

# Regulatory Adaptation to Emerging Technology and Practices in Oil and Gas Production

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*A Project of the Interstate Oil and Gas Compact Commission*

## Background and Approach

In May 2015, the Interstate Oil and Gas Compact Commission (IOGCC) initiated a project through its Energy Resources, Research and Technology (ERRT) standing committee to develop recommendations to the IOGCC and its membership on ways to improve regulatory agency awareness and responsiveness to the changing technical and operational practices in the oil and gas exploration and production (E&P) industry. The Chair of ERRT appointed Scott Anderson (EDF) and Mike Parker (industry, retired) as co-chairs to explore ways to solicit the best ideas and create a working group to support the effort.

With the assistance of the former ERRT chair, Mark Nechodom, the team developed a “discussion guideline” document to support informal interviews with regulators, industry (operators and service providers) and R&D representatives, conducted between November 2015 and August 2016. The discussion guidelines document was sent in advance of each interview. The introductory portion of the guideline states explicitly that all comments are confidential, and that notes from the interviews will be available only to the interviewer and the small core team helping to organize and guide the effort.

More than two dozen in-depth interviews and discussions were conducted. In addition, a special working session of the ERRT committee was held at the May 2016 IOGCC Annual Business meeting in Denver, CO, hosting a discussion panel of five diverse members and a roundtable discussion attended by approximately 50 participants from a broad spectrum of interests.

## Findings

Several consistent themes emerged from the discussions and interviews that are captured below in nine categories. These themes serve as the basis for the recommendations that follow.

### Responsiveness and Reactiveness

Nearly all regulators expressed a desire to keep up with new and emerging technologies and practices with an eye toward how they might create the need or opportunity for regulatory action. In general, representatives from states with higher activity levels felt their respective agencies would be well served to dedicate specific resources to monitoring and evaluating evolving technologies and practices. Representatives from states with lower activity levels appear willing to take a more informal approach.

Most regulators expressed a preference to work within existing regulatory frameworks and let industry guide them when emerging technologies and practices are sufficiently developed and may present potential issues for the regulators' consideration. The respondents shared some reluctance to try to get too far ahead of industry, particularly since nearly all regulatory agencies are limited in time and resources.

Among the regulatory respondents, many expressed a general preference to be more proactive than reactive in monitoring and evaluating evolving technologies and practices and the potential need for regulatory action. Depending on the political situation within a state however, these respondents expressed concerns that external factors can lead to regulatory action being taken too soon or too late. Either of these situations can lead to waste of limited resources, which frustrated some regulatory respondents. In these situations, the critical role of executive leadership cannot be understated, and can often make the difference between allowing an agency to take a more balanced approach and be more proactive, rather than resorting to a more reactive posture. An agency can be most successful when the top agency executives, including the governor, are explicitly supportive of the regulators, allowing them to implement a sound science-based approach when evaluating new or evolving technologies and operational practices and the need for regulatory changes.

The industry perspective on this issue was distinct from the regulators' perspective. On the whole, industry would prefer to bring new practices and technologies earlier than later to regulators' attention. A common reluctance to do so seems to have developed in recent years because of the unpredictability of the response. Protections for premature exposure of intellectual property or competitive assets were among the principal concerns. As both regulators and industry noted, the increasing use of public records laws to access information shared with regulators has made industry more reluctant to share and agencies less willing to accept certain information that would potentially be at risk of disclosure.

Most industry respondents were quick to counter that public records laws are very important tools to ensure public transparency. However, the median ground between transparency and premature disclosure leading to premature regulatory action presented a notable barrier to sharing certain kinds of information with regulators.

### Regulatory Flexibility

Regulators often want sufficient flexibility to choose between informal and formal responses in the face of emerging technology, allowing room for judging the relative "ripeness" of a particular technology. In many cases, regulators may lack sufficient experience with a given technology in field settings to be able to make accurate judgments about whether a change in regulations is appropriate. Several of this study's recommendations point to ways regulators can refine their ability to make those judgment calls.

The history of oil and gas regulation at the state level is one of balancing informal and formal approaches. On the informal side, conditions may be made within a single permit that allow the regulatory agency to monitor the use and development of a given technology or practice. As more experience and knowledge develops among operators and regulators, better judgments can be made about whether a more formal rulemaking may be warranted. But in order to accumulate data and experience, the regulator requires enough flexibility in permitting authority to be able to track and evaluate the developments and potential extent of usage of a given technology.

