Shaping State Fracking Policies in the U.S.: An Analysis of Who, What and How

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This paper presents an overview of how state and local governments have addressed the regulation of oil and gas over the past decade following the expanded industry use of new technologies like hydraulic fracturing (fracking) and horizontal drilling. A consequence of fracking was a substantial increase in energy production accompanied by the emergence of policy concerns about how resource development and jobs could be balanced with efforts to mitigate health, safety, and environmental impacts. Three key concerns are discussed in the following sections; i.e., questions about the appropriate locus of jurisdictional control over the regulation of drilling activities, an examination of how state regulators deal with environmental and health impacts associated with fracking and efforts to shape the development and implementation of policy decisions taking into account the availability of fiscal resources and political will.

Introduction

State and local government officials have become increasingly involved in the enactment and implementation of policies dealing with the regulation of companies that extract oil and natural gas in the U.S. The rapid expansion of resource development over the past decade has been driven by the energy industry’s embrace of technological advances such as hydraulic fracturing (better known as fracking) combined with horizontal drilling. Fracking has been defined as a “drilling technology that injects a mix of water and chemicals at high levels of pressure into deep underground shale deposits in order to dislodge gas. Once the rock formation is fractured, the gas can flow to the well where it is pumped out of the ground” (Saundry, 2009). It is important to note that the following discussion of fracking operations and their effects on the environment in this paper is based upon a broader interpretation of the term that covers drilling activities from the exploration phase to the eventual disposal of produced waters rather than a narrower view preferred by oil and gas companies that defines “fracking” as the process of extracting gas from shale (Evensen, et al, 2014).

The emergence of fracking has generated considerable optimism about the future of domestic energy supplies. Energy analysts at the U.S. Energy Information Administration (EIA) suggest that shale based oil and gas reserves are sufficiently robust to ensure that domestic energy needs will be met well into the future (Energy Information Administration, 2015) while others tout the expansion of well-paying jobs related to fracking operations and ancillary economic activities (Barth, 2013; Sovacool, 2014).

 However, the surge in industry investment and drilling activities in states with shale gas reserves (also known as plays) has also been accompanied by growing controversy about how potential land use and environmental impacts of fracking operations are regulated. One key issue examined in this paper is jurisdictional control. Federal agencies like the U.S. Environmental Protection Agency (EPA) and the U.S. Bureau of Land Management (BLM) have often had some say in regulating the development of energy resources but state governments have historically been responsible for the oversight of oil and gas production activities (Weber, Bernell, and Boudet, 2016). More recently, local governments have become more active in seeking greater control over fracking operations affecting zoning and land use decisions that occasionally puts state regulatory priorities in conflict with city or county policy preferences (Davis, 2014; Fisk, 2016).

In addition, there are substantive policy concerns about how environmental quality is balanced with fracking operations. This is partly based on research that considers impacts associated with air quality (Moore, Zielinska, and Petron, 2014), contaminated water supplies (Vengosh, et al, 2014), and seismic risks emanating from the underground injection of wastewater near oil and gas drilling operations (Ellsworth, 2013). There are also related policy issues linked to fracking fluid disclosure requirements, natural gas pipeline leaks, water supply impacts in arid states, and the lack of information about public health risks borne by people living in close proximity to drilling sites (Adgate, et al, 2014; Gullion, 2015).

Third, public officials and researchers want to know more about how fracking policy policies are shaped and implemented by state and local officials. This includes analyses of state-level characteristics that are associated with the breadth of policy coverage (Richardson, et al, 2013), the institutional capacity of agencies or commissions with key regulatory responsibilities (Rinfret, Cook, and Pautz, 2014) and actions taken by policy brokers or entrepreneurs to facilitate or expedite implementation decisions (Heikkila, et al, 2014). In the sections that follow, an overview of how state and local governments have addressed fracking policies is presented.

