defined in the applicable EPA rules (or delegated state programs).

Landowner Relations

- Operators should seek good landowner relations by:
 - Giving a courtesy notice of any significant operations on the property to the owner of the surface estate.
 - Driving at safe speeds in accordance with posted speed limits as applicable.
 - Staying on roads and right of ways.
 - Closing gates.

References

In identifying these recommended standards and practices, Appalachian Shale Recommended Practices Group (ASRPG) utilized various standards from other industry and stakeholder organizations as reference or starting points. Importantly, ASRPG's recommended standards and practices sometimes differ from these source standards to account for regional differences unique to the Appalachian states.

1. "Hydraulic Fracturing Operations – Well Construction and Integrity Guidelines", American Petroleum Institute, API Guidance Document HF-1, First Edition, October 2009, http://www.api.org/policy/exploration/hydraulicfracturing/upload/API_HF1.pdf
2. "Water Management Associated with Hydraulic Fracturing", American Petroleum Institute, API Guidance Document HF-2, First Edition, June 2010, http://www.api.org/policy/exploration/hydraulicfracturing/upload/HF2_e1.pdf
3. "Practices for Mitigating Surface Impacts Associated with Hydraulic Fracturing", American Petroleum Institute, API Guidance Document HF-3, First Edition, January 2011, http://www.api.org/policy/exploration/hydraulicfracturing/upload/HF3_e7.pdf
4. "Environmental Protection for Onshore Oil and Gas Production Operations and Leases", American Petroleum Institute, API Recommended Practice 51R, First Edition, July 2009, http://www.api.org/policy/exploration/hydraulicfracturing/upload/API_RP_51R.pdf
5. "Isolating Potential Flow Zones During Well Construction", American Petroleum Institute, API Standard 65 - Part 2 Recommended Practice 51R, Second Edition, December 2010, http://www.api.org/policy/exploration/hydraulicfracturing/upload/Stnd_65_2_e2.pdf
6. "Oil and Gas Industry Guidance on Voluntary Sustainability Reporting – 2010", International Petroleum Industry Environmental Conservation Association, Second Edition, 2010, <http://www.ipieca.org/library?page=1>

Secondary References

1. "Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites", Independent Petroleum Producers Association of America, Terracon Consulting, September 2009.
2. "Drilling fluids and Health Risk Management", International Petroleum Industry Environmental Conservation Association, IPIECA.org, October 2009.
3. "Urban Encroachment", International Petroleum Industry Environmental Conservation Association, IPIECA.org, October 2009.