



RESOURCES
FOR THE FUTURE



THE STATE of STATE SHALE GAS REGULATION

Executive Summary

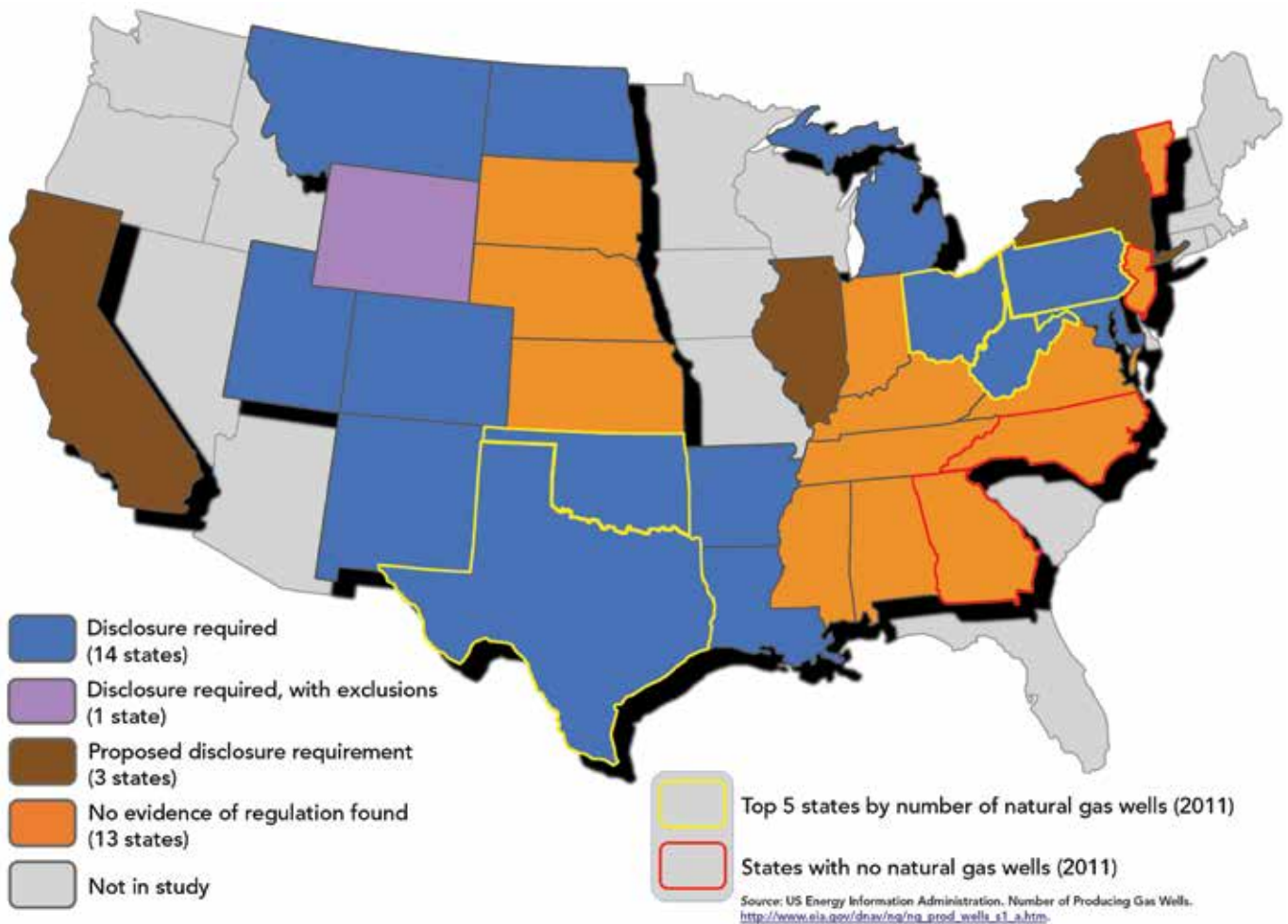
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A DVANCES in hydraulic fracturing (fracking) and other technologies are driving a boom in natural gas production in the United States, but developing this resource carries risks. Historically, states have been the primary regulators of oil and gas development. As the shale gas boom has taken off, states have updated their regulations, each with varying requirements. This dynamic regulatory environment has been challenging for industry, environmental groups, researchers, the federal government, and other experts to understand.

