THE ASPEN INSTITUTE SERIES ON ENERGY GOVERNANCE

PRINCIPLED GOVERNANCE OF SHALE RESOURCES

A REPORT FROM THE ASPEN INSTITUTE DIALOGUE ON ENERGY GOVERNANCE

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DISCLAIMER: This report from the Aspen Institute Dialogue on Energy Governance is issued under the auspices of the Aspen Institute's Energy and Environment Program and attempts to capture information, ideas, and perspectives raised during a series of three convened dialogue meetings. Not all views expressed were unanimous; not all comments represent the aim or outcome of the meeting. Participants were not asked to agree to the wording of this summary and, therefore, speakers and participants are not responsible for its contents.

The Aspen Institute is an educational and policy studies organization based in Washington, D.C. Its mission is to foster leadership based on enduring values and to provide a nonpartisan venue for dealing with critical issues. The Institute has campuses in Aspen, Colorado, and on the Wye River on Maryland's Eastern Shore. It also maintains offices in New York City and has an international network of partners. *www.aspeninstitute.org*

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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PREFACE

Beginning in October 2016, the Aspen Institute's Energy and Environment Program convened the Aspen Institute Dialogue on Energy Governance. This policy dialogue brought together a group of two dozen experts from the scientific community, industry, government, and other organizations focused on the governance of oil and gas development from shale resources. Over the course of the Dialogue, the group examined the different evidentiary foundations and approaches used in making management, policy and regulatory decisions. One of the initial goals of the Dialogue was to bring forward research and lessons learned regarding the governance of shale resource development and production across various levels of government.

The Dialogue commenced from the following question: ***How should the development and production of natural gas and oil from shale resources continue in the absence of generally recognized principles (or standards) to identify, prioritize, and respond to its potential human health and environmental risks?***

The major outputs of the Dialogue include findings, action-oriented recommendations, and a principles based governance framework. Together these outputs seek to clarify and improve the current regulatory context for anticipating and managing risk in the governance of gas and oil development from shale resources.

This report is issued under the auspices of the Aspen Institute's Energy and Environment Program. Although it is an attempt to capture the views expressed during the Dialogue, not all views expressed were unanimous. The experts who took part are identified in the appendix of this report. They participated in their individual capacity and their titles and affiliation are included for identification purposes only. Their organizations are not responsible for the views or other content of this report.

The Aspen Institute is very grateful for the generous support of the Cynthia and George Mitchell Foundation and the Alfred P. Sloan Foundation that made this Dialogue possible. Thanks as well go to Anna Giorgi who helped capture and edit the live discussion; Tim Olson who organized the wide-ranging discussions and worked with the participants to create draft findings; and Maggie Carroll who produced the final report.

The Aspen Institute Energy and Environment Program supports the findings, action-oriented recommendations, and governance framework contained in this report and believes they provide useful insights to those interested in continuing to improve the governance of shale resource development and production across the United States.

David Monsma
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INTRODUCTION

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.

The economic and social value of these new energy resources is important. We all use large amounts of energy derived from oil and natural gas and will continue to do so for the foreseeable future. Though a market glut and low prices have recently slowed production, as prices recover production is expected to increase and remain critical to the US energy future.

Production also poses potential risks to water resources, air quality, climate change, public health, and socioeconomic well-being, among other things. Therefore, as oil and natural gas production from shale resources has increased so too has the need to identify, assess, and manage the risks to communities and the environment posed by this production. **The *intensity* and *scale* of the production from shale resources is different from most traditional oil and natural gas production. It can also occur in close *proximity* to communities and population centers, because shale basins are widespread, continuous geologic deposits.**

Though federal and local regulations play an important role, states are the primary regulators of oil and natural gas production and have taken the lead role in ensuring that regulation is tailored to local conditions. States diverge in their regulatory approaches and often possess different levels of experience and philosophies for addressing risks. Even within each level of government, multiple agencies with different viewpoints often share regulatory authority over different aspects of oil and natural gas production. **The result is sometimes a mosaic of different regulatory approaches for relatively similar activities and resulting risks. Although all producing states manage risks to human health and the environment posed by oil**

and gas production, not all states manage the same risks or manage them to the same degree.

Potential risks to public health and the environment have been the topic of intense public and policy discussion. The intensity of this discussion has amplified as the scale of production has increased and expanded into locations previously unfamiliar with oil and natural gas production. The public and policy discourse reveals the challenges of connecting scientific research and other evidence to regulatory decision-making. Making sure that regulation focuses on the right risks and ensuring policy is implemented at the appropriate levels of government are ongoing challenges.

A wide range of academic, government, and NGO efforts have attempted to characterize and provide in depth research and analysis of the risks and challenges in shale resource development. Some research activities have focused their inquiries using analytical frameworks such as governance theories; risk identification; continuous regulatory improvement; best management practices; research and data development; and other analyses. To better understand the nature and extent of the risks, other research efforts have focused on how to improve the process by which scientific and social research is collected and used in regulatory decision-making.

In sum, although many of the documented impacts associated with oil and gas development have been manageable to date, the policy and regulatory decision-making process for identifying and mitigating risks associated with shale resource development can potentially be improved and better coordinated to address risks to human health and the environment, while at the same time not unduly interrupting the ability of industry to produce oil and gas.

ASPEN INSTITUTE DIALOGUE ON ENERGY GOVERNANCE – BACKGROUND

The Aspen Institute Dialogue on Energy Governance aimed to develop a range of ideas and recommendations to help better understand and improve the governance of shale resource development and decision-making. These ideas and recommendations, we believe, will help identify, prioritize, and respond to the potential risks to human health and the environment resulting from oil and gas production. The major emphasis of this work is focused on enhancing the collective capacity for recognizing and managing risks, and potentially improving the resulting regulatory decision-making process and related choices at all levels of governance.

The Dialogue initially focused on analysis of different evidentiary foundations and decision-making approaches used in environmental management, policy analysis and regulatory development, and then sought to clarify the current regulatory context for anticipating and addressing risk management in the governance of oil and gas

development from shale resources, including the powerful effect that political and economic interpretations can have on public perceptions, governance and regulatory choices. The Dialogue relied on a process of prepared dialogue aimed at advancing more coherent and informed regulatory responses at the local, state and federal levels. The Dialogue examined ways to improve the quality and rigor of evidence and research, and enhance risk communication approaches used in governance and regulatory decision-making. The participants pulled together a wide range of research and analysis on divergent policies and practices in order to both understand and address knowledge gaps where further research is needed, and to identify and examine practical actions that can be taken.

