

Understanding and Improving Regulation of Shale Gas Development

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An overview of the presentation

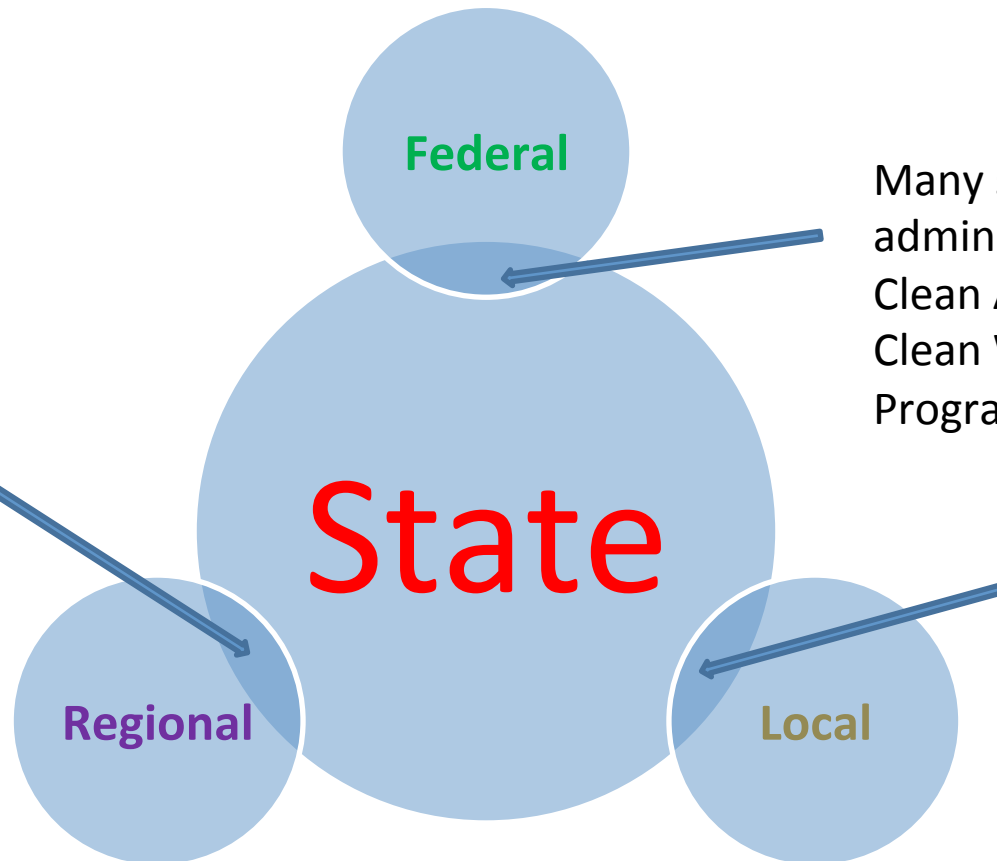
- Summary of the laws -- statutes, regulations, local ordinances, agency directives, and court-created common law-- that govern gas development from shales and tight sandstones (“tight gas”).
- Brief introduction to risks at each stage, as identified by state enforcement actions at tight gas sites.
- For each stage, examples of **local**, **state**, **regional**, and/or **federal** regulations that apply.
- Remaining challenges
 - Enforcement
 - Regulatory gaps
 - The federalism question
 - Lingering common law issues

Some caveats

- Presentation focuses on drilling and slickwater fracturing (large volumes of water), not on gel techniques.
- Focuses on shales and tight sandstones, not coalbed methane.
- Laws provided here are examples (not comprehensive), and laws are rapidly changing.
- Enforcement actions described may not accurately suggest actual risk -- likelihood of the problem occurring, magnitude of the effect, frequency with which it will occur.
 - Location, clean-up, toxicity of contaminant released (if incident involved a release) all cause variation.

The regulatory landscape

States and the federal government have formed regional commissions to regulate water quantity and quality impacts in some areas.



Many states administer federal Clean Air Act, Clean Water Act Programs.

Some states preempt most local regulation of oil and gas development; others allow it.

