



THE ROLES OF RESEARCH, STAKEHOLDERS, OPERATORS, & REGULATORS IN ENHANCING SHALE OIL & GAS GOVERNANCE

A REPORT FROM THE ASPEN INSTITUTE
DIALOGUE ON ENERGY GOVERNANCE

Dave Grossman, Rapporteur

For all inquiries, please contact:

Energy & Environment Program
The Aspen Institute
2300 N Street, NW | Suite 700
Washington, DC 20037
Phone: 202.736.2933
Fax: 202.467.0790

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The Aspen Institute
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The Aspen Institute Energy and Environment Program is an active and prominent convener of non-partisan policy dialogue and neutral forums focused on key energy and environmental topics and how to advance environmental sustainability in a technological world. The Program's mission is to take-up the enduring questions about nature and society, and to prompt new thinking among diverse participants by deliberately testing assumptions and policies about sustainable water use, clean energy, climate change, and wildlife conservation. The Program promotes values-based dialogue between thought leaders from business, government, NGOs, and academia to address complex energy and environmental policy challenges in a collegial atmosphere that allows deliberation, creativity, collaboration, and compromise to flourish. Like the Aspen Institute as a whole, the Energy and Environment program seeks to inspire and explore new ideas and provoke action in the real world.

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FOREWORD

The economic impacts of oil and gas production from shale resources seem to be clear to many, but the intensity and scale of this production has also created increased risk to human health and the environment. Existing structures have struggled to identify and respond to these risks which in turn creates uncertainty for regulators. What started almost 20 years ago as an effort by the leaders of a few small independent companies to wring additional profits from what many experts at the time thought were “mature” plays has evolved into an international force that is driving fundamental changes in global energy markets. Based on over 40 years of convening on energy and environmental questions, the Aspen Institute believes that shale resource development is so profoundly important that it forces a reevaluation of existing thinking and relationships.

With the generous support of the Cynthia and George Mitchell Foundation and the Alfred P. Sloan Foundation, the Aspen Institute’s Energy and Environment Program commenced in 2016 a Series on Energy Governance to bring together experts from academia, industry, government, and other organizations to assess concepts and policies in the governance of gas and oil production from shale resources across local, state, and federal jurisdictions in the United States. The goal of the Series is to develop new insights and recommendations to improve the governance of shale resource development and decision-making.

The Institute acknowledges and thanks our sponsors for their financial support. Most have been participants and supporters for many years. Their generosity and commitment to our work ensures the Forum can continue to provide valuable high-level discussion.

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Over the last four decades, the direct impact of the Forum on policy-making has always been difficult to quantify. However, the true lasting and ultimately more important influence of the Forum has likely been on individuals who attended – and how they have carried what they learned about issues and themselves in Aspen into the broader policy and business arenas. Forum participants gain perspectives, test ideas, participate in thought provoking discussions, make predictions (often proven wrong), and are inspired to act on key issues. Many of the key learnings and connections have occurred outside of the meeting room, with important professional and personal relationships established over meals, during free time, or on hikes. The Aspen Forums have fostered both knowledge and friendships, and they will surely continue to do so for many years to come.

David Monsma

Vice President | Aspen Institute
Executive Director | Energy and Environment Program
The Aspen Institute

EXECUTIVE SUMMARY

Across the US there are a wide variety of opportunities to produce oil and natural gas from shale resources. These opportunities have been greatly enhanced in recent years with the advent of directional drilling technology combined with hydraulic fracturing completion techniques, which have expanded the economically recoverable oil and natural gas reserves. At the same time, the development and production of shale resources have posed real challenges and potential risks to public health and the environment. Considering both the benefits and the potential risks, each state decides whether new oil and natural gas production should occur based on geology, data, analysis, input from the public and operators, economics, public policy and the state's experience with drilling activity.

Continued shale oil and gas development may require coming up with processes and structures to identify and respond to its potential health, environmental, and community impacts. Improving shale governance is challenging, especially in the current governmental context – where people have moved to the extremes and have experienced a stunning loss of faith in U.S. institutions and informational sources. State regulators, who are the key actors in shale governance, have encountered increasing conflicts with local and federal governments and other state governmental entities. Within states, for instance, hyper partisanship reigns, legislators do not trust executive agencies, local governments do not trust state governments, and everyone is acting with limited information and constrained resources. Regulators need better information and skills to be able to better adapt over time to changes in technology, practice, impacts, and concerns. An academy for regulatory excellence is one idea for promoting that goal; the idea is already being considered and advanced by some oil and gas regulators, but many questions remain about the curriculum, the logistics, the scope of potential attendees, and the funding.

How regulators utilize the science related to shale oil and gas development in making decisions is heavily influenced by how research is conducted, compiled, and presented. Research that is suitable for use in decision-making generally has seven desirable characteristics; it is relevant, prioritized, available (i.e., transparent), evident (i.e., findable), comprehensible, reliable, and credible. There are a range of potential measures and mechanisms – some of which already exist or are being planned – to help regulators access existing research, identify and fulfill additional research needs, and get research funded. For instance, associations of regulators can poll their members for

research needs, solicit outside technical expertise to compile existing research on those needs, and synthesize and deliver that information back to regulators. A repository could be created where studies can be collected, sifted, synthesized, and judged by people qualified to do it. Forums could be initiated to bring together members of the regulatory, research, and funding communities to talk on an ongoing basis about research needs; within states, this could involve regulators working to better match their priorities with the work that state universities are doing. Research funding could be solicited from federal and industry sources, while being thoughtful about how perceptions of bias are addressed.

Even with good research, regulators still have to act in the face of uncertainty. There are different kinds of research-related uncertainty in the regulatory realm, including technical uncertainty (e.g., error bars in sampling or models), value uncertainty (e.g., generalizing the results of a specific time- and place-based study or determining what counts as a high risk), organizational uncertainty (e.g., accounting for organizational biases and the presentation of cherry-picked data), and conflict uncertainty (e.g., greater capacities for stakeholders to contest scientific evidence in regulatory proceedings). These forms of uncertainty often look the same in the regulatory process, but if they can be sorted out, different institutional responses can be used to move forward in the face of uncertainty, including solutions such as putting validation practices in place, thinking more about bodies of evidence than about individual studies, and reaching out to other states dealing with the same issues.

In addition to greater utilization of research, improving shale governance also has to involve enhanced stakeholder engagement efforts. Stakeholder engagement is a vital undertaking for conveying information to and receiving information from affected constituencies. There is a spectrum of potential engagement, ranging from information dissemination to more collaborative and partnership-based efforts, and there are stakeholder engagement models within the industry and in other sectors that are worth studying.

Within the industry, the issues around fracking have become highly salient and controversial among the public, in part because the proximity and scope of shale development are so much greater than conventional development. While the public lacks expertise with regard to the details of the hydraulic fracturing process, state regulatory structures, or scientific causation of harms, communities are just trying to express their experiences with the whole process. From the point of view of those living in fence-line communities, their problems are tied in some form to the shale development that has come into their communities. Their experiences and anecdotes are just as real as statistical significance and technical accuracy, and they just want the problems to go away. Denying such perspectives, as industry and regulators have historically done, sets up a barrier to solving problems. Regulators and industry may need to shift the opportunity structure to allow better airing of community concerns

and greater two-way engagement. They can raise citizen awareness of regulators' existence, publicize industry compliance metrics, increase real-time monitoring, better train engineers on how to engage with the public, institutionalize community and stakeholder discussion groups, and pursue other collaborative approaches to address and head off stakeholder and community concerns. Nonprofit groups also play a key role in how people understand – or do not understand – the science and the development activities occurring.