On the formal side, some regulators expressed appreciation for the clarifying effect of public pressure. In some issue areas, naturally differing across the states, public pressure for more explicit regulation of certain practices, combined with a more universal demand for transparency, allowed regulators to focus on a needed rulemaking process and settle controversial issues through formal regulatory review.

Regulators expressed some frustration in our interviews about being able to use informal approaches when public pressure or demands from legislative bodies drove them to more formal decision making processes. Despite arguments that the regulatory agency needed time to study the practice or technology in field settings more carefully or that the desired action was based on limited technical information, regulators have at times felt they were being driven to rulemaking processes prematurely in order to satisfy political demands.

From the industry perspective, regulatory flexibility is a valuable means to facilitate the development of certain technologies and practices in the field. While industry experiments constantly with innovations and pursues efficiencies in safety or costs as a matter of course, we found some industry representatives reluctant to present ideas to regulators too early for fear that the reaction would be premature and ineffective. In states where the industry has a history of working across the flexibility spectrum with regulators, this barrier seemed less significant. As businesses involved in a highly competitive and operationally risk-averse industry, the flexibility to innovate was considered a premium. This issue is closely linked to the first finding on “responsiveness”, with industry expressing reluctance to share certain information out of concern that regulatory agencies would not be able to adequately protect the intellectual property of technologies or practices that may or may not require further regulatory action or response.

### **Communication and Education**

With the recent history of highly controversial regulatory issues, such as hydraulic fracture stimulation, industry and regulators alike expressed a desire to both communicate more effectively with the public at large and reach much deeper into the public education system to help develop a more informed public.

The challenges of communicating complex technologies being used in equally complex geological settings to a public poorly educated in the technical aspects of energy development were repeatedly cited in our interviews. Many expressed frustration that their critics did not have basic knowledge of geology, hydrocarbon energy resources, production techniques and other fundamentals of the industry. More frustrating to them was that many of their critics apparently felt little need or obligation to have such knowledge in order to make demands on the industry and its regulators.

As a result, several participants in this study expressed a strong desire to see more resources dedicated to education in the basic energy related science and technology, reaching from K-12 to college. Opportunities to reach out to the public through organizations such the Society of Petroleum Engineers (SPE), the American Geological Institute (AGI), and the Association of American Petroleum Geologists (AAPG), were cited regularly by regulators and industry alike. Several participants expressed some concern that both industry and regulators were not reaching out in the right ways to the right people. Many cited limitations in resources, and all spoke of the need to develop new and better partnerships between agencies, industry, educational institutions, NGOs and others to promote better knowledge and understanding of the hydrocarbon energy industry.

For regulators, an important caveat also emerged in the context of the education and communication discussion: How do we get beyond public relations campaigns and the danger of being perceived as industry advocates and promoters? Several regulator participants told of being involved in educational efforts only to be rebuffed by frustrated and angry members of the public whose convictions seemed contrary to energy development. Moreover, in some cases, legislative and other executive branch agencies were sometimes critical of regulatory agencies' educational efforts, questioning whether they were appropriate uses of public resources (even in states where the regulator is funded directly by industry fees and assessments).

Industry perspectives on communication depended in large part on the geography of their operations. Some expressed a desire to work more closely with regulators to jointly expand educational programs and communication on critical and emerging issues. Others expressed some caution about appearing to be too tightly linked with regulators, potentially undermining public credibility of both parties by sharing perspectives that are quite close with each other.

### **Science-based Regulation**

Several regulators discussed their relationship with universities, research institutions and private scientific and R&D enterprises. Respondents were asked what they would invest more resources in, if resource constraints were not a consideration. Most responses included developing capabilities within their organizations to better monitor and track emerging technologies and operational practices, and strengthening their working relationships with research organizations. All regulators felt their field staff needed more ongoing technical training and engagement, even though many were already putting a high priority on formal and informal interactions with industry and research through training, workshops, conferences, etc.

