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**Oversight Hearing: Enhanced Oil Recovery Using Carbon Dioxide
House Natural Resources Committee,
Subcommittee on Energy and Mineral Resources**

June 12, 2008

Introduction

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to be here today to discuss enhanced oil recovery using carbon dioxide on public lands. I am Tim Spisak, Division Chief for Fluid Minerals for the Bureau of Land Management (BLM), and I oversee the BLM's Oil and Gas program. My testimony today will address on-going enhanced oil recovery efforts and progress to date and future plans for large-scale carbon sequestration projects on public lands.

BLM-managed public lands and minerals continue to play an important role in meeting the Nation's energy needs. Increases in energy prices are affecting the Nation as a whole. The BLM is looking to continue to facilitate the development of oil and gas resources on the public lands in addition to providing for alternative and renewable forms of energy in an environmentally-sound way.

As the Nation's largest land manager, the BLM is entrusted with the multiple-use management of 258 million acres of land, and administers 700 million acres of sub-surface mineral estate of which the surface owners are Federal agencies, states, or private entities. Of the 1.2 billion acres inventoried by the U.S. Geological Survey (USGS) in its National Oil and Gas Assessment, 279 million acres are under Federal management. The recently released Energy Policy and Conservation Act (EPCA) Phase III Report found that these resources translate into 30.5 billion barrels of undeveloped oil and 5.3 billion barrels of proven reserves. These areas currently under lease are the most likely for enhanced oil recovery in the short term.

In 2007, nearly 3,500 new oil and gas leases were issued and approximately 500 of the more than 5,340 wells spud on over 4.6 million acres of leased Federal land were for oil production. We are diligent in executing our responsibilities to make these resources available in an environmentally-sound manner. Within the framework of a transparent public process, we carefully consider any potential effects to habitat, groundwater, air and other resources; mitigate impacts through best management practices, stipulations and conditions of approval; and balance development with other uses across the landscape. It is our role, with the appropriate environmental protections in place, to provide the tools needed to allow oil production from leased resources, to facilitate the pioneering of new technology, and to ensure a fair return to the American taxpayer from the development of resources from public lands.

Escalating oil prices affect not only interest in domestic production, but also the viability of industry to pursue unconventional and renewable fuels through advanced technologies and processes. New technologies may allow industry to effectively recover resources that were once determined to be too expensive to pursue. Continuing to support and advance these efforts, in part, is essential to addressing the energy issues we now face.

Enhanced Oil Recovery

Enhanced oil recovery (EOR) is a process used to recover more oil than can be obtained by natural pressure, through the injection of fluid or gas into an oil reservoir to force more oil to the surface. Carbon dioxide injection is one type of EOR. This process is often undertaken in the later stages of an oil and gas operation, but may be done at an earlier stage. The decision to undertake enhanced oil recovery is largely that of industry, and is generally guided by financial considerations. Industry balances infrastructure and the cost of carbon dioxide (or other medium) against the anticipated return to determine whether the investment is justified. Within the BLM's regulatory authority to administer oil and gas leases, EOR is generally incorporated into a "sundry notice" in order to ensure that the company is moving forward in accordance with the appropriate rules, regulations, and policies. An example of currently operating carbon dioxide EOR on Federal lands is the Salt Creek Field, a relatively shallow field in Wyoming that was developed in the early 1900's. In more recent times, it has become cost effective for industry to re-develop this field using modern technology and extract resources left behind after earlier efforts. Following substantial reconstruction of existing infrastructure, carbon dioxide injection EOR has been employed, effectively doubling production. In the process, 150 million cubic feet of carbon dioxide is injected per day that would otherwise have been vented to the atmosphere.

In addition to its use in enhancing oil recovery, carbon dioxide is a leasable commodity under the Mineral Leasing Act of 1920. The BLM currently collects revenues in the form of royalties derived from the sale of carbon dioxide produced in connection with oil and gas production on public lands. In 2007, the sale of carbon dioxide generated over \$23 million in royalty revenue in the states of Colorado, New Mexico, and Wyoming.

EOR's use of carbon injection will continue to yield valuable data and information that facilitates future efforts to effectively capture and sequester carbon dioxide in geologic formations found on public lands. A critical issue for evaluation of storage capacity is the integrity and effectiveness of these formations for sealing carbon dioxide underground, thereby preventing its release into the atmosphere. Current EOR efforts will enhance our understanding of these types of critical scientific and geologic issues. We expect that new information on this technology and the issues it presents will continue to be generated from activities on the public lands that we manage. As such, we anticipate the need for BLM to play an important role in collaborating with other Federal agencies, states, the private sector, and the public as we move forward in addressing legal and policy issues that arise during development.