An abridged description of the stages of shale gas development

- Conduct seismic testing (or use existing data) to locate gas.
- Develop access road and well pad.
- Drill and case (line) a well.
- Store drilling waste on site and dispose of it.
- Pump or truck water to the site.
- Perforate portions of casing where shale around casing will be fractured. Inject water, chemicals, and proppant into well at high pressure.
- Capture flowback water, store in pits or tanks, and dispose of it.
- Vent/flare natural gas during several of the above stages.
- Enter gas production phase; distribute, treat, process, and transport gas.

Seismic testing

- Wyoming Niobrara shale: “[C]omplaints, typically for **ground disturbance**, were handled on the job site . . . by the geophysical contractors without rule violation. The contractor's **seismic reclamation bond is being held** until final inspection of the remediation at sites and releases can be made, probably in early July [2011].”

Regulation of seismic testing

- **Limit areas in which testing may occur.**
 - **Wyoming Admin. Code Oil Gen. Ch. 4 s 6:** no vibroseis, seismic operations within 300 feet of building or water well.
 - **Louisiana Admin. Code tit. 76.1, § 301:** Department of Wildlife and Fisheries, Marine Fisheries Division has a Seismic Section that supervises activities. Special permit required for geophysical work in wildlife or waterfowl refuge, scenic river or stream
- If shot holes used, **require plugging, disposal of waste.**
 - **Colorado Code Regs. § 404-1:333:** must rake slurry, drilling fluids, cuttings to within one inch of surface, plug and fill all shot holes.
- Require **minimum disturbance and compaction.**
 - **Louisiana Admin. Code tit. 76.1, § 301:** in marshes, must cause minimum disturbance or damage.
 - **Code Md. Regs. § 26.19.01.03:** Department of Env'tl. Protection may deny permit for “substantial risk of causing environmental damage.”

New York does not address seismic impacts in its Revised Draft Supplemental Generic Environmental Impact Statement for high-volume fracturing.

Developing access road, site

- **Badly-eroded access road** at Michigan Antrim shale site. Permit 49851.
- **“Failures to minimize accelerated erosion”** and to **stabilize earth disturbances in watersheds** at Pennsylvania Marcellus shale sites. *See e.g.*, permits 105-21626; 131-20015; 105-21633.
- Colorado tight gas: **“Erosion channels are present around the edge of the pad No storm water BMP’s are present at the pad site.”** API 05-081-07359.

- Pennsylvania Marcellus: Two fuel tank trucks collided at the pad entrance. . . . The fuel tank was damaged and **leaked approximately 15 gallons of diesel fuel**” onto road. Contaminated material excavated. Permit 115-20293.
- Self-reported **20-gallon diesel spill** from delivery truck. Permit 115-20298.
- New Mexico tight sands: “A fuel pump split, allowing **1,000 gallons of diesel to be released.** 100 gallons recovered.” API 30-039-30557.

Regulation of well site and access road construction

- Federal, with state implementation in most states: **Clean Water Act stormwater permit** with erosion controls.
- States and regional governments sometimes impose **additional requirements**:
 - **Ohio S.B. 165** urbanized areas (codified at Ohio Rev. Code § 1509.06): site-specific review for landscaping and screening; Ohio Admin. Code § 1501:9-1-02: best management practices for oil and gas well site construction; minimize site clearing and “surface affectment.”
 - **Delaware River Basin Commission** (proposed): Non-Point Source Pollution Control Plan for well pads, water withdrawal sites in drainage of Special Protection Waters.
 - **W. Va. Code § 22-6A-7**: for sites 3 acres and larger, “site construction plan” must be “certified by a registered professional engineer”
- Federal **Endangered Species Act** limits on “takes” (including harm to habitat) if endangered or threatened species present.

Drilling and casing the well

- Pennsylvania Marcellus: “Methane migrated to surface through cement in 9 5/8” annulus.” Permit 033-26848.
- (Post-drilling – well shut in): “Cellar is filled with water. . . .Well head is leaking from somewhere below the surface of the water. Gas is bubbling up through the water all around the wellhead.” Permit 033-26828.