IMPROVING SHALE GOVERNANCE

Continued shale oil and gas development and production may well require coming up with generally agreed upon principles, standards, and processes to identify, prioritize, and respond to the potential impacts on human health, the environment, and communities. Doing so may in turn require addressing larger issues of governance, dealing with disputes between levels of government, and pursuing ways to achieve continual regulatory improvement.

BROADER ISSUES IN GOVERNANCE

Governance can generally be thought of as reasoning together and acting together. While governance is a broad, multi-stakeholder effort to identify and manage risks, the key players are often governments.

The work of governments at all levels can be challenging. There is always some level of inefficiency when making policy choices, as there are values that lie outside the market that have to be balanced. Governments are continually trying to balance capitalism and equality to come up with something that works. (Corporations have similar balancing struggles, with profits on one hand and things like community relations, treatment of workers, sustainability, diversity, and corporate social responsibility on the other.)

The work of governments is particularly challenging now. Increasingly, U.S. presidential and other elections are swinging the country in reactionary ways from one extreme to the other, rather than finding a rational middle. Those in the extremes will never be satisfied; it is easier for people to stay in their corners than to come in and compromise. Because it is not at all easy to get a government on whose goodness and wisdom one can rely, there are internal safeguards or side boards to prevent government actors from doing too much damage. There has been, however,

When there are divergent sources of information and no trust in “opposing” sources of information, there is no longer a common knowledge base for making collective decisions.

a stunning loss of faith in U.S. institutions over the past few decades, which has serious implications for questions of governance. When there are divergent sources of information and no trust in “opposing” sources of information, there is no longer a common knowledge base for making collective decisions. Ideally, as a society, citizens should have a responsibility to actively pursue knowledge and facts, not just what is delivered to them in echo chambers, but civil discourse has eroded.

An additional governance challenge is that government is mostly reactive, taking action when situations compel it. Sometimes that initial reaction morphs into being proactive – expanding from a particular crisis to anticipating and preventing potential new problems – but it is a huge challenge for regulators to be proactive instead of reactive. For one thing, the industry is constantly innovating and using new technologies, which makes it hard for regulators to stay ahead; regulators do not always even find out about the latest developments that could affect the efficacy of regulations (though their staffs might be aware). In addition, if government is too proactive, it is viewed as overreaching its regulatory authority. On the other hand, when a crisis occurs, government is generally criticized for not having the appropriate regulations in place for an unforeseen problem; a number of regulatory institutions are starting to experiment with a range of horizon scanning practices to get insights into where problems may arise in the future. Being proactive can sometimes be a challenge for industry as well, such as when new technologies to remedy problems are blocked by existing regulations that were enacted with good intent.

CONFLICTS BETWEEN LEVELS OF GOVERNMENT

State regulators are the key actors in shale governance, but they interact with other state government entities, as well as with local and federal governments. Conflicts between these government entities have been growing. Who governs, how they govern, how deliberations occur, and where there are tensions across institutions can all hinder efforts to improve shale governance.

Within states, it is a tough time to govern, and the trends toward hyper-partisanship make things even harder. In several state capitals, controversies around oil and gas tend to be much more about money than about health or environmental impacts. Wherever policymakers are discussing energy taxes, carbon taxes, severance taxes, and other energy-related topics, legislators and governors often readily admit they do not know much about the particulars. In many oil and gas states, state legislators have term limits, low pay, other jobs, and few if any structured committees or legislative staff. They are extraordinarily constrained with regard to information; like everyone, they act on very limited, rather selective, often biased sources of information. There is a hunger for what they feel is “useful” information, such as relevant case studies of what other governments have done. They have to make many

decisions in a short period of time and mostly fear making a mistake that will come back to bite them in the next election. They also want to design policies that can work over some period of time, so the same issues do not have to keep coming back to them session after session. They are reluctant, however, to engage with executive agencies as sources of information. Regardless of ideology or party, state legislators tend not to respect or trust executive agencies.

Local governments tend to be even more constrained. Many local governments do not even have a website or email address, much less larger capacity to engage in regulatory processes. Local governments sometimes do not even know that state executive agencies exist to regulate oil and gas development and often have no idea that other cities or jurisdictions have encountered the exact same issues. They are looking for anyone who can provide any kind of credible information and are often confused about where they would even begin to look. They do not know whom to trust and lack access, networks, and context. Local governments, however, tend to know who they do not trust; regardless of party or ideology, they routinely feel that they face tyranny from states. They feel disrespected by state legislatures and governors, and conflicts between local and state governments have been growing. States have reacted to local efforts to restrict oil and gas development by claiming jurisdiction and slapping down localities legally and politically. Looking ahead in shale governance, that could prove problematic, as that represents a silencing of voices that are concerned; instead, it may be worth exploring efforts more like co-management in the wildlife context, which are more about collaboration and partnership. Local government outreach, education, and training would also be helpful.

State regulators and industry have also conflicted with federal regulators. For example, when community concerns about the potential impacts of hydraulic fracturing on people's water became a big issue, the U.S. Environmental Protection Agency (EPA) felt compelled to step in to conduct a study. Every oil and gas state had rules on water, but industry operators who talked with the EPA felt they had no understanding of states' groundwater protection efforts related to the oil and gas business. State regulators had been regulating the industry for decades, and both the science and state regulations were relatively advanced, but the federal agency wanted to do things its own way. By many accounts, the agency did not appropriately handle the situation and did not work with industry, states, and communities well enough to get buy-in up front on how the study should be done.

AN ACADEMY FOR REGULATORY EXCELLENCE

Regulatory programs need to better adapt over time to changes in technology, practice, impacts, and concerns. The aim should be to pursue demonstrable regulatory excellence via a well-built participatory framework that leads to continual,

adaptive improvement of the regulatory process and decisions. A regulatory excellence academy is one idea for promoting that goal, with a curriculum responsive to the needs of regulators. The idea is still in the formative stages, but the Interstate Oil and Gas Compact Commission (IOGCC) is considering moving the idea forward.

Many questions about the academy still have to be sorted out, such as the content of the curriculum. It should be about both theory and practice, with a thumb on the practice side of the scale. The academy should be focused not just on engineering, which regulators can often learn about elsewhere, but also on other necessary skill sets such as social sciences, which could help guide regulators in responding to governance issues, setting goals for adaptive governance, and engaging with stakeholder communities. The academy could surface the systems

The aim should be to pursue demonstrable regulatory excellence via a well-built participatory framework that leads to continual, adaptive improvement of the regulatory process and decisions.

that limit regulatory actions, including things on the books and the dynamics not on the books that influence the framework in which regulators operate. Theory can be used to help workshop problems and situations that regulators are struggling with, and practical skills and approaches can be offered to help navigate them. (The focus does not need to be solely on governance failures; things do not have to be bad to get better, so a focus on how the status quo can be improved would also be valuable.) Content could include a history of regulation, basic economics, theories of governance and decision-making, community stakeholder engagement, risk

assessment and assessment of scientific studies, applied civics and political science, crisis communication and management, media training, and processes of continual improvement and adaptive management. In many ways, this would be a leadership development curriculum for regulators.

The logistics of how the academy's curriculum is presented also have to be defined. There are questions about how many hours or days the program should be, whether it is a one time thing or has a continuing element to it, and whether it is in-person or online. There could be a combination of in-person, multi-day foundational courses and online, follow-up, advanced workshops. There are pros and cons to all options. In-person gatherings have value, not least because relationship-building matters and because many people learn better and can better work through situations face-to-face. To make it easier for people to attend in person, the academy could be hosted by a rotating set of educational institutions around the country, rather than having a single location or conduit. It would be foolish, though, not to take advantage of distance learning where possible, especially as it is a good way to help more experienced regulators get occasional updates. Multi-day classes

could provide vast information, but a seven-day intensive session on several topics risks giving attendees tons of good ideas and then returning them to the real world struggles of permit backlogs and the like; it might be better for people to eat a few ounces at a time and have time to digest them, rather than to eat the whole cow at once. In addition, not everyone can get budget dollars for multi-day classes, and smaller states with less-developed programs cannot afford to have one of their directors taken away for multiple days. Another option would be to have more a la carte options that are perhaps held before or after other conferences.