In a new RFF report, *The State of State Shale Gas Regulation*, we describe, analyze, and compare 25 regulatory elements related to shale gas development across 31 states. Although not a complete review of all state shale gas regulations, it is the most comprehensive to date—systematically identifying the differences and similarities among states for the first time. The report details what type of regulatory tools each state uses, how many regulations a state has relative to other states, and for some regulations, how stringent they are. For the latter two measures, we found a high degree of heterogeneity among states. An overview is given in a series of maps and state-by-state tables (samples are shown in Figures 1 and 2). The complete set of maps and tables is available at www.rff.org/shalemaps.

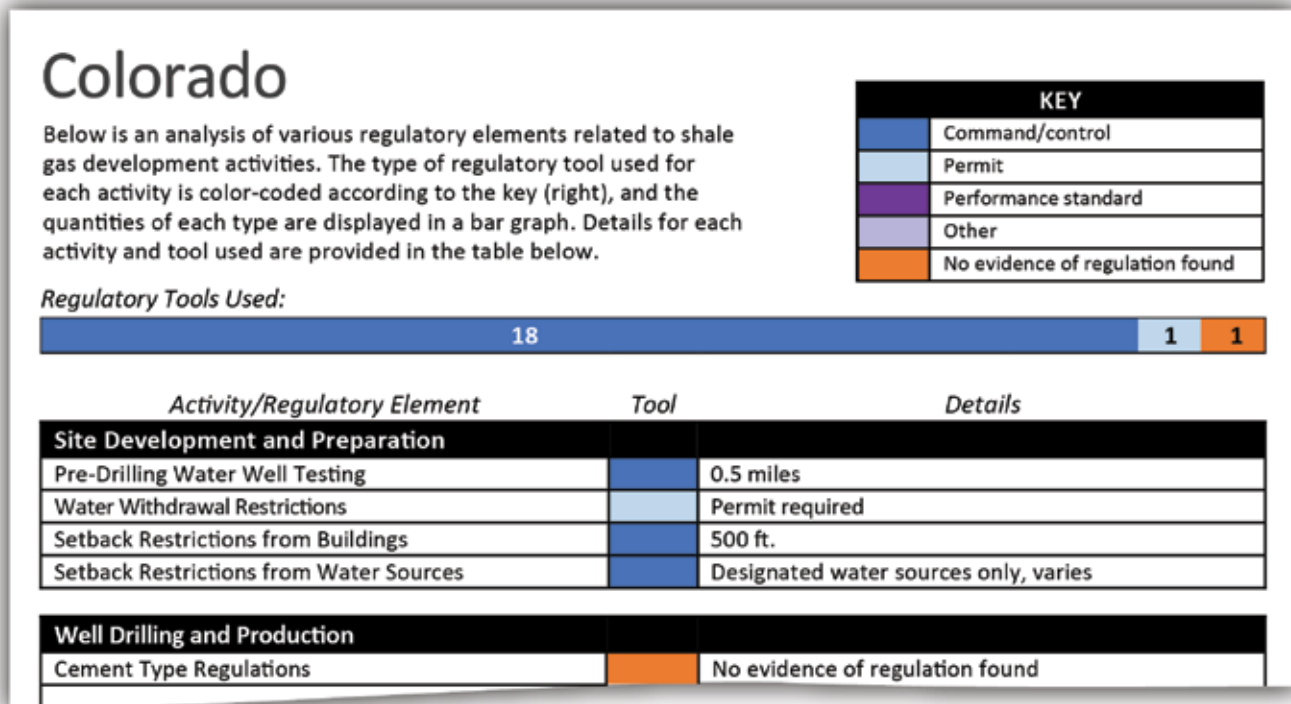
Figure 1. Sample Map: Fracking Fluid Disclosure



The report also highlights a lack of transparency in state shale gas regulations. Though regulations are publicly available, they are often difficult to find and interpret, even for experts. Moreover, states’ use of case-by-case permitting makes it challenging for researchers and the public to determine what is regulated and required.

Regulators and stakeholders often ask which states have the “best” regulations and how those regulations can be improved. This report is a first step in helping to answer those questions. However, we only analyzed what some current regulations require, not their costs and benefits or how they are enforced. We also did not rank the overall quality or effectiveness of each state’s regulations.

