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Subcommittee on Energy and Mineral Resources
Committee on Resources
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Mr. Chairman, Members of the Subcommittee, thank you for this opportunity to testify on oil shale and other non-conventional oils, and their potential role in elevating our Nation's energy security by mitigating our dependence on imported oil. U.S. energy security is important by virtue of the crucial role it plays in achieving economic security.

I would like to share with you today our thoughts on the oil shale resource in these areas – first, oil shale's magnitude and potential; then, the history of past unsuccessful attempts to develop it; and, finally, barriers to development as they exist today. In addition, I will compare the prospects for oil shale with the commercial development experience of another non-conventional resource, Alberta's vast oil sand resources.

Ensuring the present and future energy security of the United States is a primary goal of the Office of Fossil Energy, and we are committed to the President's goal of elevating our energy security through increased production of economic domestic resources. Domestic oil shale represents a resource of more than 300 billion recoverable barrels of oil and is a resource which, if economical, could play a significant role in meeting the Nation's needs for more liquid fuels over the next several decades.

We also have potential domestic sources of non-conventional liquid fuels such as the technologically mature but uneconomic Fischer-Tropsch coal liquefaction, recovery of stranded oil, undiscovered oil and other currently uneconomic resources. With high oil and gas prices, industry has strong incentives to develop technologies that will facilitate exploration of non-conventional domestic resources, and in fact there is evidence that they are doing so.

The Resource

The total U.S. oil shale resource is estimated to be 1.8 trillion barrels and is primarily concentrated in the Green River formation in northeastern Utah, northwestern Colorado, and southwestern Wyoming. Over 50% of the world's oil shale resources are in this area, 80% of which are owned by the Federal Government. It is estimated that over 400 billion barrels of oil equivalent exist in oil shale at concentrations greater than 30 gallons/ton. In 1980, the Office of Technology Assessment published An Assessment of Oil Shale Technologies, which estimated that between 189 and 315 billion barrels of oil would be recoverable from this high quality shale. Oil and Gas Journal, in its August 9th 2004 issue, suggested that 100 billion barrels of oil from domestic oil shale could be reclassified as proven reserves if the technology became commercially viable. Suffice it to say, if it were financially feasible to even partially develop, the resource could sustain an industry of 2-3 million barrels per day for decades.

The factors that limit the development of oil shale have nothing to do with the potential quantity of the resource. Historically, oil shale production hasn't been economical. The cost of production has been too high compared to the cost of producing from conventional resources. This problem has been compounded by the need to build an infrastructure to support oil shale and the cost of disposal of byproducts. Although the Federal Government attempted to make oil shale economical in the late 1970's and early 1980's, this effort was abandoned because shale oil production could not be sustained in the face of abundant and cheap conventional crude oil. This was true even though the Government embarked on this effort at a time when oil prices were higher in real terms than they are today. The failure of the Government's efforts in the 1980's was not due to the failure of the resource, the technology, or environmental problems; economically it was simply too expensive. Recently, however, industry has shown renewed interest and has begun committing resources.

What is the Commercial History of Oil Shale in the United States?

After the oil interruptions and price shocks of 1973-74, the Federal Government encouraged the development of unconventional domestic resources including oil shale. The Department of the Interior offered commercial leases for development in 1973. Bonus bids totaled $450 million for four oil shale leases and industry began development. Economic incentives were later offered for oil shale development including a guaranteed price floor ($42.50 indexed to the CPI), and a production tax credit of $3 per barrel. In total we estimate $5 billion was invested in oil shale facilities beginning roughly in 1975. Major players at that time included Exxon, Shell, Mobil, Occidental, Atlantic Richfield, Chevron, and Unocal. In the early 1980's these projects began to close and the last closed in 1992.

The consensus of the industry was that oil prices simply did not stay on a price path over the long term that would assure a reasonable return on investment for an unconventional crude oil. In addition, policy changes accompanying new administrations removed the subsidies for synthetic fuels. Witness the demise of the Synthetic Fuels Corporation, which was chartered during the Carter Administration but allowed to expire during the Reagan Administration. The oil price collapse of 1986 assured the end of the U.S. synthetic fuels industry.

The general impression left following the demise of the U.S. oil shale industry was very negative. During the boom period, the influx of workers into Western Colorado strained and ultimately overwhelmed the local infrastructure and housing, producing lasting socioeconomic effects. When the industry collapsed, the local towns were left with infrastructure in excess to their needs, shrunken property values and a tax base incapable of supporting the infrastructure.

How is Oil Produced from Oil Shale?

Kerogen, a low grade form of immature oil, is extracted from oil shale in a process called “retorting”, which requires heating of the rock to about 900 degrees Fahrenheit. Two generic methods of retorting have been developed:

• In situ: This method leaves the rock in place and injects a heat source that releases the oil from the kerogen. The shale oil then flows to a well and is pumped to the surface. The source of the heat is a technical issue still open to research and testing. The only active pilot project in the U.S., owned by Shell Oil, is using down hole electric resistance heaters, but optional technologies involve steam, microwaves, and fire.