Specifically, the Dialogue sought to accomplish the following:

- *Understand the processes by which regulators, private sector operators, and community stakeholders identify and prioritize evidence of risks to communities and the environment posed by unconventional oil and gas production.*
- *Discuss different evidentiary foundations and research evaluation approaches used in environmental management, policy analysis, and regulatory decision-making.*
- *Propose how local, state, and federal agencies can better use scientific evidence on shale resource development to improve decision making.*
- *Clarify the current decision-making context for anticipating and addressing risk management in the governance of oil and gas production particularly from shale resources.*

VISION STATEMENT ON ENERGY GOVERNANCE

The following vision statement was developed by participants in the Aspen Institute Dialogue on Energy Governance to describe the desired long-term change resulting from their work.

The Aspen Institute Dialogue on Energy Governance seeks to improve decision-making in the governance of shale resource development. Oil and natural gas development in the United States is not new. The development and production of oil and gas from shale resources, however, is different from traditional development in scale and intensity. In addition, it often takes place in close proximity to communities that may not be familiar with this type of activity. In response, Dialogue participants believe that **sustained interactions between regulators, communities, industry, and researchers can enable more effective governance of shale resources.**

In the process of coming to this conclusion, participants identified five main findings and corresponding principles (Part I) regarding the current state of energy governance in the shale resource context. They also identified three key actions (Part II):

1. **Develop and maintain reliable, use inspired research** where regulators and other decision-makers can access timely, relevant and understandable technical information;

2. **Create effective, early engagement between the various actors and systems** where all those interested in and affected by shale resource development – positively and negatively – can begin to address issues, discuss the management of potential risks and benefits, and hopefully avert later conflict; and

3. **Establish demonstrable regulatory excellence** where a well-built participatory framework leads to continual, adaptive improvement of the regulatory process and decisions.

These actions are supported by specific recommendations that, it is hoped, will lead to enhanced engagement and improved communications, and that will move the development of shale resources from crisis management to proactive resource management, minimizing external effects on human health and the environment.

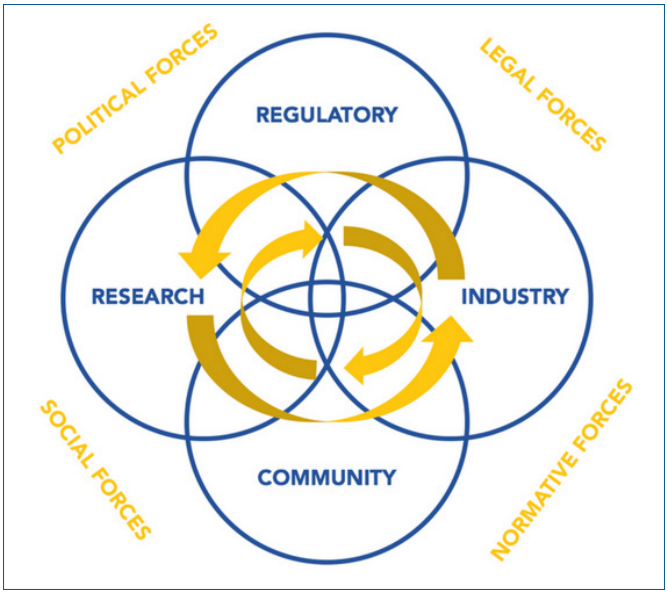

Figure 1: Sustained interactions between regulators, communities, industry, and researchers can enable more effective governance of shale resources.

Building on the initial findings, Dialogue participants also developed an **Experience-Based Governance Framework**, which provides an important conceptual structure to guide this vision and the actions and recommendations laid out. While this framework appears to be focused on regulators, as regulators usually find themselves in the center of stakeholder groups with differing objectives, it is designed to encourage and support a more dynamic interaction of all the actors and systems who play important roles in the governance and risk management of shale resource development.

FINDINGS AND PRINCIPLES

FINDING 1: THE US CAN PRODUCE SIGNIFICANT AMOUNTS OF OIL AND GAS FROM SHALE RESOURCES AND WILL CONTINUE TO DO SO FOR THE IMMEDIATE FUTURE AND PERHAPS EVEN LONGER.

Principle 1.1: Governance should provide an inclusive interactive process for impartial decision making.

Principle 1.2: The governance process should consider costs and benefits, and recognize underlying normative values and assumptions.

FINDING 2: THE PROCESS FOR DECIDING WHETHER TO DEVELOP OIL AND GAS FROM SHALE RESOURCES IS DISTINCT – ALBEIT INTERDEPENDENT – FROM THE DECISION-MAKING PROCESS FOR DETERMINING HOW DEVELOPMENT OCCURS.

Principle 2.1: States should make explicit the combination of economic and social concerns, values, and research used to determine whether to develop shale resources.

Principle 2.2: States and oil and gas regulatory agencies, working with other agencies, communities, producers, and non-governmental organizations, should provide a policy and/or plan for how shale resource development occurs.

FINDING 3: AN EVIDENCE-BASED APPROACH SHOULD GUIDE POLICY AND REGULATORY DECISION MAKING REGARDING OIL AND GAS.

Principle 3.1: Evidence-based decision-making is a model for making administrative and regulatory decisions grounded in the best available scientific research of known quality for identifying and addressing risks and benefits, and informed by experience-based evidence from the field and relevant contextual evidence.

Principle 3.2: Scientific research needs should be identified based on the use-inspired needs of regulators, policy-makers, industry, and communities and prioritized to achieve measurable beneficial outcomes.

Principle 3.3: Impartial procedures are needed and should be adopted for identifying research priorities.

FINDING 4: A PRINCIPLES-BASED FRAMEWORK FOR ASSESSING RESEARCH IS NEEDED TO ENABLE CONSIDERATION AND APPLICATION IN PUBLIC DECISION-MAKING.

Principle 4.1: Research and data should be of sufficient known quality and transparency to ensure accountability and legitimacy.

Principle 4.2: Research should be assessed and compared according to quality, scope, methodology, and replicability.

Principle 4.3: Research findings should be accessible and usable by all stakeholders.

FINDING 5: A COMMUNITY OF PRACTICE SHOULD GUIDE CONTINUOUS REGULATORY IMPROVEMENT.

Principle 5.1: The community of practice should create procedures for improving knowledge management and collective learning that promote innovation and incorporate change.

ACTIONS AND RECOMMENDATIONS

ACTION 1: DEVELOP AND MAINTAIN RELIABLE, USE-INSPIRED RESEARCH WHERE REGULATORS AND OTHER DECISION-MAKERS CAN ACCESS TIMELY, RELEVANT, AND UNDERSTANDABLE TECHNICAL INFORMATION.