Figure 2. Sample State Table



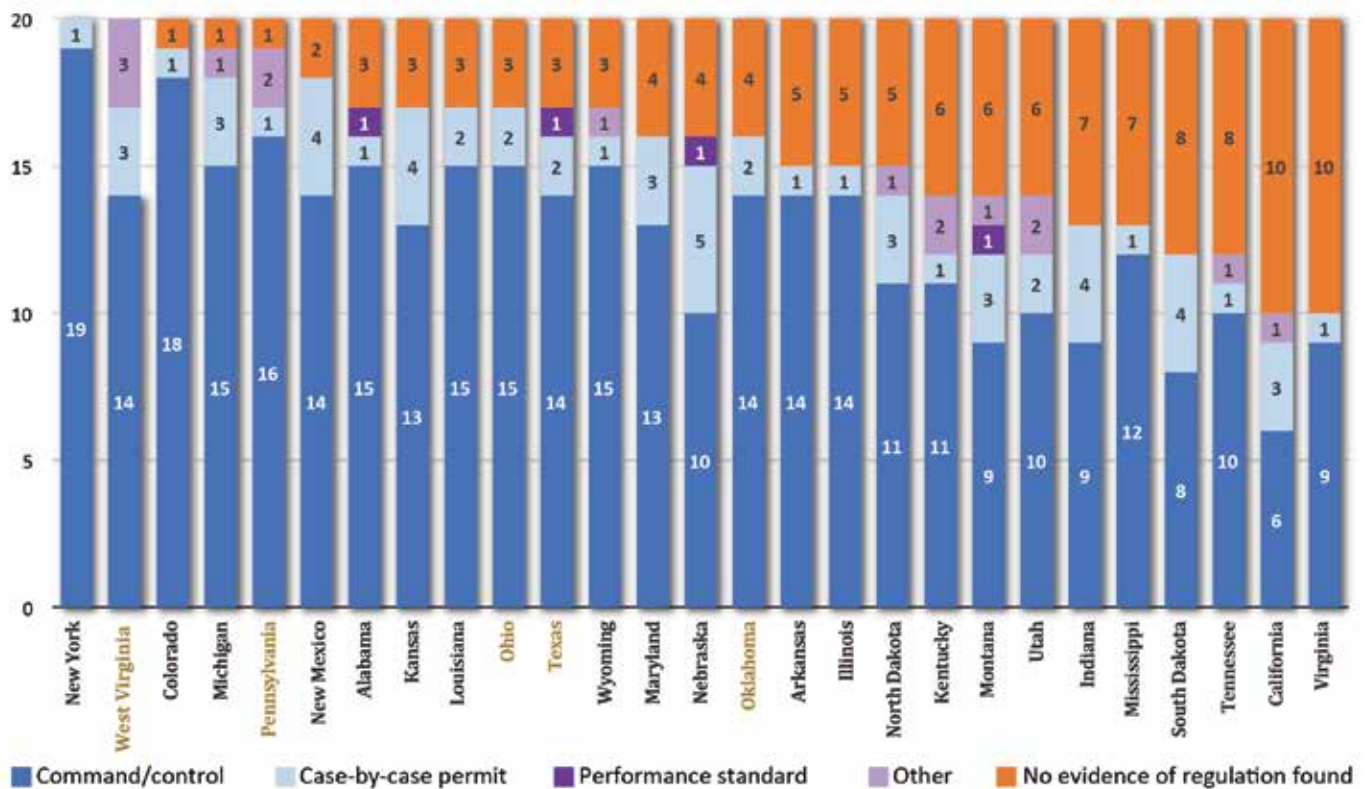
WHAT AND HOW DO STATES REGULATE?

States use a variety of tools to regulate shale gas activity, from command-and-control regulations to more flexible performance standards and case-by-case permitting. For example, a state might require wells to be cased and cemented to a specific depth below the water table (a command-and-control rule), to a level sufficient to protect all “freshwater bearing zones” (a performance standard), or it might require each well’s casing and cementing to be reviewed before issuing a permit (case-by-case permitting). Economists generally favor performance standards because, with proper monitoring and enforcement, they give firms the flexibility to meet standards at the lowest cost. Case-by-case permitting is the most flexible approach, but it can be administratively costly and may not be transparent—it is often hard to know what is permitted and what is not.