- March 30, 2011 order: “Catalyst Energy’s unpermitted discharge of iron, manganese, dissolved methane, dissolved ethane, and combustible free gas from its drilling activities into groundwater violates . . . the Clean Streams Law . . . [and] constitutes unlawful conduct and a public nuisance.”
- Louisiana Haynesville shale: “insufficient volume of cement and inferior quality of cement used during the installation of casing.” Permit 239922.

Regulation of casing and cementing

- Require minimum **strength of casing material**, or narrative standard
 - **Michigan Admin. Code r. 324.410**: strength that will withstand minimum internal yield of 1.2 times greatest expected pressure.
 - **W. Va. Code § 22-6A-24**: pressure rating must exceed anticipated maximum pressure to which casing will be exposed.
 - **New York Revised Draft SGEIS (proposed)**: would require use of new casing, or reused and pressure tested.
- Require **cement bond logs**
 - **Bureau of Land Management Proposed Rule: Oil and Gas; Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands**: running of cement bond logs for new wells no longer optional.
- Require **cement to withstand minimum pressure** and to set for a certain amount of time before well is disturbed.
 - **Montana Admin. Rules 36.22.1001**: surface casing cement must set until it has reached a compressive strength of 300 psi; no testing until it has set for 8 hours.
- Require casing to run a **minimum depth below the lowest groundwater**, or include a narrative standard such as “adequate casing to prevent ground water contamination.”
 - Ranges from **30 ft. (Kentucky) to 50 ft. (Oklahoma (or 90 ft. below surface)) to 100 ft. (Arkansas, New York proposed)**—areas with primary and principal aquifers, **Maryland, Michigan**)
 - **North Dakota Admin. Code 43-02-03-21**: “[a]t sufficient depths to adequately protect and isolate all formations containing water, oil, or gas or any combination of these.” 50 ft. below base of Fox Hills Formation.
 - **16 Tex. Admin. Code § 3.13**: “[s]et and cement sufficient surface casing to protect all usable-quality water strata.”

Regulation of casing and cementing: groundwater-specific requirements

- Require **baseline testing** of water around wells in the event that casing or cement is defective.
 - **2 COLO. CODE REGS. 404-1:317B**: collection of baseline and post-operation surface water quality data around public drinking water sources and over certain aquifers.
- Include **rebuttable presumption** that oil and gas activities caused contamination.
 - **W. Va. Code § 22-6A-18**: oil and gas activity within 1,500 ft. of center of well pad caused contamination. See also **Pennsylvania**.
- Recover damages through common-law nuisance.
 - **Fiorentino v. Cabot Oil & Gas (M.D. Pa. 2010)**: surface owners argued strict liability for water contamination, other alleged damages; court noted that Pennsylvania has not yet determined whether gas drilling and fracturing is abnormally dangerous.

Spills during drilling and casing

- Louisiana Haynesville: “Oil based mud discharged in vicinity of well and allowed to migrate to natural drainage.” Permit 239818.
- Pennsylvania Marcellus: “1,500 gallon spill of drilling mud . . . observed on the surface of the ground outside of the containment area.” Permit 131-20047.

Regulation of spills and their impacts

- Require **setbacks** of oil and gas sites from natural resources.
 - **2 Colorado Admin. Code 404-1:317B**: creates three buffer zones around public water supplies; drilling and fracturing protections required in each zone; prohibition on operations within internal zone unless variance received.
 - **58 Pa. Stat. §3215**: vertical wellbore 300 ft. or edge of well site 100 ft. from stream. (Same as proposed Delaware River Basin Commission requirements.)
 - **NY draft SGEIS (proposed)**: no fueling tanks within 500 ft. of stream.
- Require **spill prevention and control strategies**: secondary containment under fill ports, emergency contact, clean-up equipment on site.
 - New York revised draft SGEIS (proposed): would require State Pollution Discharge Elimination System permit for site construction and surface activities associated with drilling and hydraulic fracturing, and best management practices for spill prevention.
- Require **environmental pollution coverage—bonds or insurance**.
 - **City of Fort Worth ordinance no. 18449-02-2009**: requires environmental pollution liability coverage in the amount of at least \$5 million dollars per loss.
- Require **clean-up of contaminated sites**
 - **Comprehensive Environmental Response, Compensation, and Liability Act** does not apply to spills of oil or gas, but could apply to contamination from other chemicals.
 - State acts also require clean-up and industry payment for clean-up. See, e.g., **Pennsylvania's Hazardous Sites Cleanup Act**.