Recommendation 1.1: Identify research needs.

Recommendation 1.2: Accomplish priority research.

Recommendation 1.3: Assess research methodology and quality.

Recommendation 1.4: Share research and information.

ACTION 2: CREATE EFFECTIVE, EARLY ENGAGEMENT BETWEEN THE VARIOUS ACTORS AND SYSTEMS WHERE ALL THOSE INTERESTED IN AND AFFECTED BY SHALE DEVELOPMENT – POSITIVELY AND NEGATIVELY – CAN BEGIN TO ADDRESS ISSUES, DISCUSS THE MANAGEMENT OF POTENTIAL RISKS AND BENEFITS, AND HOPEFULLY AVERT LATER CONFLICT.

Recommendation 2.1: Enable credible, proactive operator outreach.

Recommendation 2.2: Create local government engagement resources.

ACTION 3: ESTABLISH DEMONSTRABLE REGULATORY EXCELLENCE WHERE A WELL-BUILT PARTICIPATORY FRAMEWORK LEADS TO CONTINUAL, ADAPTIVE IMPROVEMENT OF THE REGULATORY PROCESS AND DECISIONS.

Recommendation 3.1: Seek necessary support for an academy.

Recommendation 3.2: Ensure participant diversity.

Recommendation 3.3: Develop a curriculum responsive to the needs of regulators.

PART I: FINDINGS

Participants in the Aspen Institute Dialogue on Energy Governance agreed upon five general findings regarding the governance challenges and opportunities of shale oil and gas production. These findings are intended to express the value of shale resources as an important energy source and to provide a foundation for the governance framework (see Appendix I) and supporting actions which follow.

FINDING 1: THE US CAN PRODUCE SIGNIFICANT AMOUNTS OF OIL AND GAS FROM SHALE RESOURCES AND WILL CONTINUE TO DO SO FOR THE IMMEDIATE FUTURE AND PERHAPS EVEN LONGER.

Principle 1.1: Governance should provide an inclusive process for impartial decision-making.

Principle 1.2: The governance process should consider costs and benefits, and recognize underlying normative values and assumptions.

Oil and gas from shale resources play an important role in the US today and likely will continue to play an important role in the future. This informs the Dialogue's investigation into understanding the current structure of shale resource governance and identifying possible ways to improve it.

Oil and gas from shale resources play an important role in the US today and likely will continue to play an important role in the future.

Oil and gas development from shale resources is not evenly distributed across the US, and the impacts of development, positive and negative, are likewise not evenly distributed. Areas without development see mostly benefits, while communities experiencing development see benefits and costs. These differences can create biases and skew perceptions about the associated benefits and costs. Understanding that these differences exist and addressing them fairly calls for an inclusive and impartial decision-making process.

In addition, governance should in theory and practice provide neutral systems and procedures for considering the value conflicts oil and gas development can create. Governance should also provide a means to develop a consistent and rational way forward that maximizes the positive impacts and limits the negative risks to human health and the environment.

FINDING 2: THE PROCESS FOR DECIDING WHETHER TO DEVELOP OIL AND GAS FROM SHALE RESOURCES IS DISTINCT – ALBEIT INTERDEPENDENT – FROM THE DECISION-MAKING PROCESS FOR DETERMINING HOW DEVELOPMENT OCCURS.

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Principle 2.2: States and oil and gas regulatory agencies, working with other agencies, communities, producers, and non-governmental organizations, should provide a policy and/or plan for how shale resource development occurs.

Given the private nature of mineral rights ownership in the US, often by the time a community knows oil and gas development will take place, leases enabling access to resources have been secured and the decision of whether to produce has already been made. Communities and local governments are left scrambling to learn more about the activity, and its potential benefits and risks. Other times, oil and gas development is initially welcomed, but then challenged by expansion plans, a well-publicized accident or pollution incident, political pressures, or some other force. Across these scenarios, community members may hold sharply opposing views on development, depending on their own stake in mineral royalties, their experience with oil and gas development, and their risk tolerance.

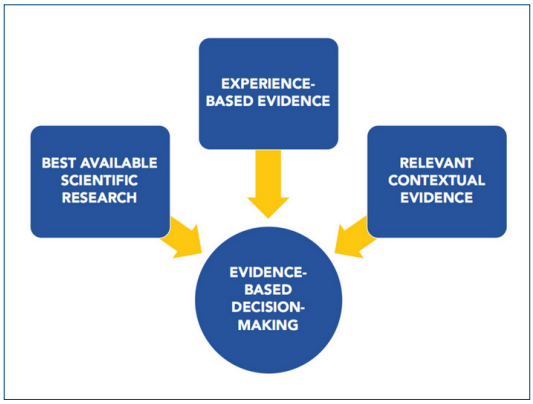
The structures and processes of governance need to be able to incorporate conflicting and shifting interests in a way that produces, where necessary, decisions that are inclusive, well-informed, and fair – and are perceived as being so. Whether the development of oil and gas from shale resources occurs should be rational, analytically based, consider both benefits and costs, and reflect the underlying values of those impacted by the development. How the development occurs should be governed by regulations based on technical knowledge and informed by practical experience.

FINDING 3: AN EVIDENCE-BASED APPROACH SHOULD GUIDE POLICY AND REGULATORY DECISION MAKING REGARDING OIL AND GAS.

Principle 3.1: Evidence-based decision-making is a model for making administrative and regulatory decisions grounded in the best available scientific research of known quality for identifying and addressing risks and benefits, and informed by experience-based evidence from the field and relevant contextual evidence.

Principle 3.2: Scientific research needs should be identified based on the use-inspired needs of regulators, policy-makers, industry, and communities and prioritized to achieve maximum benefit.

Principle 3.3: Impartial procedures are needed and should be adopted for identifying research priorities.



Determining both whether and how the development of oil and gas from shale resources occurs often creates a contentious environment where data and credible information are difficult to obtain. Actors retreat from one another, exacerbating value conflicts and inhibiting engagement – especially regarding risks. Despite these challenges, regulators are required to provide logical and thorough explanations for their actions while aiming to maximize public benefits and minimize risks.

Dialogue participants felt that the regulation of shale resource development could be improved and coordinated to better identify and address risks through evidence-based decision-making. A major key to enabling this model involves identifying, prioritizing, and supporting the development of the scientific research necessary to support sound decisions – particularly decisions by regulators.

There are instances where regulators must act despite 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 as development from shale resources is particularly controversial regulators often face heightening scrutiny. Other stakeholders also face information gaps. Therefore, research needs should be identified based on the experience-based need gaps of regulators, policymakers, industry and other communities, and on evidence.