We statistically tracked 20 of the 25 regulatory elements. The other 5 elements—identified with an asterisk in the table of regulatory elements (see page 6)—cannot be cleanly compared in the report. We found that states regulate anywhere from all 20 elements (West Virginia and, under its proposed regulatory package, New York) to only 10 elements (California and Virginia). The five states with the most gas wells (Texas, Oklahoma, Ohio, Pennsylvania, and West Virginia, shown in yellow in the figures) regulate at least 16 elements, more than the national average of 15.6.

As shown in Figure 3, command-and-control regulation is the most frequent tool used by the states, covering more than 80 percent of the regulatory elements. Case-by-case permitting accounts for 14 percent and performance standards account for about 1 percent of the elements.

Figure 3. Number of Elements Regulated and Tools Used

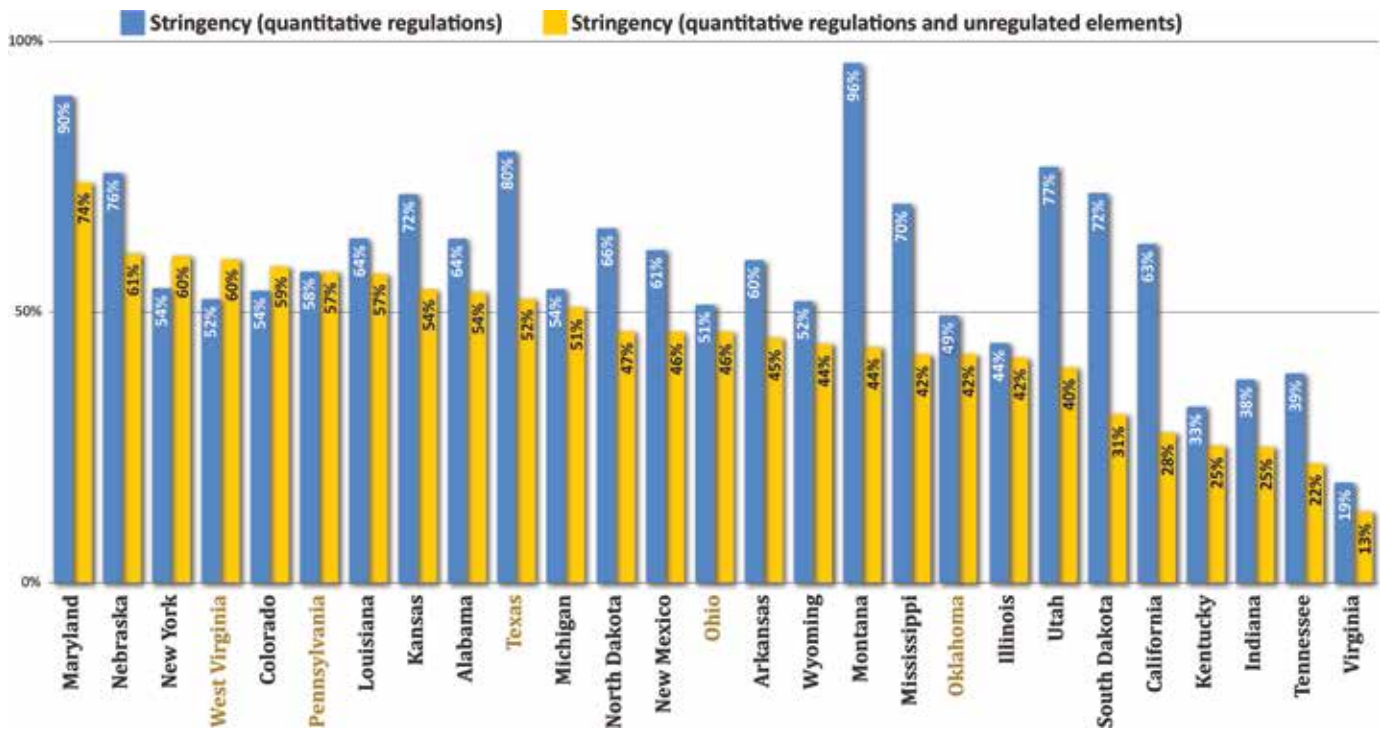


HOW STRINGENTLY DO STATES REGULATE?

For 13 regulatory elements, at least some states use quantitative regulations. For example, setback rules require wells to be sited a certain number of feet from buildings (with greater setback requirements being more stringent). For these regulations, it is possible to compare regulatory stringency across states.

Stringency can be measured in different ways. For example, when only considering the elements each state regulates quantitatively, Montana and Maryland appear to have the most stringent regulations across these elements, and Virginia seems to regulate them the least stringently (Figure 4).