Nearly all regulators expressed frustration with the “politicization” of what are fundamentally technical issues. While this frustration is without doubt endemic to most regulatory functions in government, the perception was that oil and gas regulation is more frequently targeted and politicized. Several of the participants noted that reducing unnecessary politicization was a high priority, and that they looked to umbrella organizations like the IOGCC and GWPC to help infuse a greater level of accurate scientific information into public debates about oil and gas production.

### **Regulatory and Policy Exchange: Toward Continuous Regulatory Improvement**

The long tradition of interaction and interchange among state regulators has been effective and productive, but needs to continue to evolve. Almost all agree that SOGRE (State Oil and Gas Regulatory Exchange, an IOGCC and GWPC partnership) is one of the better recent developments for facilitating discussions of regulatory issues. Regulatory program peer review through SOGRE (formal and informal) was often cited as important and needing much more emphasis and development. Another program often mentioned as worthy of more emphasis and development was oil and gas inspector certification. While these are new and developing efforts, regulators felt that more resources should be sought and invested in these two particular aspects to strengthen the knowledge, quality, and credibility of regulatory bodies.

Finally, the themes of “regulatory excellence” and “continuous regulatory improvement” were discussed frequently in our interviews. The work currently underway through the University of Pennsylvania on regulatory improvement, as well as efforts in Canada and the UK, were often cited as potentially helpful in the context of US state-based regulatory improvement. Many mentioned that the pace and necessity of innovation were out of sync with the ability of

regulatory agencies to respond, and that one potential contributing factor was the inability or reluctance among regulatory agencies (particularly at the US-state levels) to participate actively in on-going information exchange, critical regulatory program review by peers, and development of industry-regulator partnerships for issue identification and study.

Several industry respondents strongly supported the increased exchange of information among regulators, and emphasized that their operations very often crossed jurisdictional boundaries where responses to the same issue would vary depending on the regulatory entity involved. While frustration with inefficiency in jurisdictional issues between multiple agencies seemed to top the list of concerns, there appeared to be a strong preference for expanding opportunities for both formal and informal peer-to-peer interactions among regulators. Further, some industry representatives expressed a desire to participate in some way in the regulatory program reviews, even as observers or with a peripheral and complementary process.

### **Risk Analysis and Risk Communication**

Communicating risk is nearly always challenging. Regulators shared that they feel less skilled at effectively communicating risk than they wish they were, and expressed frustration that agencies do not invest in risk communication skill building until a crisis is upon them. In crisis mode, some regulators said they rely too often on their public affairs staff to “tell the story.” The regulators interviewed expressed a clear desire to work “upstream” of the crisis to educate their legislators and leaders about the basics of the industry, the fundamentals of their regulations, and the particulars of a given practice or technology.

Through this study we found that new and emerging technologies and practices should probably have a much higher priority in the communication strategies of regulators, so that affected and interested stakeholders are much better prepared to participate in the assessment, analysis and communication of potential risks.

### **Data Development and Integration**

A recent surge in data gathering, integration and consolidation technologies, combined with a significant lowering of the cost of information management, has supported rapid deployment of data and information management systems in state regulatory agencies. Focused data gathering, management and access is critical to evaluation of emerging technologies and practices.

Several regulators noted the GWPC’s efforts to develop and implement use the RBDMS (Risk-Based Data Management System), which has resulted in a major increase in uptake and adaptation of improved data management by state regulators. Those regulators we interviewed in states that have adopted RBDMS had only positive comments about it. In some cases, regulators told us that they could not have managed recent changes as effectively without RBDMS.

RBDMS was originally developed to support Underground Injection Control regulations and groundwater protection. Over time, RBDMS has been expanded to include a very broad range of oil and gas production data, geologic data, well data and other operational information into the system. Simultaneously, the demand for transparency around hydraulic fracturing also drove the development of the FracFocus system, which has been modified to be integrated into RBDMS. While RBDMS is the most widely used data management system by state oil and gas agencies, several states operate and maintain their own independently developed systems.

Regardless of the system used, most regulators noted the need for improved public accessibility to basic oil and gas data. The RBDMS developers are currently developing such a public access module, however timing for its release is uncertain.

The development of tools like FracFocus, which is driven by the public interest in transparency, is indicative of an important trend. Many regulators indicated a strong desire to have data systems that provided better transparency and accessibility in key areas of public concern.