The scope of the academy's attendees remains unclear as well. It could be only for state level staff or also for federal and local. While local government officials could benefit from training on governance, shale, stakeholder engagement, and the like, their issues are also fairly distinct from the ones faced by state (and federal) regulators. It is conceivable that the state attendees of the academy could go back home and establish local training to share what they have learned. There is also a question as to whether the academy would just be for regulators or also other stakeholders (e.g., industry), as well as whether it would be directed toward traditional oil and gas agencies or include a wider range of natural resource, environmental, and health regulators. In addition, the academy could be only for mid-level folks who could use development opportunities, or it could include junior and senior folks as well.

Funding for the academy is a big constraint, and there are many model choices. One option is to charge attendees. This is how some executive-level training programs at universities work, but regulators' abilities to pay vary widely. Some could pay a portion of the costs, but most probably could not pay anything. In addition, many states provide their own training to employees, so states would have to be convinced that the academy offers something more than the state training programs in order to justify the added cost. Depending on the curriculum, there might be industry interest in sending mid-level and other staff to the academy, and they would pay tuition to attend. The academy could also potentially work with licensure boards to ensure attendees receive continuing education credits for attending, which would be an attraction and increase willingness to pay. Another funding model would be to set up the academy as a nonprofit organization that allows corporate donations. Industry money is the most likely option, but there are concerns about whether that taints the program. It would also be a natural fit for federal funding, perhaps via a matching fund approach. Private foundation money is also possible, as is identifying a single donor to support the academy, which is how a lot of university-based institutes and Aspen Institute fellowship programs are funded. There are people who made their wealth in the oil and gas sector and also care about the environment, public health, and the interaction of regulators and industry; those people could be found and solicited for support.

It would make sense to start the academy in a pilot phase, starting small to see if there is interest, build enthusiasm, and test out some of the basics. It is worth exploring ways of collaborating with other organizations such as IOGCC, the Environmental Council of the States (ECOS), or the Groundwater Protection Council (GWPC). For instance, IOGCC already meets twice a year, with many state regulators in attendance. Because it is already on people's calendars, it would be practical to do an initial pilot of the academy in conjunction with an existing IOGCC meeting. An alternative next step might be for a state to put the program on internally and invite neighboring states.

It is also worth understanding the training programs that already exist and how best to tie the academy into them. For example, there are already technical workshops on specific topics that entities such as IOGCC run. Similarly, the Interstate Technology and Regulatory Council (ITRC), which is a subset of the Environmental Research Institute of the States and in turn a subset of ECOS, already instructs regulators and others and could provide a potential model. (ITRC evaluates technologies for acceptability in regulations and industry and is mostly focused on remediation.) In addition, the National Academy of Public Administration or the American Society for Public Administration might provide useful models.

USE OF RESEARCH IN DECISION-MAKING

Science is a pool of knowledge, and research is how that pool gets filled. How the science related to shale oil and gas development is utilized in decision-making is heavily influenced by how research is conducted, compiled, presented, and prioritized. Ultimately, regulators have to make decisions about risks using the limited information available to them.

CHARACTERISTICS OF RESEARCH USEFUL FOR DECISION-MAKING

Scientific research can inform regulatory decision-making and help regulators address and anticipate problems. Regulators make rules that have the force of law and that can result in penalties on operators, and they would like those rules to be grounded in good, clear science so their efforts are easier and more defensible. In addition, it is useful for regulators to be well-informed because they are sources of information for others such as local governments, legislators, and the public, and it is better if the regulators have accurate information to disseminate.

Science is a pool of knowledge, and research is how that pool gets filled.

Research that is suitable for use in decision-making generally has seven desirable characteristics. As described below, it has to be relevant, prioritized, available, evident, comprehensible, reliable, and credible.

- *Relevant* means research that is useful to the decision that has to be made. The academic community often picks research based on researchers' literature reviews or topics agencies will fund; academics are looking for ways to add to scholarship and get tenure. Researchers are not always focused on the needs of decision-makers. Research can range from basic to applied, but even research inspired by the pursuit of fundamental understanding can improve technologies and take end uses into account (with pasteurization as a prime example).
- *Prioritized* reflects the need for limited resources to be focused on the most important research needs.

- *Available* (or *transparent*) means having all information out there for others to use – not just the results, but also things like datasets and the actual program code used by researchers. The hallmark of science is supposed to be the transparency of how it is done so that anyone can use the same methodology and get the same answer, but there are numerous realities that make it hard to be as transparent as needed to facilitate reproducibility. For instance, if researchers are studying groundwater in a basin, they cannot publish the GPS coordinates of where the wells were, in order to protect well owners who fear effects on property values and litigation if researchers find something when analyzing the water. For health studies, federal laws prevent researchers from sharing some data. In addition, there is a sense among researchers that the data is theirs to use and publish. There is also the “file drawer” problem: that it is challenging to get null or inconsistent studies published in the literature, so they stay in a drawer. Guidelines have been put forward offering best practices to promote transparency and openness in academic journals, but these guidelines are relevant to decision makers, policy analysts, and others as well (with some adjustments).
- *Evident* means that the research can be found amidst the ton of information out there, such as in a repository of some sort.
- *Comprehensible* reflects the need for research to be explained in plain English as much as possible, with impartial descriptions and interpretations of both single studies and bodies of research. People on the regulatory/policy side can be every bit as smart as scientists, but they have different training. Groups such as think tanks and university centers try to do some translation, and some have tried to come up with processes to assess the quality and directionality of the findings in the bulk of the literature on a topic. Helping policymakers understand what the literature does and does not say is important. For instance, in reviewing the health literature related to oil and gas development, many studies look at oil and gas development activity, use what is known about the toxicity of chemicals used on well pads, and then sometimes draw very strong statistical inferences to health outcomes, but with nothing in between about burdens (e.g., emissions), concentrations (e.g., air quality), and exposures that can make the causal linkages to impacts clearer. Different types of health studies are designed to give different types and levels of evidence, and it is helpful for policymakers to understand those differences.
- *Reliable* involves quality control in the conduct of the research itself.
- *Credible*, which is affected by all of the above characteristics and matters perhaps more than anything else, is about both whether the research is believable and whether it is believed (which is very audience-dependent). Issues related to

impartiality, bias, funding sources, and other factors affect whether the research is seen as independent of any particular viewpoint. Whether research is believed by the audience also often depends on larger trust relationships, and people tend not to trust the industry, industry-funded research, or the regulators. Relatively little research is actually viewed as neutral, which is a real problem. Even with high-quality researchers and data, believing the results often depends on what side of the fence one is on; those who do not agree with the results will refute them regardless of credibility, and vice versa. Although people can acknowledge facts that they do not want to be true in some circumstances, confirmation bias is a constant issue that has to be acknowledged.

HELPING POLICYMAKERS AND REGULATORS ACCESS EXISTING RESEARCH

As noted, research has to be evident (i.e., findable) to be useful. It is a challenge for researchers in a range of institutions to get the research they have done into the hands of those who can use it. There are several possible avenues worth pursuing for getting data and research to regulators.