Figure 4. Stringency of State Regulations



However, most states do not regulate all 13 of these quantitative regulatory elements. Montana only regulates 4, for instance. If elements that each state does not regulate (even by permits) are treated as minimally stringent, their average stringency is different. In this adjusted measure of stringency across elements, the average stringency of all states is naturally lower because every state (except New York, under its proposed rules) has at least one unregulated element. Measuring stringency in this way, Maryland appears most stringent (Figure 4).

Differing conditions among states may justify regulating more or less stringently (or indeed, not regulating an element at all). In the report, we explore possible relationships between a variety of state characteristics and the regulatory activity observed.

THE SOURCES OF HETEROGENEITY

The heterogeneity of shale gas regulations is pervasive; it can be seen in what states regulate and how stringently they do so (though states do show a consistent preference for command-and-control regulations). Of course, similar heterogeneity exists in many types of state regulations—from income and sales taxes to speed limits. Regulatory differences may reflect underlying differences of geology, hydrology, demographics, or other factors that affect the local risks of shale gas development—or they could be a result of random variation built up over decades of changing oil and gas regulation, or even political factors.

We analyzed the associations between observed regulatory heterogeneity and more than 50 environmental, demographic, political, and other variables. Relatively few statistically significant associations emerged and, at most, these variables could explain only 35 percent of the observed variation in regulatory activities.

However, our analysis did find several significant associations. For example, states with more gas wells tend to regulate more elements, perhaps reflecting a greater need for regulation where there is a larger industry presence. Also, regulations that protect groundwater (underground aquifers) tend to be more stringent in states where groundwater makes up a greater fraction of overall water consumption.

State regulators can benefit from continued research into the sources of heterogeneity to ensure that they are making decisions that adequately protect the public and the environment.

CONCLUSIONS

Shale gas regulation is complex and dynamic, reflecting the complicated technology, evolving understanding of risks, and rapid pace of development. These factors may contribute to the heterogeneity across states' shale gas regulations detailed in this report.

Heterogeneity alone is not a bad thing, and is not necessarily surprising. But whether it is justified—in an economic and environmental sense—depends on whether it is rooted in underlying differences among states that affect the costs and benefits of policy choices (for example, differences in hydrology, geology, and demographics). That remains unclear—the preliminary analysis in the report cannot, alone, determine whether heterogeneity is justified. But we found only a few relationships between the heterogeneity we observe and what to us seem to be among the most obvious underlying differences that could drive it.

More research is needed, and we look forward to making further contributions. We hope our results will induce those who say the heterogeneity of shale gas rules is justified by relevant underlying factors to better support their position.

More broadly, we hope our analysis will inspire dialogue among states and critical examination of why regulations are what they are today and whether they can be improved—to better protect the public, to reduce compliance costs, to better fit local conditions, to keep pace with technology, and to reflect the best thinking about regulatory design.

REGULATORY ELEMENTS

ANALYZED

We selected and reviewed the following 25 regulatory elements that span the shale gas development process for each of the 31 states with actual or potential shale gas production.

1. General well spacing*
2. Building setback
3. Water setback
4. Pre-drilling water well testing
5. Casing/cementing depth
6. Cement type production
7. Surface casing cement circulation
8. Intermediate casing cement circulation
9. Production casing cement circulation
10. Water withdrawals
11. Fracking fluid disclosure
12. Fluid storage options
13. Freeboard
14. Pit liners
15. Underground injection
16. Fluid disposal options*
17. Wastewater transport tracking
18. Venting
19. Flaring
20. Severance taxes*
21. Well idle time limits
22. Temporary well abandonment
23. Accident reporting
24. Bans and moratoria*
25. Regulatory agencies*

* These elements were not included in the statistical comparison of regulatory elements.

Resources for the Future (RFF) is an independent, nonpartisan organization that conducts economic research and analysis to help leaders make better decisions and craft smarter policies about natural resources and the environment.

This report was developed by RFF's Center for Energy Economics and Policy (CEEP) as part of a larger initiative, *Managing the Risks of Shale Gas: Identifying a Pathway toward Responsible Development*. Updated findings are published at www.rff.org/shalegasrisks. RFF is pleased to acknowledge the generous support of the Alfred P. Sloan Foundation for this project.

Read the full report at: www.rff.org/shalemaps.

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