While protecting groundwater is clearly part of oil and gas regulations, our respondents frequently indicated that public stakeholders often blur the distinction between broader water quality regulations and oil and gas regulations that protect groundwater. Groundwater protection regulations cut across jurisdictions and environmental media. The public is increasingly demanding more data, and more transparency of that data, to ensure that source water is being adequately protected.

Regulators are also keenly aware that we now live in an epoch of “big data” (though most are not sure there is a consensus on what that actually means). There is a concern with the ease with which disparate datasets can be manipulated, which has led to both interesting discoveries about environmental system interactions, as well as seriously misguided interpretations of those data that lead to inaccurate conclusions about the effectiveness of regulation. Some of our interviewees expressed grave concerns about runaway conclusions based on “big data analysis” that take up limited resources and distract the regulatory agencies from their core missions. However, the same respondents also expressed their concern that the absence of transparency is not the right answer. In the same vein as other concerns raised about limited resources, regulators would prefer to have the time and resources to allow them to present data and conclusions based on those data appropriately to the public, while also educating the public about the sources and limitations of those data.

Industry representatives weighed in on the data access and use issue frequently in our interviews. Many cited multiple occasions in which regulators requested or required new or additional data without adequate explanation of why it was important or how to justify the additional cost burdens to provide that data. Industry expressed concern that, when reporting requirements are changed, sometimes little thought or effort seems to be given to efficient and non-redundant ways that industry could provide that data. Too often regulators found that new data requirements were often fulfilled by industry by distilling and reducing original data sources, sometimes providing simplified paper printouts. Industry expressed significant concerns that regulators’ data systems would not be able to handle the requested data adequately. Many expressed concern that the increasing integration of data requirements across media (such as air, water, land use, etc.) would only exacerbate these inefficiencies because other regulatory agencies would be involved that used data systems or had data requirements that were incompatible with the main oil and gas regulatory agency.

## **DRAFT RECOMMENDATIONS**

The following recommendations based on our findings are offered to the ERRT committee chair and the IOGCC for consideration. They are not now the recommendations of either the committee or the IOGCC. We urge IOGCC to form a review committee to review these recommendations for adoption at the May 2017 Annual Business Meeting.

We present our recommendations roughly organized around the discussion topics of the interviews and the themes that emerged in our findings.

### 1. Identifying Issues and Compiling Responsive Technical Information

**Recommendation:** The IOGCC should coordinate with American Petroleum Institute (API), International Association of Drilling Contractors (IADC), American Geological Institute (AGI), Society of Petroleum Engineers (SPE) and others as appropriate, to develop a structured process to aid in identifying and tracking high level changes in technology or operational practices that have the potential to lead to significant regulatory changes.

In order to avoid “information overload” and make sure that updates on technical developments provided to regulators are targeted toward the needs expressed by the regulators themselves, we suggest that:

- On an annual basis, a group of regulators assisted by IOGCC staff and possibly representatives of ERRT, would review notes from recent meetings of the Council of State Regulatory Officials and prepare a list of current topics of interest to regulators for which information on recent technology innovations and/or new field practices might improve understanding of new risks or risk control options. It would be helpful if, in advance of CSRO meetings, participants could complete a form that described priority topics and the reasons they are priorities. The list of topics, together with descriptions as needed of why the topics are of interest, would be provided to the API, SPE, IADC and AGI (on its own behalf and on behalf of its constituent societies as appropriate) for comment.
- Also on an annual basis, API, SPE, IADC and AGI would be asked to respond within 6 months with information relating to the topics identified by IOGCC. It is likely that the responses from API and IADC would consist largely of recently adopted or amended Standards and Recommended Practices and that the responses from SPE and AGI would consist largely of journal articles and conference papers.
- IOGCC would notify CSRO participants when information is received and serve a clearinghouse function for those who are interested.
- Depending on the nature of the information received and the availability of staff or other resources, IOGCC might consider providing an analytical function as well as a clearinghouse function. A working group or perhaps even a standing committee could be formed to track and analyze new and emerging technologies and practices, as well as researching and developing potential responses for consideration by regulators. In addition to IOGCC staff or consultants, resources could be drawn from the membership and from a diversity of institutions, including universities, operators, industry R&D organizations, federal agencies, and environmental NGOs.