Perhaps the best way to start is to ask policymakers what they need or want to know. For example, IOGCC is in the process of adopting a new program that is designed to interface regulators, in a systematic way, with people who have technical information. IOGCC will survey its state regulator members annually to identify the issues most important to them about which they want more technical information. IOGCC will send those requests to the American Petroleum Institute (API), the Society of Petroleum Engineers (SPE), and other technical bodies focused on oil and gas and ask for a compilation of the latest information that is already out there on those issues. (The technical outfits are volunteering their time in order to provide the output to a useful audience.) IOGCC will then synthesize the information and give it to regulators in a package they can absorb. Regulators do not have time to sift through thousands of studies, so it would be very helpful to them to have the information synthesized and distributed. It is a custom digest service on topics of interest. IOGCC does some of this in an informal way now, such as communicating with members sporadically on their needs, and there are also occasionally industry presentations at conferences on the latest technologies and research, but there is no formal mechanism that exists like the one IOGCC is planning.

The IOGCC approach, of course, is focused on oil and gas regulators' needs, not public health or environmental regulators' needs. The issues around the industry and communities, though, are broader than just those covered by oil and gas regulators. Approaches similar to the IOGCC model could be pursued by ECOS, GWPC, and perhaps others, polling members for priority informational needs. ECOS already has

a web clearinghouse updated annually where states can provide information (e.g., best practices) on what they are doing to reduce methane emissions, but ECOS is still trying to get a handle on its broader research needs. Coordination among the various groups could be beneficial as well, particularly as there are some technical issues that have impacts on environmental issues.

There is also research out there that regulators do not realize that they need, but should still be brought to their attention. The mirror approach is therefore needed too, with researchers figuring out on an ongoing basis what kind of topics they think regulators need to hear about.

An additional or complementary approach would be to create a repository where studies can be collected, sifted, synthesized, and judged by people qualified to do it. If an academy for regulatory excellence is created and matures, as discussed earlier, it could house the repository, compiling what is hot in oil and gas research and presenting it as part of the training. The regulators gathered at the academy could discuss what they want to know, create priorities, and learn about what is already out there and what is new in the field. The academy could provide the hub and coordinating structure, while a network of other existing expert groups fulfills the judgmental / review function. A repository for shale studies that extracts their relationships and results and incorporates the findings in models and scenarios would be a particularly useful approach – like the EPA's Environmental Benefits Mapping and Analysis Program (BENMAP), but for shale.

Academics also are not the only ones with potentially useful data. Operators often have huge amounts of empirical data, which can be particularly valuable given the significant variation in shale and the earth sciences, though much of that data is locked away due to confidentiality agreements. Operators could work with regulators on task forces to find ways of addressing issues using empirical data.

None of these issues are unique to the oil and gas industry. Other industries are regulated by states and have suboptimal information. It would be worth exploring how other sectors address these issues. The Electric Power Research Institute, for example, may or may not be a good model to consider.

IDENTIFYING AND FULFILLING ADDITIONAL PRIORITY RESEARCH NEEDS

Stakeholders and users of research include operators, regulators, legislators, advocates, and the public, and all of them could probably come up with a list of additional things they would like researched. Operator research needs, for instance, would tend to focus more on technologies and community impacts – on how they can do better what they do every day. Issues such as alternative sources of water,

alternative completion techniques (to minimize sand use), and the like are becoming more important as lateral wells get longer and denser techniques are utilized. In researching impacts on communities, operators would also like the focus to be not only on the negative impacts, but also on the positive ones, such as the uses of the increased local government revenues. In addition, there are interesting opportunities for research on how produced water can be used to create a subsurface battery that can back up renewable power.

There are other potential priorities that might be of great interest to a range of stakeholders, such as impacts on groundwater, health, and habitat (e.g., locating pipelines in the same corridor to minimize disruption). Holistic research would also be helpful, looking overall at pollution issues in a basin. For instance, if a basin is in a non-attainment area for ozone and has a violation of the ozone regulations, permitting thresholds for air pollution could go down, with big impacts on the oil and gas industry. Many issues are linked, and research that takes a broad view would be of benefit.

Deciding which research needs to actually pursue is not simple.

Regulators might have other desired research needs as well. The staff of one state's oil and gas commission flagged the following as key areas of concern: barriers to converting flare or vented gas to electricity; wellbore integrity, especially with respect to aging infrastructure; reclamation costs, especially with respect to saltwater vegetation kill; affordable remote sensing to find flow lines, pipelines, and the like; stray gas; and the lifecycle of wells from a regulatory standpoint (i.e., whether there should be a point when operators are required to plug and abandon). Research priorities could also include research on the effectiveness of regulations, including differentiation of regulatory stringency by risk, and research on the social science aspects of sound decision-making. In addition, there are still many things to be understood about the rock, even as regulators, such as proper well spacing. Another research priority could be the potential for cheap sensors, both surface and subsurface, to detect problems (as is happening in Texas with TexNet, a new sensor network to identify quakes accurately in real time and help regulators manage disposal of fluids to keep earthquakes below levels that can cause surface damage).

Identifying stakeholders' desires for additional research is not necessarily a difficult task, but deciding which research needs to actually pursue is not simple. Regulators need a process for determining what research is needed, as not everything can get funded or will have political leeway to be pursued. There have to be some criteria and buy-in from the right people (e.g., the legislature, whether it is funding the research or not). There also has to be a way to distinguish the time-scales of research needs, as some are long-term while others are immediate. Regulators and policymakers are not the only potential users, though; citizen groups should also be at the table

in setting research priorities and formulating research plans. If there is no effort to figure out what communities living right next to development feel is relevant and a priority, the research agenda could be seen as crafted by elitist outsiders.

Compiling a research agenda could be done in a few ways. For instance, if the planned IOGCC survey process (or a similar one pursued by ECOS, GWPC, or others) reveals there is no or minimal existing information on a requested topic, that provides a useful data point about a need for research. The groups that poll their members could compile state research needs that appear to be unmet by the existing literature and take those to federal (or private) funding sources. The targeted surveys of key stakeholder groups could also help identify areas of overlap regarding key research needs; a research agenda coming from a multitude of states and stakeholders could be very compelling. Those compiling the research agenda, however, should remain cognizant of the fact that,

Universities would welcome the opportunity to do locally useful research.

just as with existing research, it is possible that there are things they do not know they need researched. Calls for proposals could therefore have sections not only for pertinent research topics identified as needs, but also for people to submit proposals that are more exploratory.

Fulfilling the identified research needs is another challenge. GWPC, for instance, has a research foundation that funds some studies on oil and gas and water issues, and it has tried before to gather the needs of its members and fund a few research needs directly, but getting the word out to researchers is not something it does well. In the absence of a clear indication of what research is needed, academics will do the research they want to do and that they can get funded. If they see a need, though, and can get funding, many institutions and researchers are inclined to be useful.

Use-inspired research requires an engaged scholarship model that involves talking with potential users before developing research questions. It could be helpful to have a forum of some sort that brings together, at a minimum, members of the regulatory, research, and funding communities to talk on an ongoing basis about research needs. EPA's Office of R&D could establish a program like this, and states could also organize their own conferences for regulators and academics around open, transparent oil and gas data systems; one such conference is already planned for Pennsylvania.

Within states, it could be helpful to better match the priorities of state agencies with the work that state universities are doing. It seems like this kind of communication does happen in some states, at least on an informal basis, but it could happen in a more formal, regular way. Universities would welcome the opportunity to do locally useful research. State regulators generally have little to no funding that they themselves can offer, but they can bring something else valuable to the table: data. There is

probably all sorts of interesting data in forms and submissions that universities would love to access, with benefits to regulators too. (Much data is already in the public domain, but not all, and researchers may not even know it exists.) The ideal would be if regulatory agencies and state universities could agree on high profile, high-need topic areas that would benefit the state, which might strengthen their arguments before state legislatures (as well as federal and private sources) seeking funding for them. In addition, if a regulator can interest a social science researcher in a research topic, sometimes they can just go do the research, since much of the social science research done at universities is out of researchers' own interests without funding.

