ECONOMICS, BARRIERS, AND RISKS OF OIL SHALE DEVELOPMENT IN THE UNITED STATES

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Overview

Current world oil prices are hovering around $130 per barrel. Prices have nearly doubled in the last year and have risen by 400% since 2004. High oil prices, among national security concerns over the United States' reliance on unstable foreign sources of crude oil, have reignited interest in the U.S.' vast domestic resource, oil shale.

Oil Shale is one of the world's largest known fossil fuel resources. More than 1.8 trillion barrels of oil are trapped in shale in Federal lands in the western United States in the states of Colorado, Utah and Wyoming, of which 800 billion is considered recoverable. This amounts to three times the proven reserves of Saudi Arabia. During the past decade, a lot of attention has been given to the various extraction technologies to make oil shale economically feasible. The objective of this paper is to quantify the costs and benefits of oil shale industry development and consider the hurdles to such development.

Detailed economic analysis has been conducted on the potential development of oil shale. This paper will describe the four representative production technologies being considered by companies for oil shale development. The paper will provide details of various components of capital and operating costs for each of these technologies and the price at which each of these technologies will be economic. In addition to presenting an evaluation of the economic viability of an oil shale industry, this paper also describes the costs and benefits of such an industry to local, state, and Federal governments. Measures such as jobs created (for example: a 2.5 million barrel/day oil shale industry will require up to 300,000 direct and indirect jobs), contribution to Gross Domestic Product, and imports avoided will be described.

Methods

The Department of Energy Office of Naval Petroleum and Oil Shale Reserves constructed the National Oil Shale Model to evaluate the potential development of oil shale. The Model uses a comprehensive analysis which included a representative sample (about 70 billion barrels) of western oil shale resource divided among multiple development "tracts." Four (4) production technologies were considered. These technologies include emerging in-situ processes as well as traditional mining with surface retorting technology. Each development "tract" was screened for the potential application of each recovery technology. A detailed economic evaluation was conducted for each "tract" and the selected technology with consideration for development under alternative economic, environmental, technology, and socio-economic scenarios.

Results

The results of the analysis indicated that with a concerted effort from industry and local, state, and Federal governments, the shale oil production potential could reach 2.5 million barrels per day (MMBbl/d)by 2035 with substantial benefits to the local and national economy. The analysis has estimated capital and operating costs for commercial oil shale projects for a range of project sizes, qualities of the resource, and technologies used. Additionally, the analysis estimated annual and cumulative cashflow for oil shale projectes before and after taxes, transfer payments (royalties), revenues, and profits. The results suggested the minimum economic price, based on a 15% rate of return, for oil shale projects, varying by the technology and resource quality. Economic benefits to the state and national governments including the value of oil imports avoided and direct state and federal revnues, were approximated. The results of the analysis also revealed the most effective policy options for overcoming barriers to the development of a domestic oil shale industry. Market assurance through price guarantees, targeted tax incentives, and demonstration of technology performance at a commercially representative scale all proved to have significant positive effects on development in the modelled scenarios. The analysis also identified barriers to development including access to land and water along with uncertainty in fiscal regime.

Conclusions

The domestic oil shale resource could supply a significant volume of oil with substantial benefits to local communities, state and national treasuries, as well as the national economy. An evaluation of oil shale extraction technology economics reveals that an industry would be economically viable. Numerous hurdles, however, constrain the development of a domestic oil shale industry and Federal actions are required to encourage the

private sector to invest in the oil shale industry. If properly designed, incentives could create an opportunity for a production goal of up to 2.5 million barrels per day by the end of the next two decades.

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