

Assessing Opportunities and Barriers to Reducing the Environmental Footprint of Natural Gas Development in Utah's Uintah Basin

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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

Introduction

Development of natural gas resources in the United States has increased dramatically over the past two decades, a boom driven by favorable prices, new technological developments, and growing interest in domestic sources of energy with a smaller carbon footprint than coal or oil. Most of the expansion in U.S. natural gas production has been from so-called ‘unconventional’ reserves in which extensive natural gas resources trapped in continuous sandstone and shale formations can now be extracted using modern directional drilling and hydraulic fracturing technologies. The Uintah Basin in northeastern Utah has been one of several areas in the U.S. where major tight sands and shale gas plays have been the focus of recent natural gas exploration and development.

While unconventional natural gas is likely to be a major contributor to America’s energy future (NRC 2009), development of this new resource has not been without controversy. Local and national critics have expressed concerns about possible environmental impacts associated with the relatively dense surface disturbance footprint associated with unconventional natural gas development. Reports of ground and surface water contamination, air pollution, and wildlife impacts have attracted the attention of state and federal regulatory agencies. Access to many unconventional natural gas reserves that are located in/around environmentally sensitive areas likely will depend on the industry’s ability to successfully lessen environmental impacts.

In response to local and national pressure, a growing number of industry and academic leaders have made efforts to develop technical options and managerial strategies designed to reduce the environmental footprint of unconventional gas exploration and production. The Environmentally Friendly Drilling (EFD) program, managed by the Houston Advanced Research Center (HARC), is one such example. The EFD program was initiated in 2005; its stated objective is to identify, develop and transfer critical, cost effective new technologies that can provide policy makers and industry with the ability to develop U.S. domestic reserves in a safe and environmentally friendly manner. Presently, the EFD partnership includes 11 universities, 5 national research laboratories, and numerous industry sponsors.

While new options exist, many U.S. producers face a number of challenges and barriers that may impede the adoption and diffusion of these new technologies. In 2009, the EFD program approached researchers at Utah State University and Sam Houston State University to conduct an exploratory study of the opportunities and barriers to the expanded use of EFD practices among natural gas industry actors in the Uintah Basin in Utah.

Our team worked in the Uintah Basin to accomplish four main research goals:

- Better understand local viewpoints on the main environmental issues, concerns, and challenges associated with natural gas development in the Uintah Basin,
- Discover what steps have been, or are being, taken by industry actors in the Basin to reduce their environmental footprint,
- Determine the drivers of and barriers to the expanded use of more environmentally-friendly practices by private industry, and
- Investigate the role, both positive and negative, played by various regulatory agencies at the local, state, and federal levels in shaping the use of these types of practices by private industry.

Methods

Our research relied on semi-structured interviews with key individuals from local, state, and federal government agencies, as well as key private sector actors in different sectors of the local energy industry. In addition, we gathered data from public records, previous studies, and other secondary sources to provide historical background on the evolution of the energy industry in this region and to provide context for the information we obtained from interviewees.

Our interviewees were purposefully selected from a master list of various stakeholders involved with energy development in the Uintah Basin. This list included county administrators, state and federal regulatory agency employees, and representatives from a diverse range of private and public groups and agencies. Key informants were selected to provide a diverse array of topical and organizational experience in the Basin. A total of 26 key informant interviews, each lasting about 75 minutes, were conducted during the spring and fall 2010.

Results of key informant interviews were summarized in written narrative reports and then analyzed using standard qualitative analysis techniques. The analysis focused on identifying related themes of response for each of the major research topics. These themes were used to organize the results presented in this report.

Our findings are not meant to reflect the views of a statistically representative sample of natural gas energy development stakeholders in Utah. However, they provide insight into the common issues, priorities, and concerns of the diverse public and private parties working on natural gas energy development in this region. Moreover, the results paint a robust picture of the major drivers and barriers that have shaped the past and present use of technologies and management practices designed to minimize the environmental footprint of natural gas development.

Primary Findings

Our key informants identified a number of environmentally-oriented innovations currently being used by the energy industry in the Uintah Basin, helped explain the drivers behind decisions to use these innovations, and elaborated some of the barriers that impede the more widespread use of technologies and practices designed to reduce the environmental footprint of energy industry activities.