FUNDING FOR RESEARCH

For the most part, research costs money, and money is a thorny issue in many ways. For one thing, many state regulatory entities (and their broader associations) do not have much of it for research. The only money some agencies have for research is what the legislature provides, which usually happens when something explodes (metaphorically or not). When legislatures do grant research funding, it is rarely a slush fund for agencies to do with as they please; instead, the funding is directed towards a particular study. States have such constrained budgets that state support for studies is rare. Occasionally an issue gains such prominence and/or a researcher makes such a compelling case that a state legislature will pass a law to fund a study, but that is a cumbersome way to fund science, and it is unusual.

The federal government tends to be one of the main sources for research funding. It has elaborate structures for funding science, including the National Science Foundation, health agencies, and R&D offices within agencies. If big enough research issues are identified, these entities can be approached to put together Requests for Proposals (RFPs) and activate a network of research universities. (Federally chartered organizations such as the National Academy of Public Administration might also be interesting venues to explore.) The federal government can do some work of broad application that would benefit individual states and programs, and states and regulators have generally been supportive of the research programs at the federal level. While the federal government has money, research dollars at agencies such as EPA are very likely to go way down under the new Administration.

The private sector is another possible funding source, and it is worth exploring how to get industry associations and perhaps individual companies to fund research of mutual interest. This could be done indirectly, such as by directing a small part of severance taxes towards research of broad use and applicability. Some states have a small tax on electric utility bills that goes to an agency that makes grants for research on in-state electric utility issues, and something similar could be done with oil and gas severance taxes. Brazil and Mexico have a fund like this that goes to universities.

Creating a research fund from severance taxes, however, is probably a non-starter for many states. In addition, it would be a struggle to get the industry to buy into the severance tax fund concept because it would just be giving money away without a clear purpose or a clear problem to solve.

Rather than funding research indirectly via severance taxes, companies could provide funding more directly. Oil and gas companies, as well as other industries dealing with health and environmental issues, have had to fund research as part of legal settlements, but the industry could also just be proactive about it. To an extent, companies do this now with specific universities through consortia, and API and SPE can drive collective industry efforts on collaborative research that is of common interest. (API put out a call for proposals on air quality, water quality, and health effects a few years ago, but nothing ever came of it.) A great deal of industry-funded research at universities does really well and is widely valued. The risk of clouding from industry funding, however, is real, and the closer a research area gets to issues of conflict and politics, the more the issues of governance and taint from funding may arise. The results of the research could be instantly discounted in the minds of some.

Who is funding the study affects the credibility of the study, but no source of funding is pure. Many funders have results they are hoping to get from research. There is a need to be thoughtful about how the perceptions of bias are addressed. Having industry just give money blindly without influence over the research could make it appear more neutral, but the industry would understandably want more of a middle ground where it can help focus research in certain areas. Having a mix of funding sources could help boost credibility. For instance, getting non-governmental organizations (NGOs) to contribute funding – or at least to have a seat at the table in formulating research plans – could potentially blunt some of the attacks on the results of the research and help with acceptability. How funding is allocated is also imperative; calls for proposals, experts on review boards, and other transparent ways to determine what research gets funded can affect research credibility.

There are existing models that show how some of this can be done. For instance, Research Partnership to Secure Energy for America (RPSEA) was a ten-year construct funded indirectly by industry, from Outer Continental Shelf money. The concern about industry bias was something that had to be lived with, but RPSEA used rigorous RFPs to produce some good research on offshore and unconventional, including research that had environmental benefits as well as oil and gas benefits. Congress was not comfortable with the lack of control over the funding and let the program end after its decade, but it is not beyond reconstructing with a broader remit (though it would take some work). Similarly, the National Academy of Sciences program using money from BP (following the Gulf spill) utilized a rigorous structure to fund studies on impacts on the Gulf of Mexico. The National Academy put out a specific call for proposals to the research community, had a panel of experts evaluate

the research designs of the responses, and decided which ones to fund. The Health Effects Institute (HEI) presents a different kind of model, involving a mix of funding sources and a strict structure for impartiality. HEI is a public-private partnership for policy-relevant research (on the effects of air pollution on health) funded by industry, government, and other groups. It publishes everything, regardless of results, and has a review committee independent of the research committee.

REGULATORY DECISION-MAKING IN THE ABSENCE OF CERTAINTY

Even with good research, regulators are often – virtually always – acting in the presence of substantial uncertainty and in the absence of all the science they would like to have. There are different types of regulatory decision points where science and uncertainty come into play, including in the context of regular rulemakings, individual permitting or complaint procedures, conversations with potential greenfield communities, and crises that require quick responses. In most circumstances, regulators cannot wait for more science. They have to take steps, even if only small steps, knowing they do not have all the information and will have to adjust later as needed.

Science has often been used more as a shield to prevent regulatory action than as a means of helping to build sound regulations.

The plea for more science has, in the past, often been used more as a shield to prevent regulatory action than as a means of helping to build sound regulations. Industry and state regulatory agencies frequently talked about the need for more science in response to proposed actions at the federal level or in response to calls for action from advocacy groups. Good science, however, can support good regulatory action that lets oil and gas production proceed where it can be done with an acceptable level of risk, and the conversation about science and regulation is starting to shift more in that direction.

There are different kinds of research-related uncertainty in the regulatory realm, beyond just technical uncertainty (e.g., error bars in sampling or models). For example, there is value uncertainty, such as people coming to different conclusions on whether there is sufficient evidence to determine something. This manifests itself in many forms. One such manifestation involves the generalizability of research results. In the shale oil and gas sector, research studies are often based on conditions in a particular place and time, but because of variability in terms of surface and subsurface geology, the engineering and history of wells, state regulations, corporate practices and cultures, and the like, the findings in a particular study may or may not be easily generalizable to other places; at the same time, it is not possible to have studies everywhere and every time. The ideal would be to have science based rules that are different in different conditions in different areas, and some states do have a mechanism for

getting field rules that are different from statewide rules (though the mechanism may not be utilized often), but at a certain point a decision has to be made that there is enough evidence on which to act. Regulators are constantly trying to determine the rules of general applicability and how specific to get in setting protective thresholds, while allowing exceptions for particular cases.

It is rare that regulators talk directly to the scientists who did the work.

Dealing with something like setbacks for wells provides a similarly complicated example (though some would argue that state regulators should not be the ones figuring out setback distances at all, as that is more of a local planning commission function). There will not be one study undertaken that determines the proper setback distance. Instead, there will be many studies that determine varying answers, with setback distances differing based on how many other wells are around, what the other sources of pollution are (over which oil and gas regulators may have no control), what the vulnerabilities of particular communities are, and the like. In addition, the emissions coming off of a well site today may be different in five years, but setbacks could be based either on the current emissions or the ones expected in the near future. At some point, a decision has to be made.

Another manifestation of value uncertainty is in the translation of science into actual standards, which is hard to do. No matter how good the science, the translation into standards is a policy call, based at least in part on other political concerns within the governance structure. Any time there is science that relates to a regulatory question, there are always values that get layered in. For example, if there is objectively a 1 in 5 risk of something happening, people can vary on whether that is a high risk or a low risk, depending on how they think about the risk, how serious they think it is, or what would happen if the risk comes to pass. Someone may see a 1 in 1000 risk as pretty high if it is contamination of their well water that is at stake.

