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### The current understanding of U.S. oil shale economics

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The United States has the largest oil shale resources in the world, in excess of 6 trillion barrels. Based on analyses conducted in 2005, the Department of Energy Office of Naval Petroleum & Oil Shale Reserves (NPOSR) developed economic models designed to determine how much of this resource might be economic to recover. The models are based on using four different extraction technologies (two in-situ and 2 ex-situ), selected based on the state of their development and on availability of detailed economic data. Capital and operating costs in the models include data generally available in the public domain and actual costs obtained under confidentiality agreements. Based on this modeling, it was determined that 600 to 800 billion barrels of the 6 trillion barrel resource may be economic to recover. It was also determined that the minimum economic price for oil is \$38/barrel for in-situ extraction technologies, \$62/barrel for modified in-situ, \$47/barrel for above-ground mining/surface retort, and \$57/barrel for underground mining/surface retort. Following model development, but prior to the current recession, increased oil demand and tightening supplies led to rapidly increasing oil prices, which stimulated investment in energy projects around the globe, but which also disproportionately drove up development costs. A clear example of this is the significant increase in capital and operating costs needed to develop Alberta's oil sands from 2006 to 2008. Given that a similar experience is possible for oil shale development, this brings into question the validity of the costs and price/cost relationships embedded in NPOSR's economic models, and thus the validity of model-derived economics. To address this issue, an extensive analysis was conducted to determine costs and price/cost relationships in an environment of rapidly increasing oil prices. This new information was then included in NPOSR's economic models, and oil shale economics were recalculated. This paper will provide some of the details of the analyses that were conducted, including the relationship between rapidly increasing oil prices and costs, and the resulting impact on project economics, production, and other macro-economic benefits.