Carbon Capture and Sequestration (CCS)

The current atmospheric carbon dioxide concentration is approximately 380 parts per million volume and rising at a rate of approximately 2 parts per million volume annually, according to the most recent information from the Intergovernmental Panel on Climate Change (IPCC). The

2005 IPCC Special Report on *Carbon Dioxide Capture and Storage* concluded that in emissions reductions scenarios striving to stabilize global atmospheric carbon dioxide concentrations at targets ranging from 450 to 750 parts per million volume, the global storage capacity of geologic formations may be able to accommodate most of the captured carbon dioxide. However, it is not known how much of this carbon dioxide storage capacity would be economically feasible (assuming some price on carbon). Also, geologic storage capacity may vary widely on a regional and National scale. A more refined understanding of geologic storage capacity is needed to address these knowledge gaps.

The challenges of addressing carbon dioxide accumulation in the atmosphere are significant. Fossil fuel usage, a major source of carbon dioxide emissions to the atmosphere, will continue for the foreseeable future in both industrialized and developing nations. Therefore, a variety of strategies are being investigated to reduce emissions and remove carbon dioxide from the atmosphere. Such strategies include the facilitated sequestration of carbon for the capture and storage of carbon dioxide through terrestrial sequestration using soils and trees, or by injection into geologic formations.

Geological storage of carbon dioxide in porous and permeable rocks involves injection of carbon dioxide into a subsurface rock unit and displacement of the fluid or formation water that initially occupied the pore space. This principle operates in all types of potential geological storage formations such as oil and gas fields, deep saline water-bearing formations, or coal beds. Most of the potential carbon dioxide storage capacity in the U.S. is in deep saline formations.

The BLM anticipates taking a leadership role, in collaboration with other agencies, in evaluating and developing, where appropriate, long-term carbon sequestration efforts. The BLM's existing administrative and regulatory framework will help facilitate future carbon sequestration demonstration projects and potentially, leasing, and ultimately inform a robust, coordinated regulatory regime. In addition to experience in administering a large-scale mineral leasing program, we have the realty expertise and an existing framework for issuing rights-of-way on public land that could serve future needs for carbon dioxide pipelines across public lands. Other programmatic and land management expertise, such as the BLM's experience in evaluation of potential environmental impacts of projects, will facilitate this effort. Other agencies, such as USGS, DOE, and EPA will also play an important role in recommending geologic criteria that could be incorporated into a set of "best practices" for geologic site selection. The BLM looks forward to working closely with the USGS, DOE, EPA, the National laboratories, other Federal agencies, academia, industry and the public to develop geologic and technical criteria that could be used in future site selection.

At this early stage in the development of carbon dioxide storage technologies, especially in the absence of large-scale demonstration projects of more than 1 million tons of carbon dioxide per year, many unknown factors may impact the development of best practices. We look forward to working together to resolve outstanding legal and policy questions as we continue to learn more about the technologies and geologic information necessary in moving forward with a carbon sequestration program. We understand that the Environmental Protection Agency (EPA) plans to propose regulations for issuing Safe Drinking Water Act permits for geologic sequestration of carbon dioxide. BLM will provide input as appropriate in the rulemaking process.

Current CCS Demonstration Projects - The BLM is working with the Department of Energy (DOE) on regional partnerships that promote CCS demonstration projects. In promoting CCS efforts on public lands, the BLM is currently active in two demonstration projects: a deep saline sequestration project in Farnham Dome, Utah, and an enhanced coalbed methane project in San Juan Basin, New Mexico.

- The Farnham Dome project involves the reinjection and storage over a four year period of carbon dioxide produced on state and Federal lands with site monitoring for an additional 5 years. As a cost incentive for the demonstration project, the BLM has agreed to defer royalty payments on carbon dioxide produced from the Federal mineral estate (90 percent of the project area) until after the demonstration project when the carbon dioxide may be produced for commercial gain.
- The San Juan Basin project will demonstrate the feasibility of carbon dioxide coalbed sequestration while determining the potential for enhanced recovery of coalbed methane by injecting 75,000 tons of carbon dioxide into the formation over a one-year period.