A different type of uncertainty is organizational uncertainty, which relates to organizing knowledge systems where some people have facts that others need. Most people get their knowledge through social processes, such as the media, and people believe things because many of the social sources say the same information on an ongoing basis. That is how the majority of working knowledge for the public gets acquired. That is also how most knowledge is acquired in regulatory contexts. Regulators get the information that they get, and they often get it from organizations that want something from them. Regulators have to try to sort through the issues of bias in research to figure out which groups have axes to grind and hidden agendas and which are relatively impartial. Increasingly, regulators first hear about studies that come out when reporters call them and ask for their views on the studies, but the media generally is not much help, as different media interpretations of the same

report can sound like totally different reports. Researchers' press releases and interviews on their research are often spun or taken out of context in particular ways to suit particular story lines or positions. (It has always been the case that advocates and industry focus on the parts of research results that support their arguments, but because of the current methods of information distribution, it does seem like this kind of cherry-picking of bits and pieces of information is happening more and getting wider play.) It is rare that regulators talk directly to the scientists who did the work.

There is also conflict uncertainty, which arises because different groups in the process argue about how to think about the science. For most of the 20th century, governments in the United States stressed facts as a way of settling or avoiding political conflict. As regulatory institutions evolved, there was a great deal of emphasis on getting to the facts. In response, anyone who cares about the outcomes of policy processes has invested in capabilities to interpret, analyze, conduct, and contest scientific evidence in regulatory proceedings. This is part of why there is scientific uncertainty in regulatory proceedings – the significant social capacity in a pluralistic political system for contesting science. Some would argue there is now a science denial phenomenon, whether on climate change, genetically modified organisms, fracturing, or other topics.

These forms of uncertainty often look the same in the regulatory process, but if they can be sorted out, different institutional responses can be used to reduce, eliminate, or move forward in the face of uncertainty. Solutions could include putting validation practices in place, such as peer review, evidentiary hearings, and expert advisory panels (although there are things those practices do and do not do well). Another solution could be to think more about bodies of evidence as opposed to individual studies – and, more broadly, to consider the seven characteristics outlined earlier. In the absence of sufficient research or data, a common solution is to reach out to other states dealing with the same issue to see how they have addressed it. In general, state regulators try to apply sound, methodical, principled decision-making processes that help them understand the issues, identify stakeholders, gather the available information, outline the pros and cons of options, and implement solutions with the understanding they may need to be adjusted going forward.

That adjustment is important. Decades of inattention to regulations have created something of a crisis; regulations need to be brought up to date with current practices and science and then be continually updated. Regulators should recognize that regulations are living documents that should evolve as the science does. Review schedules are built in for many rules, but states vary in their efforts to do regulatory review and/or mandatory sunseting of rules unless re-adopted.

Induced seismicity is seen by some as a good example of state regulators responding in the presence of uncertainty. When the earthquakes started, a lot of smart

industry geoscientists could not see how the earthquakes could have anything to do with saltwater disposal, given the different depths, the types of rocks, the pressures in different formations, and the like. Regulatory agencies took some science fairly early from analogous areas (e.g., developed in the geothermal context). Agencies also lacked information on where faults are, and some companies started disclosing that information (without compromising confidential data). Regulators shared information across states as well. Some agencies took conservative steps early, such as quickly shutting down certain injection disposal wells on a temporary order, with a subsequent hearing for operators to respond; cutting back on injection in some places has resulted in decreased seismicity. At the same time, agencies did a good job of countering misinformation, taking care to say there was no evidence the quakes were caused by hydraulic fracturing (and avoiding misuse of that term).

STAKEHOLDER ENGAGEMENT

Over the past decade, regulators and the industry have had to spend far more time engaging with communities and the public to convince them that they are doing their jobs responsibly. Stakeholder engagement is now a vital undertaking for conveying information to and receiving information from affected constituencies.

SCOPE OF STAKEHOLDER ENGAGEMENT

There are good reasons for stakeholder engagement. If done well, engagement can not only educate the public but also get the valuable information that is with the public into decision making processes in a way that is transparent and builds credibility. Stakeholder engagement can be a process for eliciting values from people affected by or affecting a decision and using those values to help make choices. It provides opportunities for people to have a voice, for shared learning, and for mitigating conflict. On the other hand, stakeholder engagement is also costly, and if done poorly, may not result in better decisions, can elevate squeaky voices, and can exacerbate conflict.

Context matters. There is variability across governments, states, communities, and risks, and this variability, along with the issues at play and the amount of time available, can affect the degree of stakeholder engagement, communication, and outreach pursued. It is important to differentiate between the stakeholder engagement that industries need to do with communities where they are operating, that regulators need to do when making rules and issuing permits, and that both (and other actors) need to do in thinking about the overarching priorities of shale governance. There is a spectrum of potential engagement, ranging from plain information dissemination to more collaborative and partnership-based efforts.

The set of potentially relevant stakeholders is broad. Most stakeholder engagement focuses on the communities exposed to local impacts from oil and gas development. There are also groups that are concerned about carbon and want to keep oil and gas in the ground. From the regulators' perspective, companies in the industry are stakeholders as well; some may perceive company participation in governance as skewing

the outcomes (e.g., regulations) to be more favorable to industry, but the people that work on the issues day-to-day are the subject matter experts who can inform governance and ensure rules are enforceable and effective.

There are stakeholder engagement models within the industry and in other sectors that are worth studying. Starting a database of strategies, tools, mechanisms, and venues would be valuable; it could perhaps be done as a masters' student project, though there is a question of where it should be housed. Within the industry, the Public Outreach Committee of the IOGCC and the Marcellus Shale Coalition could be good starting points for gathering information. In terms of other sectors, the chemical industry did a lot on how to communicate with neighbors. The water sector could also provide some instructional examples of stakeholder engagement, such as watershed partnerships that have brought together levels of government, NGOs, water users, and others to inform water management processes and sometimes to act as decision-makers. The Everglades restoration effort, for example, involves tribes and federal, state, and local agencies coordinating an institutionalized task force, with citizens, NGOs, and others playing indirect roles on an advisory committee; there is also a science coordination group. While certainly far from perfect, there is a lot to learn from examples like these about design principles for effective stakeholder engagement, how science gets incorporated, when politics does or does not get in the way of making effective decisions, the importance of building trust over time, and opportunities for learning.

CHALLENGES IN ENGAGING COMMUNITIES

Major oil and gas development has been both a blessing and a curse where it has occurred, bringing revenues and jobs but also bringing lots of other consequences – for which the overwhelming industry reaction has typically been denial of responsibility. There is history at play that matters. Industry has a long history of using science as a shield or barrier, denying any role in causing problems and telling people they are irrational. The worst way to persuade someone you are telling the truth is to tell them they are irrational. The issues surrounding hydraulic fracturing are just one example.

The issues around fracking have become highly salient and infused into popular culture, in part because the proximity and scope of shale development are so much greater than conventional development. Shale development is moving into areas that have never experienced anything like it before, in close proximity to people and homes, while at the same time residential development is encroaching outward, with people moving closer to oil and gas sites. So fracking is now mentioned in cartoons, TV shows, and movies and has become hugely controversial. Movies such as *Gasland* show hydraulic fracturing going into aquifers, and the public believes the makers of *Gasland* more than the industry or regulators. There are organizations such as Reclaim the Power that are mobilizing and getting organized on civil dis-

obedience. There was a time that most people got their information from the news media, which was often wrong technically and contributed to the problem, but now it is even worse that people are getting their information from social media, a major disseminator of false information. What people think the industry does – whether it does it or not – is a cause of concern. On the other hand, the industry is not doing itself any favors with outlets such as *Energy in Depth* that reflexively attack any studies seen as unfavorable to the industry.

Public perception drives legislation and regulation. The public views the oil and gas industry as one big entity; it does not and should not really be expected to be able to differentiate one company from another. When there are parts of the industry that are not achieving the same successes as others in working with communities or in operating responsibly, those negatives always spread; for some reason, the positive interactions do not. The public also does not understand the state regulatory structures, but a lot of the conflict and friction around shale oil and gas development seems to be coming not from downhole issues but from surface issues, which tend to be handled more by environmental regulators than by oil and gas development regulators. Better shale governance has to include better engagement with environmental regulators, otherwise there is a risk of missing the larger issues that communities care about.