In some instances, it is possible to develop policies and procedures to encourage the production of research and data from those best able to produce it. This is most effective when parties have superior access to research or data (e.g., industry). Problems can arise when such research or data are deemed proprietary information or a trade secret. Processes to allow knowledgeable parties to share data while providing appropriate proprietary protections can be particularly valuable.

Research needs should be identified based on the experience-based need gaps of regulators, policymakers, industry and other communities, and on evidence.

FINDING 4: A PRINCIPLES-BASED FRAMEWORK FOR ASSESSING RESEARCH IS NEEDED TO ENABLE CONSIDERATION AND APPLICATION IN PUBLIC DECISION MAKING.

Principle 4.1: Research and data should be of sufficient known quality and transparency to ensure accountability and legitimacy.

Principle 4.2: Research should be assessed and compared according to quality, scope, methodology, and replicability.

Principle 4.3: Research findings should be accessible and usable by all stakeholders.

As discussed in Finding 3, regulators are often forced to act with incomplete and imperfect information. Generally, the public can deal with uncertainty if what is known and not known is conveyed honestly and openly, the resulting action is logical considering what is known and unknown, and there is a pre established environment of trust. By clearly identifying gaps in research as well as assumptions and other judgments, regulators can help the public understand where actions must be taken without the support of definitive evidence. If this approach is done carelessly, however, it will undermine trust in the regulatory process and may prompt legal challenges.

In addition to lacking necessary research, regulators and other decision-makers are under increased pressure to consider vast amounts of often highly technical research to make decisions. Identifying a framework based on agreed-upon structural principles can help guide the assessment of research while still allowing the variation and flexibility to analyze the broad range of research quality which exists and the wide variety of criteria used to assess research quality. Quality scope, methodology, and replicability are among some of the factors that should be utilized in this framework.

Replicability is particularly important to ensuring quality and accountability. Organizational tools help distill the qualities of research, and can be further applied to

make data and research methodologies and methods publicly available and able to be replicated when needed. For example, Resources for the Future (RFF) has developed a "span chart," which summarizes a literature review of studies of the health impacts of oil and gas development in a readily accessible graphic format. The graphic is based on how many elements of the damage function model (Krupnick et al. 2014) are covered by each study. The damage function model links oil and gas activities to burdens, concentrations, exposures, impacts, and monetary values. The span chart shows that the more elements of the damage function model that are addressed in a given study, in general, the more useful the study is. Ensuring that research findings are available and reproducible is a logical step to enhance legitimacy and accountability in public decision-making.

FINDING 5: A COMMUNITY OF PRACTICE SHOULD GUIDE CONTINUOUS REGULATORY IMPROVEMENT

Principle 5.1: The community of practice should create procedures for improving knowledge management and collective learning that promote innovation and incorporate change.

Often, regulators are caught between and expected to mediate industry and community disputes in the oil and gas context. They may also have to contend with political pressures and may be targeted by the media. This can cause regulators to act defensively, reacting to perceived risk or conflict instead of proactively seeking out information and engagement. As a result, regulators continue to miss opportunities for learning and often struggle through situations that might be aided by the experience of other regulators or experts.

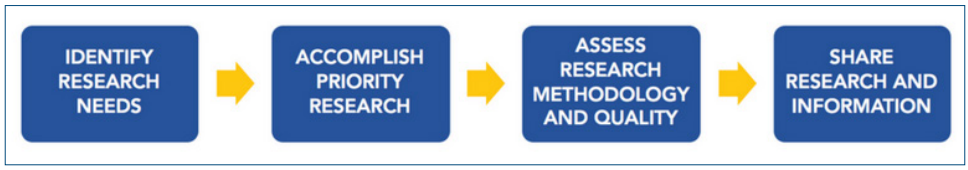
One approach to increase the exchange of information between regulators and other stakeholders is through a community of practice. A community of practice provides a model for connecting people in the spirit of learning, knowledge sharing, and collaboration as well as individual, group, and organizational development. Dialogue participants felt that there could be great value in creating a community of practice to aid the process of regulatory learning, adaptability, transparency, and accountability. This community could build on the work of the existing community of interest, which includes those involved in the regulatory process of shale oil and gas development.

PART II: ACTIONS AND RECOMMENDATIONS

Dialogue participants identified three actions that are guided by the earlier findings and the experience based dynamic governance framework (see Appendix I). The corresponding recommendations identify specific opportunities that currently exist for progress.

ACTION 1: DEVELOP AND MAINTAIN RELIABLE, USE-INSPIRED RESEARCH WHERE REGULATORS AND OTHER DECISION-MAKERS CAN ACCESS TIMELY, RELEVANT, AND UNDERSTANDABLE TECHNICAL INFORMATION.

The safe, reliable, and economic discovery and extraction of oil and natural gas depends on the convergence of well-functioning energy markets, technological advancement, fundamental research and effective regulations. However, the scientific research and data available to regulatory agencies and policy-makers do not always line up with their needs. The following recommendations outline steps to improve four inter-related phases of scientific research that support the good governance of oil and natural gas development.



Recommendation 1.1: Identify research needs.

Regulators need scientific information that allows them to govern in a way that achieves desired outcomes efficiently, minimizing unintended consequences. There are at least two broad tracks of research needed by state regulators of oil and gas

development: research into the impacts of oil and gas development on human health and the environment, and research into technologies in oil and gas that minimize impacts.

In order to meet these needs, a research agenda needs to be developed and maintained. Several recent efforts to generate research agendas relevant to oil and gas development can serve as a starting point. For example, a Special Scientific Committee convened by the Health Effects Institute (e.g., HEI 2015) developed a multidisciplinary Strategic Research Agenda to help guide future research about the possible adverse impacts of developing oil and natural gas from unconventional resources. The Strategic Research Agenda is intended for broad use by researchers, research funders, regulators, the oil and natural gas industry, environmental organizations, public health experts, and other stakeholders.

However, such efforts do not always align with the unique set of questions and circumstances that state regulators face. Use-inspired research emphasizes work addressing practical and theoretical questions necessary to regulators and other decision-makers, and can be a valuable tool in addressing regulatory uncertainties. Use-inspired research can be particularly important in the context of oil and gas development from shale resources, where technology has expanded development into regions unaccustomed to its pace and scale, and where questions about its benefits and risks to human health and the environment persist.

Therefore, **research should be prioritized into an agenda based on the use-inspired needs of regulators and other decision-makers.** This agenda should clearly and objectively identify the questions of greatest significance and those most in need of further research. The agenda should also explicitly acknowledge the criteria for determining "significance" and "greatest need."

