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Policy Issues for Oil Shale Development²

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Subcommittee on Energy and Mineral Resources
United States House of Representatives**

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Chairman and distinguished Members: Thank you for inviting me to speak on the development of our nation's oil shale resources. I am a Senior Policy Researcher at the RAND Corporation with over 25 years of experience in analyzing and assessing energy technology and policy issues. I am also the principal author of a RAND report that addresses the prospects and policy issues of oil shale development in the United States.³ This work was sponsored and funded by the National Energy Technology Laboratory (NETL) of the U.S. Department of Energy. Since that work was published in the summer of 2005, I have continued to follow the industrial progress and government activities associated with oil shale development in Colorado and Utah.

The Energy Policy Act of 2005 (EPACT) established the framework the federal government is currently using to move forward in developing the domestic oil shale industry. In some areas, such as in the awarding of small lease tracts for research and development (R&D), significant progress has occurred. But in other areas, such as in preparing for early commercial leasing, I am concerned that the EPACT oil shale provisions fall short of what is needed to ensure that the strategic potential of this unique resource could be realized.

Today, I will discuss the key problems and policy issues associated with developing the domestic oil shale industry and the approaches Congress can take to address these issues. My key conclusions are as follows: (1) the knowledge base about the economic, technical, and environmental feasibility of oil shale development is not adequate to support the formulation of a commercial leasing program on the timescale mandated by EPACT; (2) the fundamental approach the Department of the Interior is currently taking may be counterproductive if the goal is to keep open the option for a sustainable domestic oil shale industry ; (3) meanwhile, important

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² This testimony is available for free download at <http://www.rand.org/pubs/testimonies/CT279>.

³ *Oil Shale Development in the United States: Prospects and Policy Issues*, Santa Monica, CA: RAND MG-414-NETL, 2005.

opportunities for early action are not being addressed; and (4) additional legislation may be appropriate to ensure that federal actions are most effectively directed at the sustainable development of oil shale at a level commensurate with its importance to our national security and economic well-being.

The Importance and Value of Oil Shale

The potential public wealth embedded in our oil shale lands is staggering. Many, if not most, of the potential lease tracts in Colorado will contain over 2 million barrels of oil per surface acre. That means that a single 5,760-acre lease tract holds nearly 6 billion barrels. Assuming a modest recovery of the total oil within a lease tract, the potential public value of a single lease is clearly in the tens of billions of dollars. The potential public value of the total oil in place in oil shale deposits in the Green River Formation is in the trillions of dollars. However, realizing this potential depends on making further technical progress and on developing a regulatory and land management framework that ensures environmentally sustainable oil shale production.

As part of RAND's examination of oil shale development, our research addressed the strategic benefits of having in place a mature oil shale industry producing millions of barrels of oil per day. Such a level of production would yield considerable economic and national security benefits, primarily by causing world oil prices to be lower than what would be the case in the absence of oil shale development. As a result, consumers would pay tens of billions of dollars less for oil. Lower world oil prices would also cause a decrease in revenues to oil exporting nations, some of which are governed by regimes that are not supportive of U.S. foreign policy objectives. These benefits associated with lower world oil prices accrue to our nation as a whole; however, they are not captured by the private firms that would invest in oil shale development.

If shale-derived oil can be produced at prices well below world oil prices, then the private firms that do invest in oil shale development could garner economic profits above and beyond what is considered as a normal return on their investments. Through lease bonus payments, royalties, and taxes on these profits, we estimate that roughly half of these economic profits could go to federal, state, and local governments and, thereby, broadly benefit the public.

While the prospects of major economic and national security benefits motivate the development of oil shale, federal actions need to be tempered by the need to address the adverse environmental impacts and risks that accompany such development. Moreover, with the growing realization of the role of carbon dioxide in promoting climate change, these adverse impacts are not just local and regional, but also global.

