

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:

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).
1. After the promulgation date of these standards, any new pits designed shall be double-lined and equipped with leak detection.
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.