Existing entities can help bridge that gap between researchers and policy-makers. For example, the Interstate Oil and Gas Compact Commission (IOGCC) regularly surveys oil and gas regulators to understand their needs and the Environmental Research Institute of the States (ERIS) a subgroup of the Environmental Council of States (ECOS) could likewise survey environmental regulators to understand their needs. The State Oil & Gas Regulatory Exchange (SOGRE), an outreach program created under the Ground Water Protection Council (GWPC) and the IOGCC States First Initiative, could also obtain and provide valuable insights about the research needs of individual state oil and gas regulatory programs.

Recommendation 1.2: Accomplish priority research.

A coordinator needs to be identified to ensure that once research needs are identified they are addressed in a systematic way. The coordinator needs a high

level of substantive knowledge and attention to detail to perform the diverse administrative responsibilities required. The coordinator also needs to be, and be seen as, impartial and apolitical.

Another significant responsibility of the coordinator is securing support to facilitate research, which can be challenging. Governments, particularly at the federal level, sometimes allocate significant funds for research into both impact mitigation and understanding impacts, but the research prioritization process is not always transparent, and funding may be insufficient. State governments allocate minimal funds for basic research, but do fund impact research.

There are several other broad challenges associated with funding and disseminating the results of priority research. Funders and academic journals sometimes undervalue the ability to replicate research findings. It is also overly difficult to get null results published. These results are important because they indicate areas where regulatory concerns are of low priority. Another issue is the increasingly polarized environment for research. Many people look at research with skepticism, suspecting political influences.

In order to secure adequate support and enhance credibility, the coordinator should make sure that funding sources are diversified and that the process is transparent. Balancing government and foundation money with industry money can provide a more robust and rigorous research platform. **Oversight during the research process where possible can also help address concerns.** Oversight should seek to ensure that research is proceeding as intended. If periodic checks during the research process are not possible, a rigorous independent review should occur when the research is completed but before publication.

Recommendation 1.3: Assess research methodology and quality.

Research should be evaluated according to specific criteria that ensure high quality research is identified and utilized. A rigorous independent evaluation should examine at least the following features: scientific merit, the strength of findings, the relevance of findings, the transparency of reporting procedures, the interpretation of findings in light of other findings and relevant literature, adequate acknowledgment of limitations, falsifiability, and replicability. Procedural guidance can be drawn from the experience of others (e.g., journal peer review procedures, NAS review procedures, HEI review procedures, etc.) and adapted to work effectively in the oil and gas context.

Expert bodies can interpret and deliver key messages from research. The peer-review process used by academic journals can serve as a screen for quality but the effectiveness of this process has limits. For example, as noted above, academic

journals often fail to publish null results. **Therefore, independent, objective assessment of research remains critically important.** The idea of a research scorecard, where study quality is evaluated according to simple metrics, was brought up frequently; however, participants noted it is not a viable alternative to a comprehensive and fully documented assessment.

Other analytical tools can help assess and extract relevant information about research methods and quality. RFF's span chart is one example. Two other examples of qualitative judgments represented in compact form include the recently completed Colorado study on health effects and RFF's risk matrix (Krupnick *et al.* 2017). Though analytical tools can help assess specific aspects of research, they don't provide comprehensive assessment about the overall quality of the underlying research. An effective assessment of research quality requires consideration of multiple dimensions that resist simplification into a metric or diagram.

Independent, objective assessment of research remains critically important.

Science Advisory Boards (SABs) can provide regulators and decision-makers useful advice on the meaning and value of research. Though already used in a variety of different contexts, the use of SABs by regulators in the context of oil and gas regulation at the state level might be considered unconventional. Yet, if properly structured, SABs can work impartially and transparently to provide information targeted to the needs of regulators. Ideally, the outputs of SABs are clear and explain the value of the research findings in specific contexts. While SABs do not necessarily affect the nature of research being produced on particular topics, they can offer advice on the quality, generalizability, and context.

Recommendation 1.4: Share research and information.

A repository where regulators and other decision-makers can access and share prioritized research on oil and gas development and its impacts is needed. Various groups could potentially oversee this repository including a standing committee of the National Academy of Sciences (NAS), a research NGO (e.g., RFF), the Environmental Council of the States, and IOGCC. Because the research literature on oil and gas development is very broad, there may need to be a group of repositories that coordinate their work to complement one another. A single entity could coordinate repositories at various organizations.

Oversight of a repository should include doing regular literature reviews to keep the repository up to date. Providing timely literature reviews and responding to questions related to new research is important because regulators and other decision-makers are increasingly tasked with responding immediately to new studies. To be valuable such reviews need to be apolitical, and viewed as such, as well as be

technically proficient, clearly presented, and carefully documented.

Funding to support a repository or system of repositories should be broad-based. The funding of the Health Effects Institute (HEI) may serve as a good model. Here, both government and industry contribute to the operating budget.

ACTION 2: CREATE EFFECTIVE, EARLY ENGAGEMENT BETWEEN THE VARIOUS ACTORS AND SYSTEMS WHERE ALL THOSE INTERESTED IN AND AFFECTED BY SHALE DEVELOPMENT – POSITIVELY AND NEGATIVELY – CAN BEGIN TO ADDRESS ISSUES, DISCUSS THE MANAGEMENT OF POTENTIAL RISKS AND BENEFITS, AND HOPEFULLY AVERT LATER CONFLICT.

A robust and widely acknowledged process to inform regulators, communities, and operators on practices for better engagement about oil and gas development should be led by operators. Regulators and communities are not in the best position to effectively lead this process. The following recommendations propose several steps to enable better communication.

Recommendation 2.1: Enable credible, proactive operator outreach.

Develop a National Operator Advisory Board to create a network to help operators work collectively towards more effective engagement practices regarding energy, environmental, and related public policies that encourage responsible exploration, development, and production of oil and gas from shale resources. An entity such as the American Exploration & Production Council (AXPC) could be a potential lead and help set standards and provide guidelines for operators to use in developing company-specific public engagement strategies.

Develop Regional/Basin Local Development Boards to aid in creating local evidence-based engagement strategies for operators of all sizes within a specific operating area. The local boards could consist of operators and members of the local government/community and also include members of the national operator advisory board (see above) who are operating in the region. An existing example might be South Texas Energy & Economic Roundtable (STEER) which works with communities and local governments in the Eagleford Shale play.

Recommendation 2.2: Create local government engagement resources.