Jurisdictional Control over Fracking Policies

Who shapes regulatory decisions affecting oil and gas drilling activities? A state-centric

focus was adopted by producer states early on through the enactment of the Interstate Oil Compact (later renamed the Interstate Oil and Gas Compact) in 1935. The policy also created a compact commission (IOGCC) consisting of at least one representative from every member state to coordinate oil and gas production and conservation programs and to recommend a set of guidelines for the development of state regulatory programs (Zimmerman, 1995). State policymakers saw the IOGCC and its Commission as a beneficial means of avoiding federal agency regulation of energy industries while creating some semblance of market stability for member state firms. Since then, the regulation of U.S. oil and gas drilling operations has been carried out by state-level commissions, agencies or departments with occasional guidance from IOGCC. This includes regulatory decisions made before and after the surge in shale gas production occurring since the mid-2000s (Ground Water Protection Council, 2009) as well as the enactment of new state policies designed to deal with industry changes and impacts linked to fracking operations (Rabe, 2014).

Efforts to retain state-level autonomy within a rapidly changing policy arena have largely succeeded thanks to defensive political actions taken by the IOGCC, trade groups such as the American Petroleum Institute (API) and the American Gas Association (AGA), state elected officials, Republican members of Congress, and state regulators (Davis and Hoffer, 2012). In 2005, Bush Administration officials and their allies within Congress sought to prevent EPA from regulating oil and gas fracking operations under the Safe Drinking Water Act (SDWA), a provision of the Energy Policy Act often referred to as the “Halliburton Loophole.” Since then, Congressional Democrats have tried (unsuccessfully) to enact the “Frac Act,” a bill that seeks to reinstate EPA’s regulatory authority under SDWA (Warner and Shapiro, 2013).\*

This places most fracking regulatory decisions squarely within the context of state and local governments. Sub-state federalism encompasses a decisional arena that involves sometimes competing efforts by state and local officials to regulate oil and gas drilling activities. As Warner and Shapiro (2013) indicate, state energy and environmental regulators have historically been sensitive to the economic importance of industry jobs. Both industry and most state officials have sought to develop uniform regulatory requirements at the state level to ensure predictability and a level playing field. A key justification for the promulgation of statewide regulatory requirements

is that it allows companies to develop energy resources without running headlong into a patchwork of differing policies, rules, and procedures from cities and counties (Goho, 2012).

Not surprisingly, city and county officials prefer more autonomy when land use decisions

are made within their jurisdiction. A key concern is that efforts undertaken by state energy regulators to maximize the economic and energy-related benefits of natural gas development has been pursued without adequate consideration of residents’ concerns about human health and environmental protection (Sovacool, 2014). A common argument supporting more local regulatory autonomy here is based on the notion that “one size does not fit all” i.e., differing policy responses may be appropriate because of geological differences or because of the proximity of proposed drilling activities to more populated areas (Richardson, et al, 2013). In addition, fracking operations have been developed in municipalities with little prior experience with industrial activities thus stoking public fears (Jacquet, 2014). Finally, local officials worry that state officials have adopted a lukewarm or even indifferent approach to company violations of oil and gas environmental and safety regulations (Wiseman, 2014).

This has occasionally led to increasing political conflict between state and local officials. State-level policy-makers are typically in the driver’s seat when considering most key policies that regulate the development of natural gas resources in the U.S. and can largely shape or restrict the contours of local government fracking policy decisions (Fisk, 2016). State influence over local policy decisions starts with the establishment of legal authority that is granted to municipalities and counties by the state constitution and is extended through subsequent legislation. Most oil and

gas policies predate the shale gas revolution and typically begin by placing emphasis on a strong state role in fostering “the orderly development of energy resources” that takes precedence over competing local efforts to regulate drilling activities (Warner and Shapiro, 2013).

 City and county leaders concerned about fracking policy impacts have responded in a variety of ways. Some pursue a more cooperative approach to balance jobs and environmental

\*However, federal officials retain or share legal authority to shape some fracking policy decisions. Agencies such as the U.S. Environmental Protection Agency (EPA) and the U.S. Bureau of Land Management (BLM) carry out important fracking-related policymaking responsibilities that were mandated by Congress. EPA administers multiple environmental protection policies dealing with air, land, and water quality while BLM manages federal land use programs designed to balance economic (including energy development) values with environmental policy concerns. Oil and gas development can also occur on lands managed by the U.S. Forest Service, the National Park Service and the U.S. Fish and Wildlife Service; however, drilling activities occur less frequently because of policy-based land use restrictions. Finally, several other agencies are actively engaged in activities like research and development or technical assistance. This includes efforts by scientists at the U.S. Geological Survey and the U.S. Department of Energy to answer fracking-related impact questions such as the relationship between underground injection of flowback waters on seismic activity (earthquakes) or the usefulness of new technologies aimed at detecting or capturing fugitive methane emissions (U.S. General Accountability Office, 2012).

protection by negotiating agreements with industry officials. Others have enacted ordinances or regulations aimed at providing some protection for their constituents such as minimum setback requirements between drilling operations and residential areas or waterways. A smaller number of municipalities have taken a more confrontational approach such as the imposition of a moratorium or a ban on fracking within jurisdictional boundaries (Fisk, 2016).

