



G A O

Accountability * Integrity * Reliability

Unconventional Oil and Gas Development:

Recent GAO Reviews

Government Accountability Office (GAO)

- Independent, nonpartisan agency -- investigative arm of Congress
- Examines federal dollars, wherever they are spent
- Conducts studies to help Congress better manage federal agencies and funds



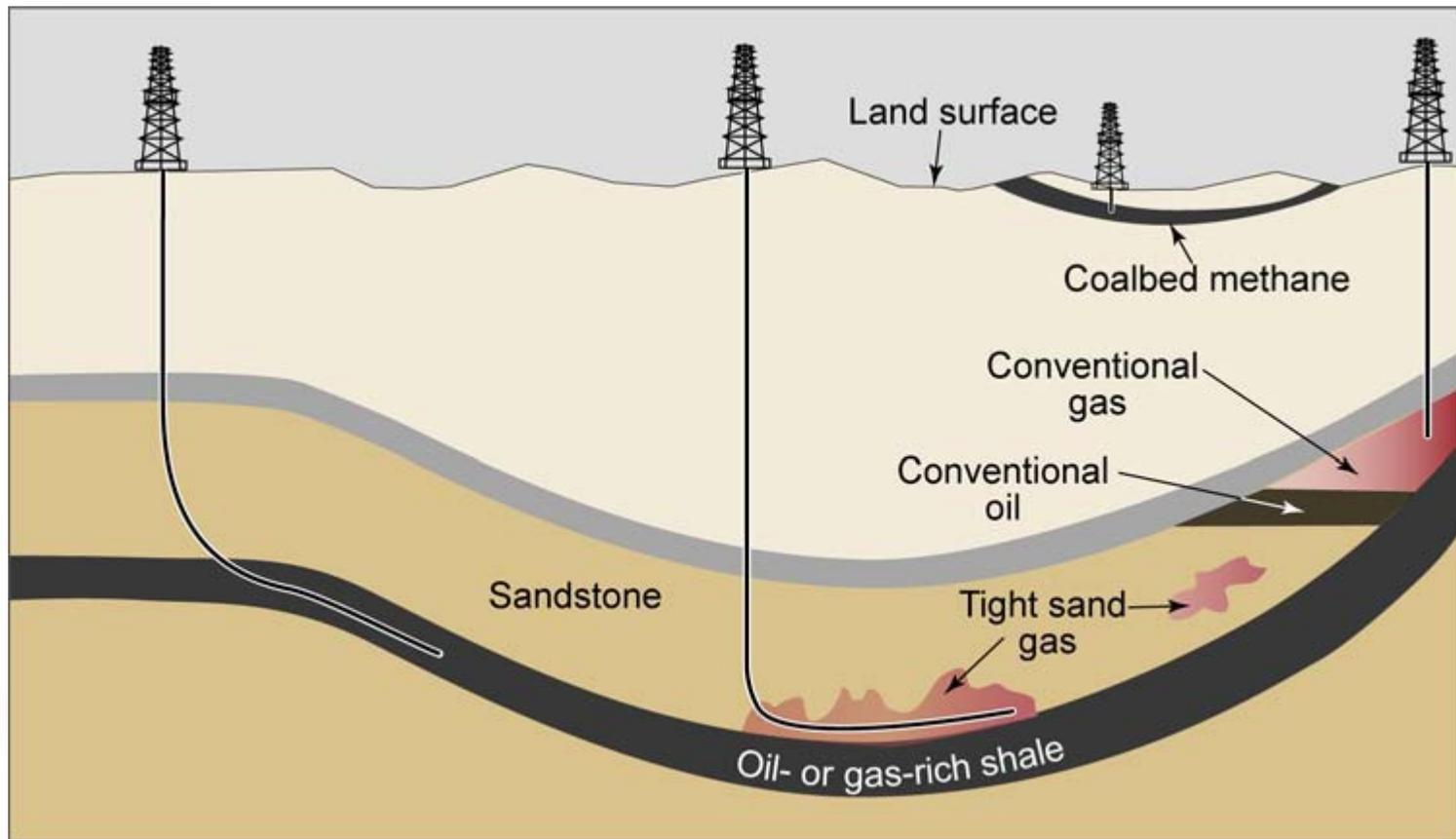
Why Did GAO Conduct This Work?