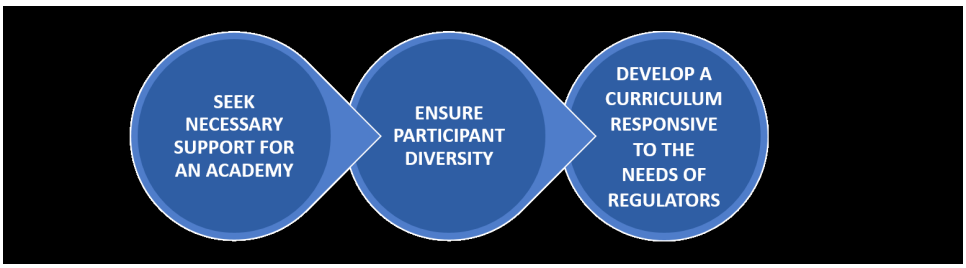
Develop a Local Government Engagement Training Resource focused on providing evidence-based engagement information and strategies as a travelling or online training module. This resource would help disseminate information

about the initial steps involved in oil and gas development before landmen from oil and gas operators actually enter a community, and would help improve engagement before development begins. This resource could also help community leaders and citizens develop and implement strategic investment plans as well as secure and manage funds from local, state, federal, and private sources. Potential leads for this program might include ECOS or the National Association of Regional Councils (NARC).

Develop a Local Government Designee Program to identify a single point of contact within local governments to lead engagement with and between regulators, operators and the community about oil and gas development. The Local Government Designee Program in Colorado might provide a good model especially if paired with the following additional features to further help ensure success in practice:

- Operators could be required to register with the Local Government Designee in the local government counties, municipalities and special districts they operate in.
- Operators could be required to provide a development plan to the Local Government Designee for use in local planning.
- The state regulator could provide financial assistance in Local Government Designee training.
- The state government could provide funding to assist local governments in the creation of Local Government Designee positions.

ACTION 3: ESTABLISH DEMONSTRABLE REGULATORY EXCELLENCE WHERE A WELL BUILT PARTICIPATORY FRAMEWORK LEADS TO CONTINUAL, ADAPTIVE IMPROVEMENT OF THE REGULATORY PROCESS AND DECISIONS.



Dialogue participants recognized that achieving and maintaining regulatory excellence is a challenge for regulators. Processes have been developed in several jurisdictions to seek regulatory excellence but the level of commitment to them varies widely. An academy for state regulators can help implement in practice the desire to continually improve the quality of regulation and the performance of regulatory agencies. The following recommendations are offered to help guide the creation of such an academy.

Recommendation 3.1: Seek necessary support for an academy.

Integrative entities and organizations such as the IOGCC, GWPC, the States First Initiative and its State Oil and Gas Regulatory Exchange (SOGRE), and TOPCORP should support the creation of this academy for regulators. **The academy would support their collective efforts to ensure that states and provinces serve as leaders in the development of oil and gas resources through sound regulatory practices that protect public health and the environment.** The academy would provide a variety of educational programs and dialogue processes designed to provide participants with knowledge about emerging trends, lessons learned, and best practices from other jurisdictions working on similar issues. It would also provide assistance to further enhance current programs or initiate new ones. Support, financial and otherwise, by these integrative efforts and organizations would provide an important signal to regulators that the academy is worthy of their support and participation.

Federal governments are sometimes in the best position to encourage state and provincial regulator participation in training and learning opportunities. While federal governments may not always have the financial resources to fully support the academy, and securing available financial support may take significant time and effort, other kinds of support at the federal level can still provide significant credibility. The US federal government has, for example, recently supported other initiatives intended to recognize states as leaders and innovators in oil and natural gas regulation. It has also supported efforts to facilitate collaboration and communication on best practices and innovations, procedures, and protocols among states, such as STRONGER, and the States First Initiative of the IOGCC and the GWPC. This academy would likewise emphasize the important role of state and provincial regulators, and provide opportunities for them to learn from one another and improve their skills. This may reduce the need for additional federal regulation, oversight and resources. Support, financial and otherwise, of the academy from federal government sources would provide an important signal that the academy is worthy of support and participation.

Recommendation 3.2: Ensure participant diversity.

Participation in the academy should initially be open to all state regulators, veteran and less senior, responsible for implementing or enforcing laws impacting oil and gas development. Despite varied mandates and institutional structures, regulators share common challenges regarding oil and gas development. The participants should ideally include a diverse range of expertise and experience including from the following disciplines: environmental science, engineering, technology, economics, public health and safety, law, and policy. Participants should also include regulators from several different jurisdictions. Including less senior regulators will capture individuals at an inflection point in their careers, where peer-to-peer learning opportunities and values-based dialogue are particularly valuable, and a community of practice can be developed. Including veteran regulators will help foster mentoring opportunities and ensure organizational buy-in.

An academy for state regulators can help implement in practice the desire to continually improve the quality of regulation and the performance of regulatory agencies.

As the academy grows in popularity, stature, and resources, consideration should be given to expanding its participation in some programs to include stakeholders beyond state regulators. This would help build a broader community of practice. While the academy could eventually become a larger effort, the initial idea is focused on creating the opportunity for state regulators from multiple regulatory agencies involved in oil and gas development to develop skills and learn from one another.

Recommendation 3.3: Develop a curriculum responsive to the needs of regulators.

The academy should seek to provide the state regulators who participate with knowledge and experience relevant to their needs. Dialogue participants discussed the possibility of the academy providing relevant professional certification. Organizations might be able to provide useful information about their needs to the academy to inform the curriculum. For example, the IOGCC already surveys state oil and gas regulators annually to understand their needs and the Environmental Research Institute of the States (ERIS) a subgroup of ECOS could likewise survey environmental regulators to understand their needs as they pertain to oil and gas development. The curriculum of the International Center of Regulatory Excellence (ICORE) of the Alberta Energy Regulator might be another valuable source of topics. Care should be taken to avoid unnecessary overlap or competition which might limit the effectiveness of both efforts.

Curriculum topics might initially focus on specific new and emerging technical topics. These topics might include: hydraulic fracturing technology, communications

and monitoring equipment, data management tools, and research assessment procedures. The curriculum should also provide practical guidance to achieve regulatory excellence like best practices (e.g., what is the state of the art in standards or stakeholder engagement?) and might also examine excellence from different perspectives such as compliance (e.g., how can regulators make certain they pose credible oversight and enforcement incentives to industry?).

Curriculum topics should include examination of the findings, principles, actions, recommendations, and frameworks developed by this Dialogue and include opportunities for discussion, structured to challenge the participants to develop new insights about themselves and the role of leadership. Similar to the leadership initiatives of the Aspen Institute, the curriculum should also provide the opportunity to engage in dialogue to recognize common values necessary to collectively improve the regulation of oil and gas development.