 When state and local governments collide over who can regulate fracking operations, the states typically win because of preemption clauses built into original oil and gas statutes. Local bans or moratoria that passed in Colorado and Ohio were eventually overturned in the respective state supreme courts (Proctor, 2016; Gilmer, 2015) or through the enactment of legislation (as in Texas) that eliminated the practice of local fracking bans (Lee, 2015). Exceptions may occur in states like New York and Pennsylvania where higher court rulings upheld local government fracking regulations because of state constitutional provisions giving greater weight to environmental policy concerns (Rabe, 2014).

Policy Impacts Associated with Fracking

 Concerns about fracking operations inevitably become intertwined with discussions about

environmental, aesthetic, economic, health, and safety impacts. A particularly salient policy issue for state and local regulators centers upon the adoption of *setback requirements*; i.e., ensuring a minimum distance between oil and gas drilling operations and residential areas, schools, hospitals and other structures as well as waterways. According to Haley, et al (2016), shorter setbacks may prove risky since residents may be more vulnerable to toxic air pollution from fracking activities; hence, longer distance requirements offers a legislative means of mitigating health risks. Meng and Ashby (2014) agree, contending that “the closer a site is to a hydraulic fracking well, the greater the hydraulic impacts associated activity will have on the surrounding environment.” However, the process of deciding what the appropriate distances are is less about attempts to determine physical risk than finding a metric that is politically acceptable. The politics of establishing setbacks is both complicated and contentious since it overlaps with all impact areas and is commonly a divisive issue involving state and local officials.

However, jurisdictions vary. A study conducted by Resources for the Future (RFF) researchers found that most producer states have enacted building setback restrictions that average around 300 feet from drilling sites; however, more urbanized states like Ohio tend to require lengthier setbacks (Richardson, et al, 2013). But one key factor is the degree of political pushback from disgruntled residents. For example, in 2013, state regulators in Colorado attempted to quell growing local opposition to drilling activities that were too close to populated areas by enacting new rules that expanded statewide setback requirements (Streater, 2013).

On the other hand, larger setback proposals are often generated by local political leaders. Municipal officials in Texas have historically possessed greater home rule authority to regulate the conditions under which drillers operate including restrictions on noise, air emissions, and time of day for trucks carrying water, sand and fracking chemicals through city streets (Davis, 2014). Consequently, over the past five years, city officials representing jurisdictions sitting atop the sprawling Barnett shale play in the Dallas-Ft. Worth area have chosen to extend setback limits, taking into consideration the need to balance the interests of residents, industry officials, environmentalists, and people owning subsurface mineral rights (Fry, 2013).

Other major policy concerns include the health and environmental impacts linked to frack-

ing operations. Regulating water quality is particularly important since public concerns about fracking practices have most commonly revolved around the possibility that underground acquifers or water wells might be at risk from migrating contaminants. This presumably occurs because of the proximity of nearby drilling oil and gas operations, fears that were exacerbated by the publicity and media accounts that accompanied the release of the documentary *Gasland* in 2009 (Mazur, 2016). This eventually led to a Congressional request in 2009 for EPA to conduct a major study identifying water quality risks associated with industry use of hydraulic fracturing and horizontal drilling to extract oil and gas resources from shale plays (Soraghan, 2011).

 What have we learned from research conducted by EPA and others? According to a report issues by the Congressional Research Service (CRS), the process of identifying the source or cause of groundwater contamination can be challenging since waterways or acquifers located in close proximity to drilling sites often lacks baseline water data to match against claims that fracking “caused” pollution (Vengosh, et al, 2014; Ratner and Tiemann, 2014). Thus far, EPA’s research suggests that “narrowly defined” fracking operations are unlikely to directly result in the contamination of groundwater because of the migration of fracking fluids although a small number of homeowner wells have been adversely affected (Davenport, 2015).