Storage of drilling waste

- Louisiana Haynesville: Frac tanks used for temporary storage of **produced saltwater**. Gauging error caused overflow, and **water overflowed into ditch and swampy area**. Permit 238585.
- New Mexico tight sands (2001): **142 barrels of produced water spilled** from production tank; 70 barrels recovered. API 30-039-25947.

- Texas Barnett shale: Driveway, pasture, pond polluted with low chloride drilling fluids diluted with rain water. Permit 630921.
- TCEQ violation in Johnson County for operating a salt water disposal facility without a permit. Permit RN105907588.
- Colorado tight sands: “Accumulation of oil in produced water pit. Excessive oil accumulation at tank battery. Berm not sufficient at tank battery. Excessive oil on ground at wellhead, oil is migrating down grade (from wellhead) toward upper pit. Wildlife accessing both pits.” API 05-103-08459.

Regulation of pit and tank storage

- Require **setbacks** of well sites (see above), or pits specifically.
 - **New Mexico Code R. § 19.15.17.10**: temporary or permanent pit or below-grade tank must be 300 ft. from stream.
- Require pits to maintain **adequate freeboard**, have **synthetic liners of a specific strength and thickness**, and place **other conditions on pits**.
 - **Code of City of Farmington, NM, § 19-1-4, 1-5**: “all waste substances” must be stored in “watertight receptors.”
 - **25 Pa. Code § 78.56**: synthetic flexible liner with a coefficient of permeability of no greater than 1×10^{-7} cm/sec.
- Require **secondary containment** around tanks and pits that can hold a particular volume spilled.
 - **58 Pa. Stat. 3218.2**: where chemicals, fuels are stored, must have containment to hold more than the volume of the largest container.
- Require **tanks instead of pits**.
 - **NY Draft SGEIS (proposed)**: water tight steel tanks.
- Require **nets** over pits
 - **Migratory Bird Treaty Act**: federal district court in North Dakota says that oil and gas operators aren’t liable simply for maintaining pits that attract ducks; fed. district court in Texas says they likely are (in a case associated w/ refinery tanks, not pits at oil and gas production sites). **U.S. v. Brigham Oil and Gas, K.P.**, 840 F.Supp.2d 1202 (D.N.D. 2012); **United States v. Citgo Petroleum Corp.**, 2012 WL 3866857 (S.D. Tex. 2012).

Disposal of drilling waste

Ohio: Induced earthquakes at Youngstown, see <http://media3.vindy.com/news/documents/2012/03/09/UICReport.pdf>.

Texas: Underground injection control disposal well that appeared to accept produced water and other wastes—all of which were potentially from *conventional wells*—[leaked into Midland's Cenozoic Pecos Alluvium aquifer](#). Plume contaminated approximately [6.2 billion gallons](#) of water according to Midland.

In Re: Heritage Consolidated, LLC , In the United States Bankruptcy Court for the Northern District of Texas Dallas Division, Case No. 10-36484-hdh-11, Nov. 15, 2010.