Examples of Current Environmental Innovation

- A number of companies working in the Basin have taken steps to **reduce their surface impact** by implementing interim and post-drilling reclamation and – when feasible – drilling multiple wells from a single pad. Other examples include adjusting pad locations or the timing of drilling activities to **protect endangered plants and other wildlife**.
- Similarly, our informants identified a number of **water quality** innovations used in the Basin, including the use of centralized piping facilities, reusing and recycling water, and protecting aquifers during drilling through the use of steel and cement casings.
- While less common, we heard reports of companies using innovations specifically designed to improve **air quality**. These include using higher tier engines, reducing release of hydrocarbon and volatile organic compounds (VOCs) from well pad machinery or pipelines, and taking steps to reduce dust particles in the air associated with surface disturbances or trucking.

Drivers of Change

Respondents identified several drivers associated with decisions by industry actors to utilize some innovative new technologies to reduce their environmental footprint. Examples of drivers of environmental innovation generally fell into 7 categories:

- The requirements of state and federal **regulatory agencies** are a major factor inducing the use of Best Management Practices (BMPs) and other innovations to reduce the environmental footprint of natural gas development in the Basin.
- Advancements in **engineering and technology** were mentioned as critical to enabling industry to address environmental concerns in a technically and economically viable manner.
- Although new environmentally-oriented practices were often perceived to add to the cost of exploration and production, respondents indicated that periods of **higher energy commodity prices** were important to facilitate the ability of industry to try new innovations. In addition, although adopting new practices

may at first appear to be cost-prohibitive, upon implementation, many ended up saving money over traditional methods.

- Energy companies appear to be sensitive to the importance of **marketing and public relations**, and were willing to use environmentally-oriented practices as a means to improve their public image.
- A **desire to avoid legal battles** (particularly related to the NEPA process for federal agency decisions) may prompt the industry to anticipate and adopt new and innovative techniques or technologies.
- Some industry actors appear to be motivated by a sincere **sense of responsibility to local communities**, and adopt environmental practices in part to limit negative impacts on local residents.
- Many respondents attributed the energy industry efforts to reduce their environmental footprint to **changes in corporate culture** toward a more environmentally-oriented ethic as younger managers enter the leadership ranks, a trend that reflects similar changes in American society at large.

Barriers to Change

In addition to highlighting the ‘drivers’ behind the adoption of new practices, our key informants were asked to identify barriers that prevented the expanded use of innovative technologies to reduce the environmental footprint of natural gas industry activities in the region. Responses were collapsed into three categories.

- **Economic barriers** were common reasons given for not implementing some new technologies or drilling practices.
- A number of respondents indicated that the current **state of technology** was inadequate due to the **geological formations** in the Basin.
- One challenge facing companies interested in using some new environmentally friendly technologies and practices in the Basin is the **complex mix of regulatory agencies** that oversee energy development in the region. Both industry and regulatory agency respondents indicated concern about the ability of current agency jurisdiction and regulatory rules to facilitate the use of new types of environmental innovations.

Implications and Conclusions

There appears to be a high level of interest by nearly all parties to accelerate and facilitate efforts to reduce the environmental footprint of fossil fuel production in the Uintah Basin. Our research suggests that investments in new technical and engineering innovations are important to help reduce logistical and economic barriers to adoption. However, new technology alone is unlikely to generate changes that are not already of interest to (and demanded by) industry and agency actors. Market factors appear to affect the pace of change: robust economic conditions in energy commodity markets make it easier for industry actors to experiment with and invest in new technology and practices, but are not likely to be a primary driver for change.

The role of regulation in driving future changes is likely to be mixed. On the one hand, if there were no possibility of stricter environmental rules and regulations in the future, the willingness of industry actors to incur costs to meet environmental objectives might be much lower. However, movement to reduce the environmental footprint of the industry will likely occur in ways that are not simply dictated by clear environmental laws and requirements. Conversations between regulators and industry are critical to clarify which kinds of environmental impacts are of most concern and to create the space for environmental innovation to occur. In addition, the perception that stricter regulatory standards will be coming down the pipe in the near future will likely serve as a major motivator for companies to proactively develop new strategies. It is likely that a handful of larger industry actors will provide a leadership role in generating and adopting environmental innovations, with smaller firms and local service contractors following their lead (perhaps only when such changes become mandatory).

The link between regulation and behavior is made more complex because of uncertainties about regulatory jurisdiction and authority in the Basin, and perceptions of variability in federal agency practices across political administrations in Washington. If they continue, these uncertainties will make it more difficult for industry actors to make informed judgments about which kinds of environmentally-oriented change are most likely to be required. A number of industry informants suggested that they would be happy to live with stricter environmental rules if (a) all relevant agencies would agree to follow the same rules, (b) they know they could get decisions on applications for leases and permits more quickly and in a predictable manner, and (c) they could be assured that these rules would be stable for the foreseeable future.