Other analysts have adopted a more skeptical position by highlighting related concerns such as spills involving drilling chemicals and produced waters, the failure to properly cap wells resulting in methane leaks into groundwater (Wiseman, 2013; Meng and Ashby, 2014), and improper storage and disposal of wastewater (U.S. General Accountability Office, 2012). The latter issue is especially troublesome since these produced waters often carry a toxic mix of drilling muds, salts, and chemicals that are not only harmful to ecological health and aquatic life but can often find points of access into waterways given the inability of municipal wastewater plants to adequately treat them (Sovacool, 2014). A number of states are paying attention and have produced rules aimed at tracking wastewater disposal activities (Richardson, et al, 2013).

Addressing air quality concerns offers yet another challenge for energy regulators. Unlike the case of water pollution where the decisional domain for the oil and gas sector is largely confined to the states, the regulation of air pollutants under the federal Clean Air Act is shared by EPA and state administrators. In some states, regulatory jurisdiction is divided between pollution control agencies and oil and gas drilling operations; e.g., in Texas, the Railroad Commission oversees most production activities affecting water quality but dealing with air pollutants falls under the jurisdiction of the Texas Commission on Environmental Quality (Rahm, 2011). The release of air pollutants such as methane, sulfur dioxide, particulate matter and volatile organic compounds can occur at differing phases of the production cycle including compressor or pipeline leaks, flaring, and construction activities (Vengosh, et al, 2014; Ratner and Tiemann, 2014).

During the Obama Administration, EPA developed rules to control the release of air pollu- tants linked to oil and gas operations that provide a baseline of sorts for state regulators to follow.

What have states done? A few have banned the practice of “venting” by energy firms; i.e., allowing natural gas to escape into the atmosphere while drilling for oil (a more lucrative resource). Both Colorado and Texas seek to not only restrict such practices to reduce pollution but to encourage the utilization of excess gas as a fuel source (Richardson, et al, 2013). In 2014, Colorado regulators within the Department of Public Health and Environmental Quality approved a rule brokered by Governor John Hickenlooper, the Natural Resources Defense Council and several energy firms that requires industry to test compressors, wellheads and tanks for methane leaks and to fix identified problems within a specified time period (Lee, 2014). And in California, a particularly tough set of rules were recently developed by the state’s Air Resources Board in the wake of a major methane leak in 2015 from a natural gas storage facility in Los Angeles County. It applies to both inshore and offshore oil and gas drilling operations and is designed to detect and quickly fix methane leaks (Fracassa, 2017).

 Health and safety impacts from fracking operations arise from multiple sources like air and water pollution but relatively few states have funded research programs to assess risk factors. Oil and gas officials and IOGCC representatives often downplay the need to investigate drilling activities since it could unnecessarily alarm the public, citing the lack of empirical evidence over the past half century that links fracking to the contamination of water supplies (Associated Press, 2012; Davis and Hoffer, 2012). However, researchers have begun to focus on selected public health issues such as disclosure requirements for companies to reveal more precise information about fracking chemicals that would better enable physicians to treat people adversely affected by nearby drilling activities (Banerjee, 2012). Other health concerns include analyzing the effects of exposure to air and water pollutants generated by oil and gas production, and impacts from related or secondary processes such as worksite hazards or the transport of oil and gas via trucks, pipelines or railroads (Patterson, et al, 2017; Haley, et al, 2016).

 Physician access to specific information about fracking chemicals to aid in diagnosing ailments of patients exposed to air or water close to drilling sites has become a particularly thorny problem for policymakers. Industry officials are generally willing to list chemicals in use without offering more detailed data pertaining to concentration levels sought by health care providers, information considered to be “intellectual property” or a trade secret. In Pennsylvania, policymakers crafted a policy that tilted more closely to industry concerns by requiring doctors wanting access to sign a confidentiality agreement not to disclose proprietary information to outside parties (Banerjee, 2012).