Regulation of waste disposal (much of this also applies to flowback)

- **Limit means by which wastes may be disposed of.**
 - **La. Admin. Code tit. 43: XIX, § 303:** produced water disposal through “subsurface injection” into permitted saltwater disposal well, enhanced recovery injection well, or other disposal wells (community salt water or gas plant disposal wells).
- **Require testing and/or treatment of wastes prior to disposal.**
 - **New York Revised Draft SGEIS (proposed)** would allow possible road spreading after beneficial use determination and naturally-occurring radioactive materials analysis, or disposal through wastewater treatment plant with approved pre-treatment program.
- **Place other conditions on disposal.**
 - **Ohio Rev. Code § 1509.226:** No application of brine to “water-saturated surface,” “directly to vegetation,” “between sundown and sunrise”; vehicle must move at least 5 miles per hour at all times when brine applied; maximum uniform application rate.
- **Require waste tracking.**
 - **Delaware River Basin Commission Revised Draft Regulations** would require tracking of “wastewater from the point of production to the point of transfer, treatment, and discharge.”
- **Expand federal requirements for the construction and monitoring of underground injection control wells under the Safe Drinking Water Act.**
 - **Ohio Emergency Rules on Underground Injection Control Activities** (Executive Order July 10, 2012): graduated maximum allowable injection pressure; continuous monitoring of annulus.
- **Use common law nuisance, trespass suits.**
 - **FPL Farming v. Environmental Processing (Tex. 2011):** receipt of underground injection control well permit does not immunize disposal well operator from tort liability.

Withdrawing surface or ground water, or reusing wastewater

- November 10, 2010, Susquehanna River Basin Commission ordered J-W Operating, LLC to “cease all water-related activities” at a Marcellus site because it **had not obtained water withdrawal approval** from the Commission.
- July 2012: SRBC suspended water withdrawals for fracturing in certain areas due to low streamflow.

Regulation of water withdrawal

- Require **minimum in-stream or passby flow** during withdrawal
 - **W. VA. CODE § 22-6A-7**: must demonstrate sufficient in-stream flow immediately downstream of withdrawal point.
 - **Susquehanna River Basin Commission**: passby flows – “prescribed quantity of stream flow that must be allowed to pass a specific point downstream from water supply” during the water withdrawal.
- More generally **prohibit withdrawals** from impairing aquatic species or other water uses.
 - **W. VA. CODE § 22-6A-7**: must show “[m]ethods to be used for surface water withdrawal to minimize adverse impact to aquatic life.”
- Require water management plan and other reporting of anticipated water use.
 - **Penn. DEP Water Management Plan for Marcellus Shale Gas Well Development**: location of source, average daily quantity proposed to be withdrawn (gallons per day), maximum water withdrawal rate.
 - **BLM federal and Indian lands**: operators would have to describe water source to be used, including location. BLM could require mitigation.

Fracturing of the well

- New Mexico tight sands: “During fracking a valve was left open due to human error causing a **release of 245 gallons of frac water, all recovered.**” API 30-045-34625.
- Pennsylvania Marcellus: “**Blowout, frac fluid release**” in Tioga County. Permit 117-20373.

Mar. 10, 2009, letter from DEP, North Warren, PA: Lab analysis of spring water “indicated levels of Chlorides, Total Dissolved Solids, Calcium, Sodium and Specific Conductivity that were in excess of EPA’s drinking water standards.

Elevated levels of these parameters are indicative of a dilute brine solution and suggest an infiltration of frac water into the shallow ground water that supplies your spring.” Similar letter Feb. 17, 2009, from North Warren, PA.

Regulation of the fracturing process

- **Require mechanical integrity testing (MIT).**
 - **EPA Draft Permitting Guidance for Oil and gas Hydraulic Fracturing Activities Using Diesel Fuels**, at 24: ensure that owners conduct internal and external MITS before first stimulation and after completing all hydraulic fracturing stages.
 - **BLM for federal and Indian lands**: mechanical integrity testing prior to hydraulic fracturing.
- **Require monitoring of well pressures** throughout process.
 - **BLM for federal and Indian lands**: operator would have to continuously monitor and record pressures during well stimulation.
 - Pressure would have to be contained within string through which stimulation is pumped.
- **Control air emissions during fracturing process**
 - EPA **Clean Air Act New Source Performance Standards** for volatile organic compounds from fractured and refractured wells
- **Require specific types of blowout equipment**, which can be controlled remotely.
 - **25 Pa. Code § 78.72** requires blowout prevention equipment for all Marcellus wells. See also **Montana** and **Louisiana** for detailed requirements.