- Congressional requesters in Senate and House raised concerns:
 - Advances in horizontal drilling and hydraulic fracturing techniques have increased domestic oil and natural gas development
 - Concerns about potential environmental and public health effects and adequacy of existing federal and state environmental and public health requirements

Two Recent Reports Provide a Foundation for Further Work

- *Key Environmental and Public Health Requirements, GAO-12-874 (2012)*
- *Information on Shale Resources, Development, and Environmental and Public Health Risks, GAO-12-732 (2012)*

Conventional and Unconventional Oil and Gas Reservoirs



Sources: U.S. Energy Information Administration and U.S. Geological Survey.



Federal Environmental and Public Health Requirements: Key Laws

- Safe Drinking Water Act (SDWA)
- Clean Water Act (CWA)
- Clean Air Act
- Resource Conservation and Recovery Act (RCRA)
- Comprehensive Environmental Response, Compensation, & Liability Act
- Emergency Planning and Community Right-to-Know Act
- Toxic Substances Control Act
- Federal Insecticide, Fungicide, and Rodenticide Act

Federal Environmental and Public Health Requirements: Overarching Themes

- Parts of the 8 laws may apply to well pad activities
- Exemptions are related to preventive programs
- EPA generally retains authorities to respond to environmental contamination
 - Imminent & substantial endangerment authorities
 - Access, information, & inspection



Key Federal Environmental Requirements - Examples

Law	Selected Requirements
SDWA	<ul style="list-style-type: none">• Permit or approval by rule required for injection of produced water into well• Authorizes regulation of injections for hydraulic fracturing with diesel fuel
CWA	<ul style="list-style-type: none">• National Pollutant Discharge Elimination System (NPDES) permit required for discharge of produced water to surface waters• Generally discharges to surface water not allowed, except in West• Publicly owned treatment works must be permitted to accept produced water
RCRA	<ul style="list-style-type: none">• Wastes that do not originate within the well or generated by field operations, and which are hazardous, are subject to federal hazardous waste regulations; may have limited applicability at wells



Federal Exemptions Relate to Preventive Programs and Permits - Examples

Law	Type
SDWA	Hydraulic fracturing with fluids other than diesel fuel does not require a UIC permit
CWA	Federal stormwater permits are not required for uncontaminated stormwater at oil and gas construction sites or at oil and gas well sites
RCRA	Oil and gas exploration and production wastes are not regulated as hazardous waste

UIC Class II Program: Enhanced Recovery and Disposal Wells

151,000 permitted wells
80% enhanced recovery
20% disposal



Source: EPA.



EPA-Run Class II Programs- Selected Provisions

- Submit a permit application with information including:
 - identify any existing water or abandoned production or injection wells generally within 1/4 mile of the proposed well
- Obtain a permit
- Demonstrate that casing and cementing are adequate
- Pass an integrity test prior to beginning operation and at least once every 5 years
- Comply with monitoring requirements, including:
 - the injection pressure,
 - rate of injection, and
 - volume of fluid injected

State-Run Class II Programs

- States responsible for implementation – permitting, monitoring, enforcement
- EPA approves Class II UIC programs under:
 - Section 1422: state typically adopts EPA regulations or equivalent
 - Section 1425: state demonstrates program is effective in preventing endangerment to underground sources of drinking water
 - Result is that some state programs differ significantly from EPA regulations and may be run by oil and gas agency



EPA's Draft UIC Guidance on Permitting of Hydraulic Fracturing with Diesel

- Energy Policy Act of 2005 excludes “[t]he underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations” from the definition of injection
- Draft guidance issued May 2012
- Recommendations such as:
 - Identifying diesel fuel
 - How to apply standard requirements to fracturing
- Does not apply to authorized state Class II programs

Information on Shale Resources, Development, and Public Health Risks

Several members of Congress asked GAO to describe what is known about:

- Size of shale oil and gas resources and the amount produced from 2007 through 2011
- Environmental and public health risks of shale oil and gas development.