### 2. Chief Technology Officers

**Recommendation:** State oil and gas regulatory agencies should develop a centralized process for tracking new and emerging technologies and operational practices. In some states, the regulatory agency should establish a position for a Chief Technology Officer, whose main function is to track and analyze emerging technologies and practices.

Regulators often cited a need to have a centralized way of tracking new and emerging technologies and practices within their own agencies. In one example (Alberta), the agency

established a position specifically to track and evaluate, and to make recommendations for consideration and action, emerging technologies that may require regulatory response.

As with the issue scoping recommendation, the level of commitment, resources and personnel may vary depending on the activity level within a state and come from diverse sources, such as a joint appointment at a university, or a shared position with another state regulatory agency (such as the delegate water quality protection authority).

### 3. Regulatory Excellence Academy

**Recommendation:** The IOGCC in coordination with its state agency members should develop processes or venues that allow higher-level regulatory officials professional development opportunities to share lessons learned from regulatory adaptation efforts associated with new technologies or operational practices.

A common theme among both regulators and industry representatives was how to achieve an ongoing process of “continuous regulatory improvement.” Several cited the work of Cary Coglianese from the University of Pennsylvania Law School on regulatory excellence. Through this program, several regulatory programs have been assessed, and a number of state and provincial regulators (the effort extends well beyond the US and Canada) have developed assessments and training programs to support the pursuit of excellence in regulatory responsiveness. A part of this effort is focused on the effects of new and emerging technologies. We recommend that an entire effort be devoted to learning from successes in regulatory adaptation to new technologies and practices, across multiple environmental regulatory regimes, and that training and exchange programs receive the necessary investment to support other integrative efforts, such as SOGRE, TOPCORP, IOGCC’s Inspector Certification program, and GWPC’s training programs.

### 4. State Oil and Gas Regulatory Exchange

**Recommendation:** IOGCC should find sources of funding and support to conduct additional consultations, peer review programmatic assessments and support activities for state oil and gas regulatory programs. We recommend that IOGCC explore ways to involve representatives from industry, the public, and government agencies other than “oil and gas” agencies to advise regulators in the peer review assessment processes.

IOGCC and GWPC have developed and adopted a program for state regulators to take advantage of peer review, program assessment and expertise within the two organizations. This program, SOGRE, was mentioned regularly in the interviews, nearly always with positive comments. SOGRE has great potential to not only support internal improvements in oil and gas regulatory agencies, but to advance the transparency and legitimacy of the agencies and the regulated communities they interact with. Since our findings showed that a primary strength of SOGRE is its “peer review” focus, we recommend that state regulators plan more frequent investments with other state peer agencies, and explore including other state agencies in the peer review process (such as environmental, land management and wildlife management regulatory agencies).

### 5. Inspector Professional Interaction and Training

**Recommendation:** We recommend IOGCC continue and expand its support of training programs like the IOGCC Inspector Forum and TOPCORP, seeking funding and support from a diversity of sources.



As with SOGRE, the recent establishment of the invitation only inspector networking sessions, which have preceded the IOGCC semi-annual meetings, has been met with enthusiastic response. Feedback from those sessions indicates that there is a great deal of unmet demand for additional interchanges between state-level inspectors. We recommend including federal employees (particularly BLM) to bring additional perspectives and allow them to share their experiences, particularly for those states with substantial oil and gas development on federal lands. We further recommend that training opportunities such as TOPCORP be supported financially directly by the IOGCC.

## 6. Non-rulemaking Policies

**Recommendation:** We recommend that IOGCC develop a list of informal and semi-formal policy tools (other than rulemakings and decisions in contested cases) that are available to administrative agencies, gathering and analyzing examples under differing regulatory regimes.

Under the theme of regulatory flexibility, many regulators, and several industry interviewees, expressed a desire to understand better how regulatory agencies can use less formal procedures and policies to monitor, track, and respond to new and emerging technologies and operational practices. Examples include guidance documents, informal policies relating to whether to grant exceptions to rule requirements, and permit conditioning. Such mechanisms are used to ensure that regulators and operators are employing proper safety, operational and environmental procedures during new practice development in the field. However, industry representatives expressed some frustration that a) procedures varied widely from state to state in which they operate, and b) innovations that are successful in one state but not publicized can be met with skepticism or barriers in another state.