The issues around fracking have become highly salient and infused into popular culture.

In general, the lack of expertise within communities has to improve. The public tends to lump everything involving shale development under the term “fracking,” whether a surface spill or groundwater contamination from poor well-casing integrity. Experts know the difference, but the public does not, and it is not clear that educating them is a battle worth fighting. The public typically relies on anecdotal evidence, rather than hard facts; they do not care if it is technically a frack or just a surface spill, they just want the problems to go away. From a community standpoint, experiences and anecdotes are just as real as statistical significance and technical accuracy. Denying such perspectives, as industry and regulators have historically done, sets up a barrier to solving problems. Industry or regulator comments that minimize anecdotal evidence immediately create antagonism, setting the regulator or company in opposition to what the community might value.

It would behoove industry to get in front of this and get into communities to lay the framework of what to expect, but the industry is so competitive that companies will not divulge which areas they are moving into until all the land is leased and ready to go, at which point the clock is ticking on getting wells going, which means there often is little time for community outreach. The community is usually entirely excluded from the decision of whether to develop in a location at all. Decisions about what

infrastructure to build and where have historically been made by the industry, with a little bit of regulatory oversight and process. The access point for fence-line communities is therefore in rulemaking, permit, and complaint procedures, which are technical processes late in the game where the information that exists within communities is not solicited and where their concerns do not get the same airing. In energy issue after energy issue, the industry's unwillingness to disclose before everything is settled represents a huge governance challenge. There are other sectors where this is not the case – where there are more public processes that engage citizens in land use and urban planning ahead of time. An inflection point may be approaching, where people either remain comfortable with industry-driven decisions or where engaging people in the design of their local energy future becomes much more important.

STEPS REGULATORS CAN TAKE

Regulators may need to shift the opportunity structure to allow better airing of community concerns. Two-way engagement is important, not just one-way (though there is still a need for tools to enhance one-way educational engagement). It is incumbent on regulators to think of better, two-way advisory processes; there is value in developing long-term, robust institutional arrangements. A regulatory agency, for instance, could utilize a multi-stakeholder engagement group every couple of months to discuss issues and get advice on how the agency can engage stakeholders on them. For many in the community, 90% of the issue is wanting to know they have been heard and really listened to in the process. If regulators go right to trying to solve problems from a technical standpoint, the community has not been heard. Governance needs to bring those two aspects together. If the governance structure is at least considerate and balanced, people are more likely to abide by it even if it does not produce their desired decision. If people do not trust the fairness and inclusiveness of the process, though, they are less likely to abide by it.

It is a struggle, however, for regulators to figure out how to deal with anecdotal evidence from communities. On the one hand, things seem very real to the people experiencing them, but the industry can also rightly counter that there is no evidence of any connection between their activity and the claimed harm. There is no easy answer. Anecdotal complaints may just require a different approach to addressing them.

Awareness is a key first step. If citizens are aware that the regulator even exists, their confidence jumps. Regulators can also put on their websites what actions are triggered when an individual call comes in and what happens when a critical mass of calls occurs. Real-time compliance dashboards can track incidents, regulations, enforcement actions, and other metrics and can be effective in the media response to an incident. Reports on industry performance can highlight for the public where

incidents have occurred, which companies have to improve performance, and which companies are doing a good job. Some regulators have launched efforts to tell stories about how the regulator operates – the qualitative stories behind the numbers – and have found them to be seen as more credible; although regulatory agency staff may view such efforts as “fluffy” or not serious, stakeholders find them more accessible and relatable.

Technology and research might also be useful. For example, for episodic issues, remote sensing could help. Regulators can deploy resources such as mobile air monitoring vans or 24-hour monitoring of air emissions. For systemic issues, historical data could be mined to link spatial and temporal data about every well with medical records in the region. That said, there is already real-time monitoring for many things, such as sound, and even if the monitors show compliance, complaints still occur. Being in compliance will not make anyone feel better if they still think it is too noisy. In addition, some people may be looking for financial gain from reaching settlements with companies with deep pockets. Studies of cases of anecdotal contamination have shown few with any actual evidence of a link to oil and gas development activity, and those who proceeded with litigation were generally wealthier people who believed they had been wronged. Poorer people simply wanted remediation.

Area-based regulation can take account of the issues of specific importance to stakeholders in different regions, which can vary. Some regulators are also beginning to use social research to tailor their engagement and communications efforts and to identify trends in areas before they become explosive issues. Many state regulatory agencies, though, do not even have a public information officer. While it would be ideal for regulators to bring in social scientists and experts in public engagement, that is not always a practical option. People well-versed in technical knowledge, however, may not be the best at talking to communities. If there is a forum about water contamination under homes, and an agency engineer responds to a woman concerned about dying prairie dogs by noting that they are actually ground squirrels, that does not go over well. Engineers generally do not get training about engaging with the public, but that now has to be part of their day jobs. This could be a task taken on by SPE, to better train their people to be messengers in communities.

STEPS INDUSTRY CAN TAKE

The industry and communities need to figure out how to better co-exist. Just as communities generally do not get a say in where shale development happens, the industry does not get to vote on whether subdivision developers can expand into their areas. Similarly, if an operator has decided on a depth for drilling and then someone puts in a super-deep residential water well, the operator’s wells are suddenly out of compliance. There is a need for back-and-forth communication to enable co-existence.

At every stage of the oil and gas development lifecycle, there needs to be a community engagement strategy for all stakeholders involved. Engagement needs to be designed around the communities where operators are, which have different histories and concerns. What works in one place may not work in another.

The industry and communities need to figure out how to better co-exist.

Most operators in North America have at least something on their websites providing some kind of information to the public about what is going on. The industry has put forward efforts such as FracFocus to be more transparent on what is in the chemistry, and other approaches

to tackling issues (e.g., induced seismicity) have included very public efforts and tools. Some entities are trying to make clearer how companies are working above and beyond regulations, which may be particularly important in an era when people perceive industry as benefitting from federal deregulatory efforts. Companies have hosted tours of frack sites, set up booths at state fairs, and otherwise tried to convey information about their activities. These are important, but they are also one-way engagement approaches.

Even some companies that have led the way on stakeholder engagement have not done well in terms of two-way engagement. Listening is important for the industry; it is not a viable option to shrug off the concerns of the general public (or anyone else). For instance, working with local officials to ensure that truck traffic is not running during school times can help communities address some of their fears and prevent them from snowballing into bigger concerns. Some operators are teaching employees how to engage and be ambassadors among their friends, family, and neighbors. Some in the industry are co-funding synergy groups that bring in communities and operators for ongoing discussions about concerns and issues, which have helped reduce tensions and improve relationships. These are collaborative approaches, where people feel heard and considered.

ROLE OF NGOS

Stakeholder engagement is only partly about what the science shows and what industry operators do. It is also about what people *perceive* the science to show and the industry to do. Companies will not be their own validators; ultimately, other stakeholders must lead that validation. Nonprofit groups play a key role in how people understand – or do not understand – the science and the development activities occurring.

Nonprofits are part of the governance framework, and the environmental and public health community is no more monolithic than the industry is. Some NGOs noisily oppose all development and do not really add much to the discussion, though they

get a lot of press and have the ears of some legislators. These groups will stir the pot no matter what industry does, sometimes seem to operate without regard to facts, and have no interest in compromising or offering suggestions. Other NGOs work with industries, being tough but pragmatic. Some have had the opportunity to tour oil and gas sites and have found it very instructive, but many NGOs have not had that chance. NGO partners can help illuminate different issues, ways of thinking, and ways of preparing for community engagement.