The Current Commercial Leasing Schedule

At present, a number of firms are making appreciable investments in research directed at furthering the development of technologies required to produce liquid fuels from oil shale. However, to my knowledge, none of these firms has gathered technical information adequate to warrant a decision to invest hundreds of millions, if not billions, of dollars on first-of-a-kind commercial oil shale plants. These firms continue to focus on process development, improvement, and evaluation, but they have not yet conducted the front-end engineering and design work needed to establish the economic viability, oil recovery potential, and environmental performance of the approaches under consideration.

The fact that industry is years away from establishing commercial viability and environmental performance calls into question the analytic basis of the current, legislatively imposed schedule for establishing regulations for commercial leasing. The programmatic Environmental Impact Statement (EIS) for commercial leasing is being prepared with very limited information on the environmental performance of important new processes, especially the in-situ extraction methods that offer to reduce significantly the environmental impacts of oil shale development. There is limited information on the response of local vegetation and wildlife to ecosystem loss or damage, on the eventual options for habitat restoration, or on how carbon dioxide emissions will be managed, including the feasibility of geological sequestration.

A reasonable alternative is to eliminate the legislative requirement to fast-track the promulgation of regulations for a commercial leasing program. Instead, the federal government could focus its efforts on the critical steps required for developing oil shale, as further discussed in this testimony.

The Challenge of Oil Shale Leasing

For several reasons, the federal approach to oil shale leasing cannot be based on the approach used to lease other energy resources—such as coal, petroleum, and natural gas—that occur on federal lands. First, as discussed above, there is no prior commercial experience that is relevant to the development of the rich U.S. oil shale resources. The government lacks important information about the costs and risks of development. It thus runs the risk of either being too lenient about lease bonus and royalty payments, allowing firms to have access without adequate compensation to the public, or too zealous, causing a loss of private-sector interest in oil shale development, especially for initial commercial plants.

Second, because of the vast size and geographic concentration of the highest-value oil shale resources and the need to perform extensive on-site processing, leasing decisions made by the federal government may have a profound impact on the residents of northwestern quarter of Colorado and the northeastern quarter of Utah. In particular, large-scale development of oil shale will cause federal lands to be diverted from their current uses, will almost certainly have adverse ecological impacts, and will likely be accompanied by socioeconomic impacts that could be particularly severe, especially within the northwestern quarter of Colorado.

Finally, and most important, the impacts on air and water quality, the provisions taken to meet demands for water, and the infrastructure associated with the initial round of commercial plants may impede, if not fully preclude, the development of oil shale to a level commensurate with its potential economic and national security value to the nation. As with the previous issue, this problem derives from the geographic concentration of all high-value oil shale resources to the very small area encompassed by the Piceance Basin of Colorado and within a small portion of the Uinta Basin within Utah. As an example of this problem, estimates made in the early 1980s predicted that shale-derived oil production could not exceed a few hundred thousand barrels per day, based on considerations of how just a few plants located in the Piceance Basin would degrade regional air quality.

The Critical Path for Oil Shale Development

In my judgment, establishing a broad-based commercial leasing program within the next five years is not necessary and, in fact, may be detrimental to oil shale development. Since the publication of the 2005 RAND report sponsored by NETL on the prospects and policy issues of oil shale development, important technical progress has taken place. A number of highly reputable firms have announced their interest in pursuing oil shale. Some of these firms are participating in the Research, Development, and Demonstration (RD&D) lease program being administered by the Bureau of Land Management (BLM). Others are interested in participating, if a second round of RD&D leases becomes available. However, based on our knowledge of where these firms are in technology development and evaluation, none—with the possible exception of Shell Oil—will be prepared to make a financial commitment to a pioneer commercial-scale oil shale facility for at least five and, in some cases, as many as ten years.

Given this judgment about corporate preparedness to move forward with oil shale, I suggest the federal government direct its efforts at the list of “early actions” listed in the RAND oil shale report,

viewing those actions as priority measures for developing oil shale as a strategic resource for the United States.

