Probabilistic, Risk-Based Decision Support for Oil and Gas Exploration and Production Facilities in Sensitive Ecosystems

DE-FC26-06NT42930

Goal

The project goal is development of modules for a web-based decision support tool that will be used by mid- and small-sized oil and gas exploration and production companies as well as environmental regulators and other stakeholders to proactively minimize adverse ecosystem impacts associated with the recovery of oil and gas reserves in sensitive areas in the Fayetteville Shale Play in central Arkansas. This decision support tool will rely on creation of a database of existing E&P technologies that are known to have low ecosystem impact.

Performers

University of Arkansas, Fayetteville, AK
Argonne National Laboratory (ANL), Washington DC

Results

Project activities began in October 2006. In addition to the project team, several organizations were represented at this meeting. During discussions, several additional stakeholders were identified to be included in the meetings. The project team has held two meetings with stakeholders. The first meeting was held in Fayetteville, AR, in October 2006 with industry and regulatory agency stakeholders. Following that meeting, ANL was asked to prepare a report that summarized all the regulatory requirements facing oil and gas operators in Arkansas. The draft report was completed in November 2006. A second meeting was held with just the regulatory agencies in Little Rock, AR, in December 2006 to discuss their concerns and interests and to receive feedback on the draft report.

Benefits

The benefits of the project are better environmental protection while operating in sensitive environments. The decision tools developed through the project will allow operators to select locations within their leases and technologies that minimize environmental impacts while still allowing hydrocarbon production. Once the tool is demonstrated in the Fayetteville Shale formation, the concept can be transferred to other locations.

Background

The Fayetteville Shale play is an unconventional natural gas play across central Arkansas. It is a tight formation and requires fracturing to produce economic quantities of gas. The currently active play encompasses a region from approximately Fort Smith, AR east to Little Rock, AR approximately 50 miles wide (from North to South). Initial estimates are that it may rival the prolific Barnett Shale play in Texas, currently the Nation’s most active natural gas play. At present, there are about 2 million acres under lease in this play (Poynter, 2006). It is expected that thousands of wells will be drilled during the next several years – current field rules from the Arkansas Oil and Gas Commission limit the number of wells to 16 per square mile section. This development will entail installation of massive support infrastructure of roads and pipelines, as well as drilling fluid disposal pits and infrastructure to handle millions of gallons of fracturing fluids. Arkansas also has coalbed methane fields (Hartshorne Shale play) along the western edge of the state that are part of the Arkoma Basin that extends north through Oklahoma, Kansas, and western Missouri. The focus of the project is on gas production in Arkansas as the test bed for application of a proactive risk-management decision support system for natural gas exploration and production. The principal objective of this project is development of tools that will allow industry to rapidly evaluate alternative leases through a GIS-based risk management approach so that location-specific environmental concerns can be identified early in the permitting process.

Summary

The meeting discussions revealed that the major themes, education and integration, would offer the greatest benefit to stakeholders. The industry's perception is that there is a need for education. There was also general

agreement that more-efficient communication between the regulators and industry would be a significant benefit to all. There was some discussion regarding the scale and scope of this project with respect to the proposed fate and effects/risk modeling. Current practice requires an onsite survey to be completed by a registered surveyor, and there was a strong concern expressed from the industrial participants that risk modeling based on remotely sensed digital elevation models and existing soil type maps would not be extremely useful and could potentially lead to conflict if the model recommendations were subsequently overruled by onsite survey results.

The first stakeholder meeting had attendance from these organizations: SEECO, Inc., Chesapeake Energy Inc., Arkansas Oil and Gas Commission (AOGC), Arkansas Department of Environmental Quality (ADEQ), U.S. Fish and Wildlife (FWS), and the Arkansas Geological Commission (AGC). Additional stakeholders that should be included in the meeting, were identified as Arkansas Natural Resources (formerly Soil and Water), Department of Health (wellhead protection), U.S. Army Corps of Engineers, Arkansas Natural Heritage Commission (ANHC), U.S. Forest Service, Arkansas Natural Heritage Commission, and the Bureau of Land Management. Representatives from most of these organizations attended a meeting in December 2006. The outcomes of these meetings include need for:

Education: The industry representatives indicated that having a central location where all interested parties could access information about industrial practice would be very useful. They agreed that there is a public perception that oil and gas E&P operations are always bad for the environment. While all development carries an environmental cost, industry representatives want their existing corporate cultures, policies and practices of using minimally damaging modern technologies to be explained in a straightforward manner to the public. Both SEECO and Chesapeake offered to provide educational materials, in particular, information detailing the life-cycle of a typical gas lease and their current practices.

Integration: The stakeholders present agreed that improving inter-agency communication through the permitting process would result in a more streamlined mechanism for the close cooperation of the agencies involved in the regulation of the FSP. The outcome of this identified need will be to develop web-based communication tools that help the regulatory (and non-regulatory, but concerned) agencies provide information to the operators in a timely fashion. For example, information available that will allow the operators to quickly screen a section for potential development vis a vis the presence of threatened / endangered species that can be matched with maps of existing roads and streams to provide guidance on the appropriate planning of access roads and drill pad placement.

Datasharing: Interest from the industry regarding the availability of information from each of the regulatory bodies was expressed – having the information compiled by different agencies that is publicly available merged into an easily accessible forum would be beneficial. There was also discussion about the need to protect information that originates from both the government/regulatory side (e.g. endangered species locations, cultural resources) and from the industry regarding when their use of the tool would be publicly known (i.e. protection of preliminary investigation as part of their business planning that is proprietary).

Current Status (July 2007)

February,2007: The initial Task 0 was to identify and establish contact with stakeholders. The major stakeholders provided considerable feedback regarding the project. A good working relationship with the stakeholders has been fostered and an additional meeting is planned for March 2007. Task 1 work is underway, and the project team has coordinated with FWS for inclusion of BMPs that FWS is compiling with a multiagency task force. In Task 2, ANL has compiled a document that outlines the current regulatory framework in the Fayetteville Shale Play. However, based on the December 18, 2006 regulators' meeting, this activity has been placed on temporary hold while the AOGC modifications are defined and implemented.

July, 2007: As part of Task 2, meetings and discussions have taken place with individual stakeholders to establish datasharing agreements. The principal organizations include the AOGC, ADEQ, AGC, and ANHC. The last group is particularly important because their database contains information regarding the location of sensitive species in the state. Early identification of these regions is particularly important with regard to the project objectives of environmental protection. The details of these datasharing arrangements have not been completely outlined. In

addition, for Task 1, we have been to the DeSoto Field, under SEECO's operation, to gather data regarding the industry current practices; a visit to a Chesapeake site is planned in the near future.

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