Other states like Colorado and California have attempted to finesse this issue. Shortly after a disclosure policy was enacted by Colorado lawmakers in 2013, Colorado Oil and Gas Conservation Commission (COGCC) regulators negotiated an agreement with the Colorado Department of Health and Environmental quality and the Colorado Medical Society allowing physicians to gain access to information about fracking chemicals. Doctors would still be required to sign a confidentiality form preventing them from disclosing trade secret data to industry groups but could share information with patients, other health care professionals and public health agencies (Finley, 2013). A California policy adopted in 2014 allows drillers to apply for permission to withhold the exact formula for the chemical mix used in fracking operations. However, they must disclose the chemical constituents deployed within 60 days of completing a frack job which is then posted on the state’s Division of Oil, Gas, and Geothermal Resources website along with a plan to monitor nearby groundwater for contaminants (Environmental Working Group, 2015). Both approaches represent some improvement. However, a key problem occurs when people visit a health care facility to evaluate symptoms of illness that may be related to proximate drilling operations only to discover that the physician is reluctant to go through the bureaucratic hassle required to gain access to fracking chemical information (Centner, 2013).

There are 28 states that currently require disclosure. Many utilize FracFocus, a registry operated by the American Petroleum Institute that contains a sizeable database of chemicals used in fracking operations. This is particularly important since EPA is statutorily unable to address a number of health-related concerns because of exemptions from federal environmental protection laws (Warner and Shapiro, 2013). The effectiveness of these policies in actually providing more disclosure of medically relevant data is not clear but some policy designs may be more useful than others. A recent study by Konschnik and Dayalu (2016) indicated that industry requests to with- hold information are significantly less likely to occur in states with shorter time requirements for reporting chemicals and in states using a systems approach that lists chemicals in ways that prevent “reverse engineering” by firms attempting to fraudulently uncover the reporting company’s trade secrets.

Beyond disclosure requirements, how do fracking operations affect public health? Larger scale studies dealing with health issues are lacking and state officials have generally been wary of funding such efforts. Some smaller research efforts have been carried out that show correlations between health problems and nearby oil and gas drilling activities. Researchers from the University of Pennsylvania and Columbia University looked at hospitalization records in three Pennsylvania counties between 3007 and 2011 to determine whether increased incidence of cardiovascular and neurological conditions were linked to physical risk characteristics. They found that cardiovascular problems were significantly related to the number of wells while neurological conditions were more likely to occur in close proximity to higher well density (King, 2015). A study conducted by University of Colorado scientists compared childhood cancer rates in rural areas within Colorado where fracking operations were common or rare. As expected, cancer rates were significantly higher in areas with greater oil and gas activity; however, the Director of the state’s Public Health and Environment Department cautioned that the findings were limited by the failure to control for other potentially important factors such as neighborhood turnover or degree of exposure to pollutants (Ingold, 2017). While more research is clearly needed, some states are making an effort to monitor citizen complaints and concerns by setting up hotlines or website contacts points to gather information.

There are secondary impacts linked to fracking operations as well. A particularly important concern is the rising number of accidental explosions or spills that occur as a result of the need to not only extract shale oil and gas resources but to process and transport them as well, including well pads, access roads, pipelines and trains (Stine and Cohon, 2016). After collecting spill information from the fifteen largest oil and gas producing states, Soraghan (2014) reported that well over seven thousand spills occurred in 2013 - this amounted to 26 million plus gallons of oil, ftacking fluids, and wastewater, a total that exceeded the volume of polluted waters from the 2010 Deepwater Horizon incident in the Gulf of Mexico. A more recent study of spill data from four states concluded that most spills occur within the initial three years of production and that the most common pathways are storage and pipelines (Patterson, et al, 2017).

Finally, there may be additional indirect effects from either drilling processes or from the acquisition of materials used to extract oil and gas. One impact of note can be attributed to “induced seismicity” or the emergence of earthquakes in states with existing geological fault lines and the nearby injection of large quantities of wastewater from nearby fracking operations (Sovacool, 2014; Davis and Fisk, 2017). Some upper midwest states like Minnesota and Wisconsin have become major sources of sand that is used in fracking operations, a resource that has become both economically profitable for mining companies as well as a growing health concern for workers exposed to sand particulates (Kennedy, 2014).

Shaping Fracking Policy Decisions

 What are the factors that shape state fracking policy decisions? There is little in the way of federal guidance or standards and analysts find little evidence of policy diffusion across states (Rabe, 2013). And since state regulation of oil and gas drilling predates many of the green state laws enacted since the 1960s, there remains a structural bias within commissions or agencies with oversight responsibilities to place more emphasis on the orderly development of energy resources than on environmental protection goals (Warner and Shapiro; Fisk, 2017).