Conducting critical ecological and environmental research: This includes developing and implementing a research plan directed at establishing options for mitigating damage to plants and wildlife, conducting mathematical modeling and monitoring of the subsurface environment, and conducting research directed at identifying options for long-term spent shale disposal.

Developing a federal oil shale leasing strategy: The overall goal of this strategy should be preserving the option of the sustainable, and publicly acceptable, large-scale development of oil shale within the Green River Formation. While developing information and analyzing options for eventual commercial leasing should be an important component of this strategy, the near-term objectives should focus on obtaining information required for determining when, how, where, and how much development should occur on federal lands within the Green River Formation. Beyond the above-mentioned ecological and environmental research, critical information needs include process performance, infrastructure demands (especially, water, power, processing facilities, and pipelines), options for protecting regional and local air and water quality, analysis of the feasibility of multi-mineral development, and options for carbon sequestration.

Fostering technology development: By providing small RD&D leases within the Piceance Basin to three firms, the BLM has made important progress in moving oil shale technology forward. However, this should not be a one-time program. In preparing for a second round of RD&D leases, the BLM should review the continued appropriateness of provisions that may not be consistent with a strategic plan for large-scale oil shale development. Examples of questionable provisions include requiring multi-mineral development and granting preference rights to future commercial leases. Other firms that appear to be highly qualified to invest in oil shale development are interested in obtaining small lease tracts suitable for RD&D. Encouraging their participation is in the national interest, because a broader set of participants will promote greater innovation and competition. We also suggest that the federal government consider sponsoring high-risk, high-payoff research directed at improving the yield and environmental performance of oil shale technologies. To the extent that this research is conducted at universities and national laboratories, it offers the important benefit of educating and maintaining a cadre of scientists and engineers that are highly knowledgeable of oil shale development.

Providing land access to early commercial plants: While a commercial leasing program is premature, a mechanism is required for providing access to federal oil shale lands to those firms prepared and able to finance, construct, and operate pioneer commercial oil shale production

facilities. Given that production from a single lease may have a public value of tens of billions of dollars—once oil shale technology is commercial and competitive leasing is possible—we suggest that the government refrain from attempting to establish the regulatory parameters for the full exploitation of a lease site that would occur after expansion of the pioneer facility. An alternative approach is for the government to provide land access and possibly other assistance in the context of a cooperative agreement with the industrial proponent of the project. Such an agreement would be project-specific and would include provisions covering the schedule and duration of the project, environmental performance, environmental monitoring, and payments to the government, all of which would be consistent with the government's overall leasing strategy. Most important, the initial cooperative agreements should not prejudice how lease agreements might be done in the mature phase of an oil shale industry.

Fostering early commercial experience: In building first-of-a-kind plants, a private firm will take on considerable technical risks, as well as the market risks associated with fluctuating world oil prices. Considering the economic and national security benefits associated with achieving large-scale oil shale production, it is appropriate for the government to share in these risks. This is a policy area that RAND is currently examining. At this time, I can say that we are considering a number of options, such as allowing capital investments in pioneer plants to be expensed and deferring lease bonus and royalty payments until the production facility is operating at a profit. The efficacy and economic and fiscal impacts of these options require further analysis.

However, based on my own professional experience and judgment, I caution against the use of federal loan guarantees. Firms with the technical and management wherewithal to build and operate first-of-a-kind oil shale plants—and then move forward with subsequent plants—generally have access to needed financial resources. Loan guarantees can induce the participation of less-capable firms, while shielding the project developer from the risks associated with cost overruns and shortfalls in plant performance. The public then ends up with the bill if the project fails.

Dealing with the impact of oil shale development on global climate change: Most process concepts for producing liquid fuels from oil shale cause carbon dioxide emissions in excess of those associated with refining conventional crude oils. Since most of these emissions will come from large stationary sources, such as power plants providing electricity to oil shale facilities and plants for processing shale-derived oil, it may be feasible to capture this excess carbon dioxide. For initial commercial shale processing plants, an option is to use this captured carbon dioxide for enhanced oil recovery in nearby oil production areas.