APPENDICES: EXPERIENCE-BASED DYNAMIC GOVERNANCE FRAMEWORK

Generally, a framework can play an important organizational function by helping clarify the roles and responsibilities of participants in a particular context. From the background provided by their initial findings, Dialogue participants developed a framework for governance to guide improvements among diverse actors across local, state, regional, and national levels in both the public and private sectors.

Governance can be described broadly as the interactive systems and procedures, including markets, corporate structures, the regulatory state, community norms, and political systems, that guide multiple actors and institutions towards economic, social, and environmental objectives. A governance framework can be described broadly as a values-based ideological structure that identifies principles needed to make and implement governance decisions.

There is ample research and other literature that attempts to define characteristics of "good governance" and its potential benefits. Good governance involves the ability to be accountable, transparent, responsive, inclusive, effective, efficient, participatory, and produce valuable outcomes. These characteristics in turn help promote confidence in government, can lead to better decisions, and support values-based decision making. Governance is, by nature, very complex and resists easy simplification. In the context of oil and gas development, there is likely no single policy applicable to all issues or decisions that can emerge. Further, the various actors involved play important and potentially overlapping roles in governance systems. These actors also interact in different ways over time and operate under shifting institutional and legal requirements that can further constrain or shape their actions.

In order to make sense of this complex, dynamic environment, Dialogue participants began by defining actors as belonging to four broad idealized governance systems: **research, regulatory, industry, and community.** Participants in the Dialogue then recognized that these systems and the actors within them operate in an environment

constrained by political, legal, social and normative forces. In the current framework these four systems exist and operate independently. Actors within the systems occasionally interact with one another and some of these interactions span systems. However, absent an intentional governance structure, these interactions can be inconsistent and haphazard.

While discussing several recent examples where governance responses were effective, a consistent theme began to emerge. **Sustained interactions between regulators, communities, industry and researchers resulted in more effective governance of shale resources.** To increase and harness the power of this theme participants created a governance framework they referred to as **experience-based dynamic governance.** Under this framework, venues, processes, and incentives are designed and arranged to ensure purposeful sustained interaction between actors and systems. Meanwhile, regulatory and integrative organizations serve critical organizational and gap-filling functions.

Dialogue participants consciously chose to develop a framework but stopped short of developing a fully articulated governance policy. Instead they identified 5 major components that together form the basic framework. The hope is that the essential flexibility of this framework will enable and empower actors in each of the systems to adopt and integrate the framework into their own systems and procedures.

Experience-Based Dynamic Governance Framework

Enhance collective capacity for recognizing, assessing and addressing risks.
The risks associated with the development and production of oil and gas from shale resources need to be recognized and addressed by governance at all levels. This can be improved in-part through more explicit procedures connecting regulatory questions to research facilities.

Explicitly acknowledge different tolerance for risk and different beliefs among actors.
Different risk tolerances and beliefs create complexity and conflict between actors that is to be expected. Systems and procedures must be resilient to this and able to come to some resolution.

Ensure appropriate spatial and temporal scale, and intensity.
Each issue, question, or decision will be different and must be addressed in the governance systems and procedures accurately and adequately. Each situation may require action from different actors, at different or concurrent times, over varying amounts of time, and with varying degrees of attention.

Identify means to continually improve the regulatory decision-making process.
Improvement in governance systems and procedures should continuously occur at all levels. At the same time, variation and flexibility on implementation is important for activities that are inherently different.

Progress involves aligning the purposes, objectives, and actions among multiple systems and actors while also recognizing and bridging the gaps between them.
Aligning actors across diversity while also recognizing gaps may require individuals capable of spanning network boundaries, or the creation of institutional mechanisms or new venues.

PROPOSED EXPERIENCE-BASED GOVERNANCE CASE STUDIES

Dialogue participants believe the value of their governance framework can be demonstrated through the examination of several different cases that highlight effective governance responses, particularly when oil and gas development enters a new community or a new issue/risk emerges.

The goal of these case studies is to break each instance down into distinct, concrete pieces and identify what occurred. This provides a practical application of the governance framework. In this way, the framework can be used to identify innovations that can be translated to other jurisdictions or similar governance challenges.

Case studies recommended by some Dialogue participants include:

- **The Oklahoma Coordinating Council on Seismic Activity which brought together state resources and related stakeholders for regular meetings on topics of shared concern/responsibility to share data, studies, developments and proposed actions to identify gaps and overlap in state agency activities and opportunities for improving communication with the public.**
- **The multi-stakeholder task force convened by the governor of Colorado in response to rapid increases in oil and gas development near urban and suburban communities to make legislative and policy recommendations to address conflicts between local and state regulation.**
- **The voluntary option available in Colorado to create memorandums of understanding (MOUs) between operators and local government regarding the siting, operations, and impacts of oil and gas development that state regulators will recognize and enforce.**
- **The multi-stakeholder process involving both leading oil and gas companies and environmental groups used by the Colorado Department of Public**

Health and Environment to develop its LDAR rules to control methane emissions.

- **The process involving multiple regulatory agencies working together that resulted in the development of FracFocus to provide hydraulic fracturing chemical transparency to the public.**
- **The multi-stakeholder process in the Appalachian Basin resulting in the creation of the Center for Responsible Shale Development which led to agreement on industry performance standards and an independent, third-party evaluation and verification process.**

DIALOGUE PARTICIPANTS

Following are the 23 participants who took part in the Aspen Dialogue on Energy Governance. The participants took part in their individual capacity and their titles and affiliation are included here for identification purposes only. Their organizations are not responsible for the views or other content of this report. In addition, not all views expressed in this report were unanimous; not all comments represent the aim or outcome of the meeting. Participants were not asked to agree to the wording of this summary and, therefore, speakers and participants are not responsible for its contents.

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ACTION AREA DISCUSSION SUMMARIES

*A draft version of this report was distributed to participants of the **Aspen Institute Forum on Energy and Governance**, a larger meeting of stakeholders and experts in shale governance which included several Dialogue participants. During the Forum, discussion groups were held to discuss in depth the three action areas highlighted in this report. Building off the report, participants expanded on the aspects of each action they found most compelling.*

Action 1 Discussion Group: Develop and maintain reliable, use-inspired research where regulators and other decision-makers can access information

Regulators of shale oil and gas don't have the time to sift through thousands of studies in order to find existing information pertinent to their decisions. **Therefore, priority issues for regulators should be isolated and compiled, and existing research on these topics should be collected, synthesized, and distributed back to regulators.** There is an IOGCC project that is about to begin that will poll members on their priority issues. After polling is complete, the IOGCC will reach out to oil and gas engineering-focused bodies to compile relevant information, research, and data. The IOGCC will then organize this information to be sent to regulators. Other organizations could also engage in similar activities, for example ECOS could do provide a similar service to environmental regulators.