However, some states are more favorably predisposed to seek more of a balance between oil and gas production and environmental policy concerns than others based on aggregate factors such as partisan orientation, ideology, historic sensitivity to environmental policy concerns, socioeconomic attributes and the economic importance of oil and gas production. In addition, policy decisions are influenced by institutional politics; e.g., the extent to which states have unified or divided partisan control, whether there is a significant jurisdictional divide between state and local officials, the degree of leadership exercised by governors or other policy brokers, the presence of alternative policy venues like ballot initiatives and the role played by state courts in resolving policy disputes. Finally, the process of crafting better fracking regulations depends on resource capacity issues, i.e., the provision of ample budgetary and staff resources to implement administrative decisions.

Despite a dearth of empirical work on cross-state variation in fracking policies and environ- mental impacts, some analysts have concluded that aggregate factors are important politically and substantively. Rabe (2014) points to the growing divide between strong blue and red states in terms of policy direction while Richardson, et al (2013) found that states vary considerably on the substance of regulations. A particularly important factor is the economic context of oil and gas regulatory decisions. This is borne out by detailed case analyses of fracking politics in high production states like Colorado (Heikkila, et al, 2014), Texas (Rahm, 2011), and Pennsylvania (Rabe and Borick, 2013). While the most obvious impacts lie in the provision of jobs and severance tax revenue for public programs (Sovacool, 2014), the oil and gas trade associations in these states also play an important role in shaping industry friendly decisions through direct lobbying, public relations and generous campaign expenditures for pro-drilling candidates running for state elective positions.

A recent study examined statistical relationships between several aggregate factors and efforts by state policymakers to mitigate fracking-related environmental impacts in twenty states that account for most oil and gas production in the U.S. Not surprisingly, the amount of production and severance tax revenue were found to be significantly associated with mitigation policies along with political factors such as the state-level percentage of residents self-identifying as democratic or liberal. On the other hand, socioeconomic and educational indicators were not strongly correlated with these policies while a state’s historic record on environmental programs was only weakly associated with efforts to reduce adverse impacts (Davis, 2017).

In examining the role of political institutions in the implementation of state fracking policies, governors often play a prominent role by working with agency or commission staffers to shape regulatory decisions designed to offer operational guidance for safe and environmentally sound drilling practices and, on occasion, the establishment or clarification of the differing responsibilities assigned to state and local officials (Rinfret, Cook, and Pautz, 2014). In Ohio, Governor John Kasich has worked to update regulatory requirements for fracking, efforts made easier by confining regulatory jurisdiction to the Ohio Department of Natural Resources and excluding Ohio EPA.

While some gubernatorial initiatives like adopting a severance tax in Ohio have been constrained by legislative pushback, others have had success with a more collaborative approach. Colorado Governor John Hickenlooper worked closely with COGCC and multiple stakeholders to craft key environmental rules through the use of task forces and public hearings (Heikkila, et al, 2014). Chief executive roles vary according to the amount of political capital invested in fracking issues, whether partisan control over state government is unified or divided, issue saliency among state residents, and the degree of tension between state and local officials regarding regulatory jurisdiction.

 Achieving regulatory objectives is also influenced by other factors such as problem intractability, the availability of resources, and whether or not enforcement decisions are given priority. Some policies are simply harder to implement than others. In a recent study, researchers surveyed oil and gas regulatory experts in an effort to determine which programs were more likely to create compliance challenges. The more difficult programs included tracking the disposal of produced waters and reducing air pollutants linked to venting or flaring in the production of oil and gas (Zirogiannis, et al, 2016).

 States also differ in levels of funding and staff to support fracking program operations. This is often less problematic for larger oil and gas production states that have been around for a while since policymakers were historically able to generate revenue through the imposition of severance taxes on companies based on the amount of resources extracted. A recent review of producer states utilizing severance taxes during the initial decade of the shale gas era found that while relatively few changes were made to alter existing policies, a number of these opted to use the revenue in a more targeted fashion to address negative externalities associated with drilling operations or to share revenues with local communities impacted more heavily by oil and gas production (Rabe and Hampton, 2015). Relatedly, a recent study also found that states with higher severance tax rates were significantly more likely to adopt policies that mitigate environmental risks (Davis, 2017). Other states like Pennsylvania sought to gain a competitive advantage by deciding to adopt an impact fee on oil and gas companies rather than a severance tax. However, Neuhauser (2014) found that if state officials had taken the same fiscal route as nearby West Virginia (5% severance tax rate) between 2012 and 2014, that an additional $630 million in revenue could have been received to better fund public programs.