• Surface retorting: This technology depends upon mined ore for a feedstock. The ore can be either surface mined or mined underground. The ore is brought to the surface, crushed and placed into a retort. The shale oil is removed and the spent shale sent for disposal. The shale oil is upgraded by the addition of hydrogen and then is conventionally refined to produce finished products. Several different retort designs have been constructed and tested in the United States as a part of earlier development efforts. However, there are currently no commercial surface retorts in the U.S. processing oil shale.

Challenges to Commercialization

Perceived Risk: Shale oil activities in the late 1970s and early 1980s have left a legacy of uncertainty. Members of industry and the citizenry alike are uncertain about the risks associated with commercial development.

Current Oil Industry Economics: U.S. domestic oil production is high cost compared to many parts of the world because our fields are mature and declining. Private investment dollars are directed to the most economic areas where costs of production are low, like West Africa, Brazil, the Middle East, Russia and Central Asia. As long as current geopolitical and market conditions persist, we expect more money to flow to energy extraction on a world wide basis; however, not a large share of it is expected to be invested in the United States in the immediate future. As conventional oil plays become more difficult to find, and as conventional domestic oil production peaks, industry will again begin to focus on the development of the resources that can be extracted profitably at higher prices, including oil shale.

Prospects for commercial oil shale production will depend on the private sector’s perception of the relative profitability of oil shale versus competing resources. Factors that will determine economics are projected oil price trends, tax rates, cost of production, resource access, royalty payments, permitting requirements, cost of byproduct disposal, and the willingness of the State and local populations to host a new industry.

The size of the industry will be limited by existing distribution, pipeline capacity, water availability, power distribution, and refining capacity in this region of the Rocky Mountains. If the oil shale industry develops to any appreciable size, investments will be required to expand the limited infrastructure.

Land Access and Usage: A major driver of shale oil extraction economics is the concentration of the resource. Movement of ore to the retort can be very expensive, because the ore is mostly rock with only a little oil (more than one ton of ore per barrel of oil). Therefore, the ore must be processed at or near the geologic formation where it is found. While the natural resource is very concentrated in Colorado, Utah and Wyoming, the ownership is not. The Federal Government owns 80 percent of the resource base, and the remaining tracts are broken up. At this time the Department of the Interior does not have a commercial leasing program, although it recently established a leasing process for small tracts to conduct research, development, and demonstration projects and is accepting nominations from industry for parcels to be leased.

Environmental Impact: The environmental impacts of shale oil development are significant. Like the resource, they will primarily be concentrated in small geographic locations. Because oil shale is mined, there are surface impacts. Oil

shale production is water intensive, which is an important limited resource in the regions with oil shale deposits. Because the retorting processes are energy intensive, there are combustion emissions in areas where the air is currently very clean. The mining or in situ technologies may also disturb the local water tables. In the case of the in situ technology, the spent shale in place may contain toxins that need to be kept away from ground water. In the case of surface retorting, the spent shale, processing water, and other byproducts must be disposed of in a safe manner. How to do that on a massive scale has not been defined. To produce a million barrels of oil would require disposal of more than a million tons of byproducts.

The positive aspect of the resource is that its density is so great that most of the environmental impacts can be restricted to a relatively small area within two or three States. However, because shale oil production is energy intensive, the industry could add significantly to green house gas emissions during production. Similarly, greenhouse gas emissions will be released when the fuel is consumed.

Extraction Technology: Despite the significant research and development conducted 20-30 years ago, there is no accepted benchmark for the best technology to use. Furthermore, because of modern developments in environmental protection and resource conservation, it will be important for the existing technologies to improve from an efficiency, and environmental impacts perspective. Companies will have to advance extraction technologies through research, development, and demonstration.

Comparison with Alberta Oil Sand Commercialization

Commercial production from formerly uneconomical resources occurs as markets change and drive technology development. Oil from Alberta oil sand, once considered to be an unconventional resource, is being commercially produced today. Oil was first produced at a commercial scale from Alberta oil sand more than 35 years ago. Today, oil sand production is over one million barrels per day and is expected to exceed 2 million barrels per day within the next eight years. A strong partnership between government and industry stimulated more than $65 billion in private investment to accelerate development and achieve industry scale operations during this decade.

Like oil sands, U.S. oil shale is rich, accessible, geographically concentrated, and well defined. However, the technologies required for exploitation of oil shale are very different from those required for oil sands. The richness of the respective resources are similar, with oil sands yielding approximately 25 gallons per ton of bitumen while some oil shale deposits yield an average of about 30 gallons per ton. A comparison of the qualities of the two oils shows them to produce a similar product after processing. The Athabasca sand produces 34 degree API oil and the oil shale produces 38 degree API oil. However, there are important physical differences between oil sands and oil shale and the extraction technology for one cannot directly be transferred to the other.

Summary

In summary, we need to examine all of our resource bases if we are to do a credible job in protecting the United States' energy security interests. As part of its energy security goal, the Department is committed to improving energy security by developing technologies that foster a diverse supply of reliable, affordable, and environmentally sound energy and improve our mix of energy options. The Department will work to achieve this goal in support of the economic security of the United States, in line with our commitment to deliver results for the American taxpayer. Mr. Chairman, and members of the Subcommittee, this concludes my prepared statement. I will be happy to answer any questions you may have at this time.