The value of non-regulatory processes and regulatory flexibility in the context of evaluating new or emerging technologies or practices should not be underestimated. The use of discretionary mechanisms and policies has enabled industry to initiate limited introduction of key technologies and practices under controlled and constrained conditions. In some cases, new regulatory approaches have been developed as a result of early discretion and non-regulatory permit conditioning or operating parameters.

Regulators and industry alike could benefit from a regularly updated taxonomy of informal tools that have been successfully used by regulators to allow early-stage innovation with technologies and practices in the field. We recommend careful use of non-regulatory mechanisms, and simultaneously urge regulators to ensure increased transparency regarding when and how non-regulatory mechanisms are used to assure stakeholders that adequate attention is being paid to performance and outcomes.

**We further recommend that the audience for this learning and exchange extend to include stakeholders such as environmental NGOs and state/local elected officials and their staff.** In particular, in states with statutorily required environmental review procedures (such as CEQA in CA), we believe it is important to ensure that stakeholders who tend to enter the decision process much later be invited to participate in learning exchanges with regulators and industry so that less formal policies and procedures can be better understood, often as very effective means by which new technologies and practices are safely vetted and reviewed prior to any formal rulemaking processes.

## 7. Data Development and Evaluation

**Recommendation:** We recommend that IOGCC support continued development of robust data management systems like RBDMS that include capabilities that enable assessment and evaluation of emerging technologies and practices.

In many cases, data gathering and analysis at the early stages of an evaluation effort will allow identification of which data, at what scale and frequency, is appropriate for ongoing regulation of a given technology or practice. Premature application of incorrect or inappropriate data capture can not only impede technology deployment, it can lead regulators to incorrect conclusions about protective measures or technology performance. We recommend that a venue be identified for sharing experiences on data capture and evaluation specifically in the context of emerging technologies and practices during the assessment and evaluation phases. Data evaluation can also include providing public access to state regulatory data (with reasonable IP controls), and support for additional cross-media and cross-jurisdictional data integration. A key example would be integrating groundwater management regulatory data (often held by agencies other than oil and gas regulators) with oil and gas operational data. As demand grows for more comprehensive and transparent data management systems like RBDMS, oil and gas regulators should be positioned to meet that growing demand.

## 8. Risk Communication and Science Education

**Recommendation:** We recommend that IOGCC support more comprehensive and integrated efforts to improve public understanding of basic sciences and technology and oil and gas exploration and production operations, and to integrate those educational efforts with improved risk communication skills at the state regulatory agency level.

Several responses from regulators and industry indicated challenges with communicating risk in the context of oil and gas production in particular, and energy development in general. A part of that challenge is trying to communicate risks to audiences with very limited understanding of geosciences and basic resource conservation and management principles. Public education and risk communication skill building would require focused investments in training and information exchange, and could be modeled after other successes in improving risk communication, such as dam safety programs (US Corp of Engineers and Bureau of Reclamation), transportation safety communication, API RP 100-3 Community Engagement Guidelines, or other public engagement processes for risk mitigation.

## 9. Technology Transfer

**Recommendation:** We recommend that IOGCC, perhaps through the ERRT Committee, consult with RPSEA and PTTC regarding the most effective ways to facilitate technology transfer for the regulatory audience, and help convene and sponsor opportunities as appropriate. We further recommend a specific focus on technology transfer of federally funded research to state agencies.

Both regulators and industry noted that transfer of knowledge regarding technology and practices to the regulatory sector is often slower than desirable or effective. Many research institutions – including universities, government agencies (state and federal) and private sector R&D – have robust channels between industry and the R&D community. However, the pathways that ensure that regulatory agencies are more fully apprised to research agendas, research outcomes and technology transfer opportunities are less effective. Further, there are

several instances in which successful input from the regulatory community has shaped research agendas and helped to set priorities among industry and R&D organizations. Our respondents cited several examples in which US Department of Energy (DOE) the US Environmental Protection Agency (EPA) and other federal R&D organizations had successfully transferred key technologies to the private sector, but less effectively to the state regulatory agencies. Implementation of this recommendation might be patterned after recommendation #1, related to vetting issues and setting priorities for review of emerging technologies and practices.

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