 Another key to the successful implementation of fracking regulations is enforcement. This ensures that regulatory decisions are carried out effectively to not only improve safety and environment protection but to deter illegal or irresponsible behavior by drilling operators as well. Studies by Wiseman (2012 and Sumi (2012) find major deficiencies in enforcement programs in terms of funding, reporting requirements for major spills, very few inspections relative to the number of wells, weak penalties for violations, and an unwillingness on the part of regulators to assess fines or to punish lawbreakers. They suggest that in prioritizing approaches to improving enforcement that it makes sense for inspectors to pinpoint and follow through on high risk violations, particularly surface oil spills that can do considerable damage to water quality and aquatic life. Related risk reduction proposals call for getting inspectors to pay more attention to the proper casing of wells and to do more water testing near fracking operations before and after production activities (Wiseman, 2014). Another approach advanced by Konschnik and Bowling (2014) directs attention to the large number of small businesses involved in the waste management business. They propose two things – holding well operators accountable for oil spills or unsafe disposal practices by requiring them to use tracers and to offer or require training for waste haulers.

Conclusions

 While energy politics often resembles a jurisdictional maize when it comes to addressing policy tradeoffs, the regulation of oil and gas has long been dominated by state agencies or regulatory commissions thanks to strong political support from state officials, trade associations such as the API and membership of producer states in the IOGCC, a compact developed in the early twentieth century to maintain state autonomy with minimal involvement from the federal government. While EPA retains some authority to regulate air emissions from drilling operations under the Clean Air Act, state regulators control most other aspects of fracking operations. However, sub-state disputes over decisional autonomy continue to divide state and local officials particularly over land use issues such as setback requirements designed to create a buffer zone between drilling activities and residential areas, hospitals, parks, or government buildings. While disputes are occasional resolved through collaboration between key stakeholders, state courts increasingly decide these issues, ruling in favor of local governments’ efforts to place some restrictions on fracking operations in New York and Pennsylvania but upholding the ability of state regulators to preempt local efforts to ban or unduly restrict drilling activities in Colorado and Ohio.

 The politics of fracking at the state and local levels of governance is also complicated by the need for policymakers to address numerous impacts – both positive and negative. When the shale gas revolution gained traction in 2009, the uptick in drilling provided a much needed economic boost to states otherwise suffering high levels of unemployment as well as a source of royalty income for farmers and others who sold subsurface mineral rights energy firms. But drilling in smaller communities often took a toll on roads, increasing traffic, noise and inconvenience for residents as well as the costs of proving government services to the influx of new oil and gas workers. Environmental impacts included the withdrawal of large quantities of local water sources for fracking operations, the disposal of contaminated produced waters, and air pollution generated by compressors or undetected leaks from pipelines or storage tanks. Health impacts arise from the difficulty of arranging physician access to information from energy companies about the chemical makeup of fracking materials so that patients exposed to pollutants can obtain a quick and more accurate diagnosis as well as the larger question of individual risks associated with living or working in close proximity to oil and gas drilling activities. There are also secondary impacts that can be attributed to frack sand mining, earthquakes stimulated by the underground injection of wastewater near geological fault lines, and spills produced by the transport of oil and gas from production sires.

 Finally, there are several factors that shape state fracking decisions aimed at balancing resource development with environmental protection. This includes economic factors such as a greater amount of oil and gas production and higher rates of severance taxation as well as political factors like partisan orientation (democratic) and ideology (liberal). In terms of institutional actors, governors with a strong interest in energy policy occasionally act as policy entrepreneurs to achieve policy goals, usually in conjunction with regulatory staff. However, the implementation of fracking policies continues to pose a daunting challenge for policymakers because some programs are more difficult to administer than most, staffing and budgetary constraints, and the weak enforcement of environmental rules in most states. Suggested changes to improve policy outcomes include more strategic targeting of higher risk industry actions (like oil spills), increased training of industry subcontactors, and in some cases industry insurance requirements to cover liability costs for remedial actions.

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