Regulation of the fracturing process, continued

- Regulate the **trucks that carry fracturing chemicals**.
 - DOT Hazardous Transport Rules.
- Require **disclosure of chemicals used**.
 - **16 Tex. Admin. Code § 3.29**: allows parties to challenge trade secret protection.
- Limit the **types of chemicals that may be used**.
- Provide **general prohibition on contamination** (possibly useful in court).
 - **Ohio Admin. Code § 1501:9-1-07**: conduct operations “in a manner which will not contaminate or pollute the surface of the land, or water on the surface or in the subsurface.”
 - **Oklahoma Admin. Code § 165:10-3-10**: “no oil, gas, or deleterious substances shall be permitted to pollute any surface and subsurface fresh water.”

Storage and disposal of flowback water

- New Mexico tight sands: “Someone opened the valves on two frac tanks releasing KCL water, spilling 800 [barrels], none recovered.” API 30-045-34815.
- Pennsylvania Marcellus: “Flowback fluids overtopping tanks spilling out of open manholes onto ground surface beyond secondary containment.” Permit 115-20341.

Regulation of flowback disposal

- As with drilling wastes, **limit the available methods of disposal.**
 - Ohio S.B. 165 (codified at **Ohio Rev. Code § 1509.226(10)**): “flowback from the stimulation of a well, and other fluids used to treat a well shall not be spread on a road.”
- Require **treatment prior to disposal.**
 - By 2014, Clean Water Act **Discharge Standards for Wastewater from Shale Gas Extraction**
 - **25 Pa. Code § 95.10**: operators must reduce total dissolved solids to a certain concentration prior to disposal.
- Require **recycling.**
 - **25 Pa. Code § 95.10**: wastewater source reduction strategy must “identify procedures” the operator will follow to maximize recycling and reuse.
- Modify existing **wastewater treatment permits.**
 - **Pennsylvania** requested that operators stop sending flowback to grandfathered plants.
- Regulate the **trucks carrying flowback** to avoid spills.
 - **Arkansas Oil and Gas Conservation Comm’n. Rules E-3, B17**: \$100 fee/ transportation tank; name, address, and business and emergency telephone numbers; visible permit sticker.
<http://www.aogc.state.ar.us/onlinedata/forms/rules%20and%20regulations.pdf>.

Gas venting and flaring

- Colorado tight sands: Valve on wellhead **venting gas** without Form 4 venting approval. API 05-081-06920.
- Pennsylvania Marcellus: **Flaring of natural gas near pipe** with flowback water **caused** flowback water to heat and **flowback pipe to burst**. Flowback was vacuumed up. Permit 005-30714.

Regulation of venting and flaring

- **Monitor emissions** from “equipment leaks and venting.”
 - **EPA Reporting Requirements for the Petroleum and Natural Gas Industry**, 40 C.F.R. Part 98.230 et seq.: annual reporting of methane and CO₂ emissions from leaks and venting; methane and NO_x from flaring (but for onshore production, only if 25,000 metric tons of CO₂ equivalent or more per year?).
- **Prohibit** these practices **except where necessary**, and require capture of gas.
 - **EPA Clean Air Act New Source Performance Standards** for volatile organic compounds from fractured and refractured wells: Green completion technologies capture methane emissions as a “co-benefit.”
 - **Texas proposal, RRC News Release May 23, 2012**: considering requiring that flaring be a last resort option, possible amendments to flaring technologies and pilot program for using gas as power source for on-lease operations.
<http://www.rrc.state.tx.us/commissioners/porter/press/052312.php>
- Provide **numerical limit** on total quantity vented.
 - **New York Revised Draft SGEIS**: venting during flowback max of 5 MMscf during consecutive 12-month period.

Distributing, treating, processing, transporting gas

- Texas: **Condenser valve** that was **left open at compressor site** for four days emitted natural gas. Permit RN105858369.