When regulators and operators do community outreach, they are encountering a situation where there is already a lot of misinformation. It might be beneficial to have a national-level partnership between the industry and a respected environmental organization to give Americans a baseline of facts related to fracking. There could, for instance, be a temporary exhibit that goes to different nature and science museums that describes what upstream oil and gas development involves and provides basic education. In general, having companies and regulators partner with respected environmental organizations boosts public confidence that companies will act more responsibly.

APPENDIX I: AGENDA

FRIDAY, SEPTEMBER 15

Roundtable Opening Reception and Dinner

SATURDAY, SEPTEMBER 16

Welcome and Introductions

David Monsma, Executive Director, Energy & Environment Program,
The Aspen Institute

Session One: Values, Leadership, and Governance

To orient the thinking and discourse for this forum, participants are invited to engage in a brief level-setting seminar using readings selected from the time-honored Aspen Leadership Seminar. These readings have been selected to encourage a joint exploration through open discussion of ideas, concepts, and values regarding leadership and governance.

Moderator: David Monsma

Aspen Leadership Seminar Readings:

- **Aristotle**, *Nicomachean Ethics* (350 BC)
- **Arthur Okun**, *Equality and Efficiency: The Big Tradeoff*, The Brookings Institution (1975)
- **Karl Popper**, *The Paradoxes of Sovereignty*, from *Popper Selections*, edited by David Miller (1985)

Session Two: Assessing Research Quality, Span and Replicability in Decision Making

The *intensity* and scale of oil and natural gas production from shale resources is different from most traditional production and it is often occurring in close *proximity* to communities and population centers – creating new types of risks. The potential risks include but are not necessarily limited to: water resources, air quality,

climate change, public health, and community socioeconomic quality. Though all producing states manage risks to human health and the environment posed by this production, not all states manage the same risks or manage them to the same degree. How can scientific research be used better to inform regulatory decision-making?

Session Three: State and Federal Research Priorities

Some risks have received considerable research attention while other risks have received considerably less than they might warrant. Operators, academics, government regulators, NGOs, and impacted communities each have an important role to play in seeking to determine the nature, extent, and response to these risks but they have differing and often competing obligations, constituencies, and tolerances. Where are the knowledge gaps about these risks? How might sustained interactions between different actors improve the identification and prioritization of research?

SUNDAY, SEPTEMBER 17

Session Four: Regulatory Decision-Making in the Absence of Certainty

There are instances where regulators are compelled, or otherwise obligated, to act swiftly in spite of factual or empirical uncertainties due to a lack of research or data. This challenge is not unique to the context of oil and gas development from shale resources, but this development is particularly controversial and therefore more prominent in the public eye, heightening scrutiny. Can policies and procedures be developed to encourage the timely production of useful research and data from those best able to produce it? How can the systems and processes of governance preserve the kind of progressive experimentation necessary for producers to survive a continued low-price environment (a “lower for longer” scenario)?

Session Five: Effective Stakeholder Engagement – Purpose and Process

There are many different ways to examine and describe the involvement of the public in civic and political life. Yet, effective public engagement can provide more nuanced and collective views about an issue by a broader spectrum of the public and present opportunities for the public to better understand a question, values at stake, and potential impacts. How is public engagement influenced and enabled in the shale context? How can public engagement be used to ensure that public decisions are optimal and the best fit for local conditions and needs?

Session Six: Breakout Sessions

Breakout A: Small group discussion about state and federal research priorities.

Breakout B: Small group discussion about effective stakeholder engagement.

Breakout C: Assessing scientific research in regulatory decision making.

MONDAY, SEPTEMBER 18

Session Seven: Breakout Reports

Breakout A: Small group discussion about state and federal research priorities.

Breakout B: Small group discussion about effective stakeholder engagement.

Breakout C: Assessing scientific research in regulatory decision making.

***Moderator:** David Monsma*, Executive Director, Energy & Environment Program,
The Aspen Institute

Session Eight: Moving the Conversation Forward

Building upon discussions in the preceding sessions and looking forward strategically, what are the priority needs that this group can identify or help clarify?

APPENDIX II: PARTICIPANTS

Scott Anderson, Senior Policy Director, US Climate and Energy Program, Environmental Defense Fund

Bruce Baizel, Energy Program Director, Earthworks

Gerry Baker, Associate Executive Director, Interstate Oil and Gas Compact Commission

John Baza, Director, Utah Division of Oil, Gas and Mining

Kim Blanchette, Vice President National/International Relations and Public Affairs, Alberta Energy Regulator

Jim Bolander, Head of O&G Engineering, Independent Energy Standards

Al Collins, Senior Director, Regulatory Affairs, Occidental Petroleum Corporation

Cal Cooper, Director, Special Projects & Emerging Technology, Apache Corporation

Cathy Foerster, Commissioner, Alaska Oil and Gas Conservation Commission

Dave Grossman, Principal, Green Light Group (*Rapporteur*)

Keith Hall, Director of Mineral Law Institute, LSU Law Center

Ken Harris, State Oil and Gas Supervisor, Division of Oil, Gas, & Geothermal Resources, State of California

Marilu Hastings, Vice President, Sustainability Programs, The Cynthia and George Mitchell Foundation

Tanya Heikkila, Professor, University of Colorado Denver

Zac Hildenbrand, Chief Technical Officer, Inform Environmental/UTA-CLEAR

John Howie, President, Tellurian

Kate Konschnik, Executive Director, Harvard Law School Environmental Law Program

Alan Krupnick, Director, Center for Energy and Climate Economics, Resources for the Future

Matt Lepore, Director, Colorado Oil and Gas Conservation Commission

Joe Lima, Director, Environmental Sustainability, Schlumberger

Dawn Lima, Subsurface and Development Manager, Bonanza Creek Energy

Rick McCurdy, Manager - Corrosion, Chemicals & Water, Chesapeake Energy

Lisa McKenzie, Assistant Research Professor, Colorado School of Public Health, University of Colorado

Evan Michelson, Program Director, Alfred P. Sloan Foundation

Clark Miller, Professor and Associate Director, Arizona State University

Ron Minsk, Fellow, Center on Global Energy Policy, Columbia University

Mike Paque, Executive Director, Ground Water Protection Council

Adam Peltz, Senior Attorney, US Climate and Energy Program, Environmental Defense Fund

Amy Pickle, Director, State Policy Program, Nicholas Institute for Environmental Policy Solutions, Duke University

Barry Rabe, Professor of Public Policy and Director of the Center for Local, State, and Urban Policy, University of Michigan

Nathan Richardson, Assistant Professor, University of South Carolina School of Law

Matthew Rinegar, Corporate Legal Counsel, Schlumberger

Martha Rudolph, Director of Environmental Programs, Colorado Department of Public Health and Environment

Nick Tew, State Geologist and Oil and Gas Supervisor of Alabama, Geological Survey of Alabama

Scott W. Tinker, Director, Bureau of Economic Geology, The University of Texas at Austin

Sarah Uhl, Program Director, Clean Air Task Force

Donna Vorhees, Director of Energy Research, Health Effects Institute

Eric Washburn, President, Windward Strategies

Lori Wrotenbery, Director, Oil and Gas Division, Railroad Commission of Texas

Dan Yates, Associate Executive Director, Ground Water Protection Council

Ali Zaidi, Precourt Energy Scholar, Stanford University; Senior Advisor, Morrison & Foerster

THE ASPEN INSTITUTE

David Monsma, Executive Director, Energy and Environment Program, The Aspen Institute (*Moderator*)

Greg Gershuny, Managing Director and James E. Rogers Energy Fellow, Energy and Environment Program, The Aspen Institute

Anna Giorgi, Program Associate, Energy and Environment Program, The Aspen Institute

Calli Obern, Program Associate, Energy and Environment Program, The Aspen Institute

APPENDIX III: SPONSORS