We look forward to evaluating the results of these projects and to using these results to explore additional demonstration projects on public lands. If appropriate, we will begin looking at the costs and benefits of moving forward to develop a program for public lands. As the largest Federal land manager, the BLM will continue to support these demonstration projects, as well as other demonstration project opportunities that may be identified involving resources managed by the BLM.

Energy Independence and Security Act

The BLM is currently implementing the carbon capture and storage provisions of the Energy Independence and Security Act (EISA) [Public Law 110-140]. Section 713 of EISA directs the BLM to maintain records on, and an inventory of, the quantity of carbon dioxide stored within Federal mineral leaseholds. The BLM is reviewing its current data collection structures and methods, including commercially available data, and will determine how this new data collection requirement can be incorporated into existing systems. The BLM is coordinating with the Minerals Management Service on changes that may be required to the Oil and Gas Operations Report that is used to collect production and injection data on Federal mineral estate.

Section 714 of the EISA directs the Secretary of the Interior to submit a report to Congress by December 2008 containing a recommended framework for geological sequestration on public lands. In coordination with the Environmental Protection Agency, the Department of Energy, USGS, and other appropriate agencies, the BLM is examining criteria for identifying candidate geological sequestration sites in several specific types of geological settings. Additionally, the BLM will consider the EPA proposed regulations for carbon capture and sequestration when available to ensure that all of the BLM's recommendations are in compliance with the Safe Drinking Water Act and regulations under that Act. The BLM will be considering a regulatory framework for the *leasing* of public lands for the long-term geological sequestration of carbon dioxide, while providing for public review and protecting the quality of natural and cultural resources.

Future Efforts

As the BLM advances long-term carbon sequestration efforts, several issues need to be addressed. Federal leasehold or Federal mineral estate liability issues related to the release of carbon dioxide stored underground will need to be studied and evaluated. Relevant experiences from enhanced oil recovery using carbon dioxide on public lands will assist us in examining this issue. In addition to scientific and geologic issues, legal and regulatory issues remain, specific to carbon dioxide sequestration on land in cases in which title to mineral resources is held by the United States, but title to the surface estate is not.

In preparing our report to Congress under EISA, the BLM will examine existing statutes, regulations, proposed regulations, and case law, and recommend whether additional legislation may be necessary to ensure that public land management and leasing laws are sufficient to accommodate the long-term geological sequestration of carbon dioxide on public lands.

In the meantime, the BLM plans to participate and expand its involvement in carbon dioxide research, development and demonstration projects. We will also continue to permit enhanced oil recovery operations on public land; analyze the data we are beginning to collect under Section 713 of EISA; examine the adequacy of existing regulations and proposed regulations; and move forward on other recommendations that will be developed over the next six months.

Conclusion

Addressing the challenges of reducing atmospheric carbon dioxide and understanding the effects of global climate change are complex issues with many interrelated components. Geologic sequestration of carbon dioxide is one of several mechanisms being investigated by the scientific community. While promising, a number of unknowns remain.

- Existing demonstration projects have studied injection of carbon dioxide of geologic origin rather than atmospheric carbon dioxide. The economics of capturing and sequestering carbon dioxide from other sources are not well understood.
- Significant technological, scientific, and logistical challenges remain in geologic carbon sequestration, such as the ability to evaluate formations for containment capabilities over long periods of time, measured in hundreds or thousands of years. However, large scale demonstration projects such as those described earlier in my testimony will begin to address these challenges.
- Complex questions on access, compensation, and ownership of formation pore space on split-estate lands have not yet been resolved.
- Abandoned wells in proximity to injection sites often are not able to contain pressure increases associated with carbon dioxide injection, and can require substantial re-engineering.

- Liability and safety questions in the event of carbon dioxide leakage or salt water intrusion into fresh water aquifers are unresolved, although research jointly sponsored by EPA and DOE is underway to assess these issues.
- The degree of public acceptance of the construction and operation of nearby carbon dioxide sequestration facilities is unknown.

The assessment activities required by the BLM in EISA should ultimately increase the information base upon which decision makers will rely as they deal with these issues. In addition to addressing the challenges presented by carbon dioxide, this commodity presents certain opportunities for future knowledge and use. The BLM stands ready to assist Congress as it examines these challenges and opportunities.

The BLM will continue to support our Nation's energy needs and facilitate the pioneering of new technology and processes. As the Nation's largest Federal land manager, the BLM recognizes its responsibilities to the country and the opportunity to play a key role in enhanced oil recovery and carbon capture and sequestration. I look forward to providing you with the results of our efforts this December. I would be happy to answer your questions.