Regulation of dehydrators, compressors, pipelines

- **Monitor emissions**
 - **EPA Reporting Requirements for the Petroleum and Natural Gas Industry**, 40 C.F.R. Part 98.230 et seq.: natural gas transmission compression, processing facilities, and other equipment.
- Place **minimum stack heights** on equipment (nuisance-based)
 - **New York Revised Draft SGEIS (proposed)**: if wet gas encountered, minimum 30-ft. stack height for dehydrators
- Require **technological controls or pollutant reduction**.
 - **New York Revised Draft SGEIS (proposed)**: Non-Selective Catalytic Reduction controls on wellhead compressors.
 - **Colorado Air Emissions Requirements for Oil and Gas Industry**: 95, 90, or 75% VOC controls required depending on time and location of emissions.
- **Clean Air Act** controls apply to certain equipment.

Remaining challenges: Enforcement

Note: active well numbers include *all* wells, including conventional wells that aren't fractured; active well numbers likely include wells that are not in fact producing.

	CO 2012	LA 2011	MI 2012	NM 2012	OH 2012	PA 2010	TX 2012
Number of field inspectors	36	59	27	12	40	76	153
Approximate number of active oil and gas wells	49,062	not yet identified	15,742	56,366	55,083	92,326	279,856

Data from Margaret Ash, Field Inspections Mgr., Colorado Oil & Gas Conservation Comm'n.; John Adams, La. Dep't of Nat. Resources Env'tl. Div.; Stephen Riley, Permitting Geologist, Ohio Dept. of Nat. Resources, Leslie Savage, Chief Geologist, Railroad Comm'n of Texas, and other agency staff and agency documents. For complete footnotes, see Wiseman, *Regulatory Risks in Tight Gas and Oil Development*, forthcoming, NATURAL GAS & ELECTRICITY. For full table and citations, see Natural Gas and Electr., Wiley, Dec. 2012.

Funding enforcement and hiring experienced inspectors

- **Ohio S.B. 165 (codified at Ohio Rev. Code § 1509.50)**: In addition to severance tax, imposes oil and gas regulatory cost recovery assessment on owners (those who own and develop mineral resources).
- **West Virginia H.B. 401 (codified at W. Va. Code § 22-6-2a)**: Inspectors must meet minimum experience requirements and be paid at least \$35,000 annually (supervisors \$40,000).

Regulatory gaps

- Some states, such as Texas, appear to have few setback requirements; setbacks vary widely among states.
- Many states do not require baseline water testing.
- Some states lack specific blowout prevention requirements.
- Many states should consider transforming narrative casing and other requirements into more specific directives.
- Few states have addressed certain impacts, such as habitat fragmentation.

How to address the gaps: the federalism question

- **Federal regulation?**
 - Federal or regional regulation needed where externalities cross state lines; the EPA has begun applying and updating existing federal laws.
 - Other considerations: expertise and resources, likelihood of inefficient “capture” of regulators by industry, understanding of local conditions.
- **State consistency – not uniformity**
 - Climatic, geological, other conditions vary among states, but states must better compare information and improve regulations.
 - High priority: establish federal database that compares state regulations in a useful, easy-to-read manner.

“Stateism”: as some states resist both federal and local regulation, we must avoid NIMBYism but give municipalities some control

- **Pennsylvania** in Act 13 tried to improve state regulation and further preempt local regulation; Pa. Supreme Court has heard oral argument in appeal that struck down portions of the Act.
- **Colorado's** governor created a task force for recommendations on state-local regulation; *New York Times* reports that state may sue Longmont, which tried to ban fracturing.
- **New York** courts have generally allowed municipalities to ban fracturing despite general preemption provision under state law.

Lingering common law issues

- For some states, we still do not know whether natural gas drilling and fracturing are strict liability activities.
- Outside of Texas, is it unclear whether parties may recover damages for allegations of trespass from fractures. (Texas has settled the matter in *Coastal Oil and Gas Corp. v. Garza*, and the answer is “no”.)
 - With better technology, however, we may know how far fractures extend, and trespass damages could be more easily measured. Other states may not necessarily follow *Garza*.
- The extent of nuisance or trespass damages available for surface and subsurface pollution will require further test cases.

Questions?