There are also many areas in shale oil and gas development important to regulators where research does not yet exist. **The work of state universities could be better matched with research priorities articulated by state agencies.** Instead of informal communication practices between state agencies and state universities, these interactions could be formalized. State regulators could come to universities with a research agenda, data, and fundraising support. Partnerships between state regulators and universities could help unlock state, federal, and private money for research.

In addition, **a compelling research agenda that comes from the states could be developed and communicated to federal or private funding sources.** The IOGCC, GWPC, or ECOS could help develop this agenda by compiling unmet state research needs through polling, building off the IOGCC's current project on polling state

regulators and supplying existing information. This agenda and research funded by federal or private sources could help fill in gaps not being met by universities.

Collecting research priorities, compiling and distributing existing research, and creating agendas for new research is a complicated set of tasks, and should be coordinated. The academy referenced in the Dialogue Report could act as a coordinating institution. Regulators could discuss what they need to know, create priorities, and learn what is already out there as part of the curriculum. It could host the information "repository," collect new information, and even potentially sift through literature and provide judgements on research for regulators. The academy might be the central location for coordination and dissemination itself, or could be the hub of a network of institutions which perform these functions.

To enable these activities to take place, **novel and credible research funding mechanisms should be developed.** Private sector funding is one possibility, and combining industry associations and individual companies to fund research of mutual interest is one strategy to explore. A small severance tax directed toward research that would be useful both to citizens, government, and industry is another possibility. In all cases, maintaining credibility of research is important, and so combining public and private funding is a useful strategy.

Action 2 Discussion Group: Create effective, early engagement between the various actors and systems in shale development

There are several different variations of stakeholder engagement that are important to address: stakeholder engagement by industries in the communities where they operate, stakeholder engagement by regulators when making rules and issuing permits, and the broader level stakeholder engagement across multiple actors. Each of these categories is distinct, though lessons can be drawn across all three.

Communities experiencing new or more intense shale development often question whether or not the development should take place. However, by necessity, they are excluded from being a part of that decision. In addition, communities are often not asked what they want and need to know in the process of development, and their access to decision makers is through rulemaking, permits, and the complaint process. In parallel, industry doesn't have a say in whether new subdivisions are built or if communities expand closer to development sites. Given these realities, **dialogue between all stakeholders is important in the process of governance.** While everyone may not be happy with every outcome, the process of getting to the outcome should be perceived as fair.

Some participants felt that many who oppose shale oil and gas development are opposed to the perception of what is being done, but not actually what is being

done. Therefore, an effort to educate and inform stakeholders about the industry itself is needed. Tools for integrating industry, regulators, NGOs, and others into partnerships that can build education and training programs together should be developed. Systematically working with organizations widely viewed as credible by both industry and communities, like EDF or NRDC, to try to set a baseline of facts about shale oil and gas development could be a helpful aspect of engagement for industry and regulators. **However, engagement should not be a one-way flow of information.** It is important to ask communities and stakeholders what they need and what they want to know.

In addition, participants discussed the **importance of context**. There is variability across governments, states, communities, and risks. **Engagement should to be designed specifically for each community.** A one size fits all approach to engagement will not work, though lessons learned can still be instructive. The ability of industry to go into a community and work with leaders on a community's specific concerns eases tensions and fears. It is also important to think beyond the localized impacts of oil and gas to a broader set of actors and circumstances. For example, NGOs play a large role developing public perceptions of shale resource development. In addition, the history of oil and gas production in the US should not be forgotten. Cycles of oil booms and busts are familiar to many communities. Money and politics also play an important role in the backdrop.

In the context of stakeholder engagement, **more time could be spent on building from past experiences.** Regulators, industry and other stakeholders all likely have experiences to share. Starting a database of tested strategies, tools and mechanisms for public engagement would be useful and could help improve future engagement. The Public Outreach Committee of the IOGCC or the National Academies of Public Administration might be good host organizations for this database or other programs to encourage knowledge sharing. Alternatively, a master's student might make this their project.

Action 3 Discussion Group: Establish demonstrable regulatory excellence that leads to continual, adaptive improvement of the regulatory process and decisions

The Academy on Regulatory Excellence and Leadership would focus on social sciences and physiological sciences to help regulators engage with stakeholder communities. The curriculum of the academy would establish a demonstrable, participatory regulatory excellence framework to discuss governance, regulatory excellence, leadership, and how regulators can improve current practices. The academy would include adaptive and continuous improvement, and a well-built participatory concept. The goal of the academy would be: 1) to discuss the systems that limit regulatory actions, 2) to provide the latest social science to help guide how regulators respond to governance issues and set goals for adaptive governance.

The academy would not necessarily be limited to oil and gas regulators, and would aim to engage both junior and senior-level participants, possibly including representatives from industry. The academy would be a useful tool to inform current regulators and prepare the next generation of thought-leaders. A certification or credit-earning process could be incorporated in the academy for regulators, as no certification process currently exists for regulators.

Format Suggestions

The academy could be held as a pilot program for a **half-day event** in May 2018 before or after the IOGCC Meeting in Oklahoma City to gauge interest from regulators. The pilot program could present the mission statement of the academy and give regulators a sense of the curriculum on governance and leadership and the value of participating.

Another option for the academy is an onsite, **two-day foundational course** on governance and leadership for those who are more nascent in their careers, followed by a **five-day course of study** for junior and senior-level participants. After the onsite meeting, online workshops would be held with content based on participant feedback from the course. There could also be an opportunity to focus more closely on shale development for those in the space.

The academy could be hosted in a state and held with neighboring states to provide a more convenient location for regulators to convene and could offer department-wide training for officials. The academy would support efforts to ensure that states take a leading role in developing the curriculum.

Another component of the academy could be a leadership development and awareness training for mid career professionals. The training could be modeled off the Aspen Institute-Rodel Fellowship in Public Leadership, which selects emerging leaders to explore values and leadership, relationships with stakeholders, and responsibilities of public leadership.

Possible funding for the academy could originate from the federal government, states, foundations, private sector, or registration fees from attendees.

The academy curriculum would discuss topics such as: *History of Regulation, Economics 101, Theories of Governance, Community Stakeholder Engagement, Risk Assessment/Science Assessment, Applied Civics and Political Science, Institutional Theory and Network Analysis, Federalism to the Local Level, Crisis Communication and Management, Processes of Continual Improvement and Adoptive Management, The Rise of Administrative State and Law.*

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