But the extensive development of oil shale would likely produce carbon dioxide at levels beyond the capacity of the enhanced oil recovery market. In this case, the captured carbon dioxide may need to be geologically sequestered. At present, however, the technical feasibility of geological sequestration has not been demonstrated. Thus, a critical issue in developing oil shale may be successfully demonstrating geological sequestration in the general vicinity of the Piceance Basin. Toward this end, planning for oil shale development should include assessing the potential use of co-produced carbon dioxide for enhanced oil recovery and the viability of geological sequestration, including a large-scale demonstration.

Options for Legislative Action

Congress has the opportunity to address a number of existing legislative constraints and mandates that may not be in the best long-term interest of the nation, if oil shale development is to remain a viable option. There are also a few areas where Congress may need to assert its will, such as including the U.S. Environmental Protection Agency in federal planning for oil shale development. I suggest the following for consideration by the Committee.

- 1) Rescind the requirement to prepare a programmatic EIS for a commercial leasing program within 18 months. Instead, require that the programmatic EIS be a phased effort for establishing an oil shale leasing and development strategy for the federal government. The initial phase of this effort should be directed at establishing critical information needs so that appropriate research programs can be formulated and carried out.
- 2) Rescind the requirement to establish final regulations for a commercial leasing program within six months of completing the programmatic EIS. As discussed above, within the next few years, it is unlikely that adequate technical, economic, and environmental information will be available to formulate fair and equitable leasing regulations.
- 3) Require that the Department of Energy, the Department of the Interior, and the Environmental Protection Agency cooperatively develop a federal oil shale leasing strategy.
- 4) Require that the Department of Energy, the Department of the Interior, and the Environmental Protection Agency investigate and report on alternative approaches to providing access to federal lands for early first-of-a-kind commercial facilities.
- 5) Require that the Department of the Interior make available for leasing additional lands for the purpose of conducting RD&D activities.
- 6) Require that the Department of the Interior and the Department of Energy prepare plans for conducting critical environmental and ecological research; high-risk, high-payoff process improvement research; an assessment of carbon management options; and a

large-scale demonstration of carbon dioxide sequestration in the general vicinity of the Piceance Basin.

In closing, I commend the Committee for addressing the important topic of moving forward with oil shale development. In much of the policy debate on oil shale development, I see two sides. On the one hand, there are the boosters who overestimate the benefits and urgency of moving forward and often dismiss the serious environmental and policy issues that need to be addressed. They advocate using the development of oil sands in Alberta, Canada, as a model for the development of U.S. oil shale. Anyone familiar with the heavy subsidization of early oil sands production and the environmental degradation that continues to be associated with Canadian oil sands extraction knows that the “Alberta model” is a nonstarter for development in the Green River Formation. On the other hand, there are the naysayers, who in their concern for environmental protection appear to dismiss the economic costs of importing high-priced oil and the national security consequences of continued wealth transfers to certain oil exporting nations.

At RAND, our research has identified a course that addresses both the environmental concerns and the national benefits that accrue from large-scale production. We often refer to the RAND approach as a “measured approach” in that it involves gathering information and proceeding at a slow enough pace to enable evaluation and course correction along the way but fast enough to advance understanding and preparation for possible large-scale commercial production so that in a decade we are in much better position to weigh both benefits and costs. The current framework established by EPACT to rush forward with commercial leasing is clearly not a measured approach.

The United States has before it many opportunities—including oil shale and coal, renewables, improved energy efficiency, and fiscal and regulatory actions—that can promote greater energy security. Oil shale can be an important part of that portfolio. And it will be as long as we proceed with a strong commitment to take a well-informed path, recognizing that we have important environmental, economic, and national security issues at stake.