Scope and Methodology

- Analyzed information from EIA, USGS, and the Potential Gas Committee on reserves estimates and production for shale oil and gas.
- Interviewed key agency officials and reviewed the assumptions and methodologies used to estimate shale oil and gas resource size and production.
- To determine risks, we reviewed relevant studies and publications from state and federal agencies, industry, academia and non-governmental associations.

Shale Oil and Gas Resources and Production

- Estimates of technically recoverable shale oil and gas and proved reserves of shale oil and gas have increased in recent years
- Estimates of U.S. shale oil and gas resources are highly dependent on the data, methodologies, model structures and assumptions used
- In 2011, shale oil production increased to 217 million barrels and shale gas production increased to 7.2 trillion cubic feet

Environmental and Public Health Risks

- GAO identified environmental and public health risks in four key areas:
 1. Air quality
 2. Water quantity
 3. Water quality
 4. Land and wildlife

Environmental and Public Health Risks – Water Quantity

- Identified potential risks of withdrawing water from streams, lakes, and aquifers for drilling and hydraulic fracturing:
 - Decreased downstream flows impacting wildlife and riparian vegetation
 - Withdrawal at multiple sites at the local level, could potentially stress limited water resources in arid and semi-arid regions
 - Persistent water use could result in long-term losses of water resources within a region



Environmental and Public Health Risks – Water Quality

- Identified risks to water quality resulting from shale oil and gas development include:
 - Spills and releases of produced water, chemicals, and drill cuttings
 - Ground disturbances resulting in sediment and pollutant contamination of surface waters
 - Underground migration of gases and chemicals to aquifers as a result of improper casing and cementing.

Environmental and Public Health Risks – Induced Seismicity

- Some risk of induced seismicity as a result of underground injection of wastes produced during oil and gas development
- Few documented seismic events compared to the number of injection wells in operation
- Magnitude of seismic events not possible to predict given lack of comprehensive data on complex natural rock systems
- See also: *Induced Seismicity Potential in Energy Technologies*, National Research Council, National Academy of Sciences (2012)

Extent and Severity of Environmental and Public Health Risks

- Extent and severity of risks are dependent on:
 - *Location and rate of development*
 - *Geological characteristics*
 - *Climatic conditions*
 - *Business practices*
 - *Regulatory and enforcement activities*



Ongoing Work Related to Underground Injection

- Joint request by members of the House and Senate to review:
 - Federal and select state permitting and inspection processes and requirements governing oil and gas development of federal and Indian minerals.
 - Federal and select state actions taken to modernize rules and requirements governing oil and gas development in response to technological advances associated with horizontal drilling and hydraulic fracturing.



Ongoing Work Related to Underground Injection

- Joint request by members of the House and Senate to review EPA's Class II UIC program. GAO will review:
 - EPA and state implementation of the Class II UIC program
 - EPA oversight of the Class II UIC program
 - Key challenges EPA and states face in implementing the Class II UIC program



Supporting GAO Reports

- *Key Environmental and Public Health Requirements, GAO-12-874 (2012)*
- *Information on Shale Resources, Development, and Environmental and Public Health Risks, GAO-12-732 (2012)*

Related GAO Reports

- *Information on the Quantity, Quality, and Management of Water Produced during Oil and Gas Production, GAO-12-156 (2012)*
- *Unconventional Oil and Gas Production: Opportunities and Challenges of Oil Shale Development, GAO-12-740T (2012)*
- *BLM Needs a Comprehensive Strategy to Better Manage Potential Oil and Gas Well Liability, GAO-11-292 (2011)*



We conducted these performance audits from November 2011 to September 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.



GAO on the Web

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