

## Report Digest: *Oil Shale in the West: 14 Unanswered Questions*

Contacts:

Julia Haggerty, Ph.D., 406-600-1766, [julia@headwaterseconomics.org](mailto:julia@headwaterseconomics.org)

Chris Mehl, 406-570-8937, [chris@headwaterseconomics.org](mailto:chris@headwaterseconomics.org)

June 2009



### Synopsis:

This report summarizes recent research and policy documents to provide a brief overview of the current state of oil shale development and the many contingent factors that will determine when and if commercial oil shale development becomes viable in the U.S. West.

We conclude there are at least 14 unanswered questions about the viability of oil shale production at a commercial-scale. Understanding the answers to these questions will be crucial to making informed decisions about the viability of the industry and the relationship between its impacts and its benefits. The full report can be found at [http://www.headwaterseconomics.org/energy/14Questions\\_2010.pdf](http://www.headwaterseconomics.org/energy/14Questions_2010.pdf).

### Overview:

Recent high crude oil prices, anticipation of a peak oil crisis, and a focus on developing domestic sources of fossil fuel have contributed to a renewed interest in mining and processing the oil shale found in Utah, Wyoming, and Colorado to yield a crude oil substitute. The development of a commercial-scale industry remains a tenuous proposition due to a number of technical, environmental, regulatory, and economic challenges. The viability of oil shale development relies on major assumptions regarding the industry's ability to overcome these and other obstacles.

Federal policy designed to encourage development of oil shale, combined with the vast scale of the resource, means that oil shale development will remain a possibility in the U.S. West as long as the nation continues to rely heavily on fossil fuels for energy. As a result, it is important to understand the issues that affect the development of a western oil shale industry.

The current information basis for making informed decisions about oil shale development is thin at best. This report explores a range of questions about the viability and impacts of an oil shale industry that need to be answered before policy makers and the public can effectively engage in the decision-making process that affects the utilization of public lands for an oil shale industry.

One of the most pressing questions about oil shale is scale. Predictions about the commercial viability of oil shale depend on developing an industry at a volume 150 times greater than the combined total of existing worldwide oil shale production. The scale of activities required to achieve such a volume—and to make oil shale profitable, by distributing its significant costs across a vast economy of scale—would dwarf any industrial land use ever pursued in the United States.

Whether the industry could perform profitably at this scale, and whether the region's social, physical, and biological infrastructure could withstand the associated impacts are as yet unknown issues that cloud a realistic vision about the future of oil shale.

## Summary Findings:

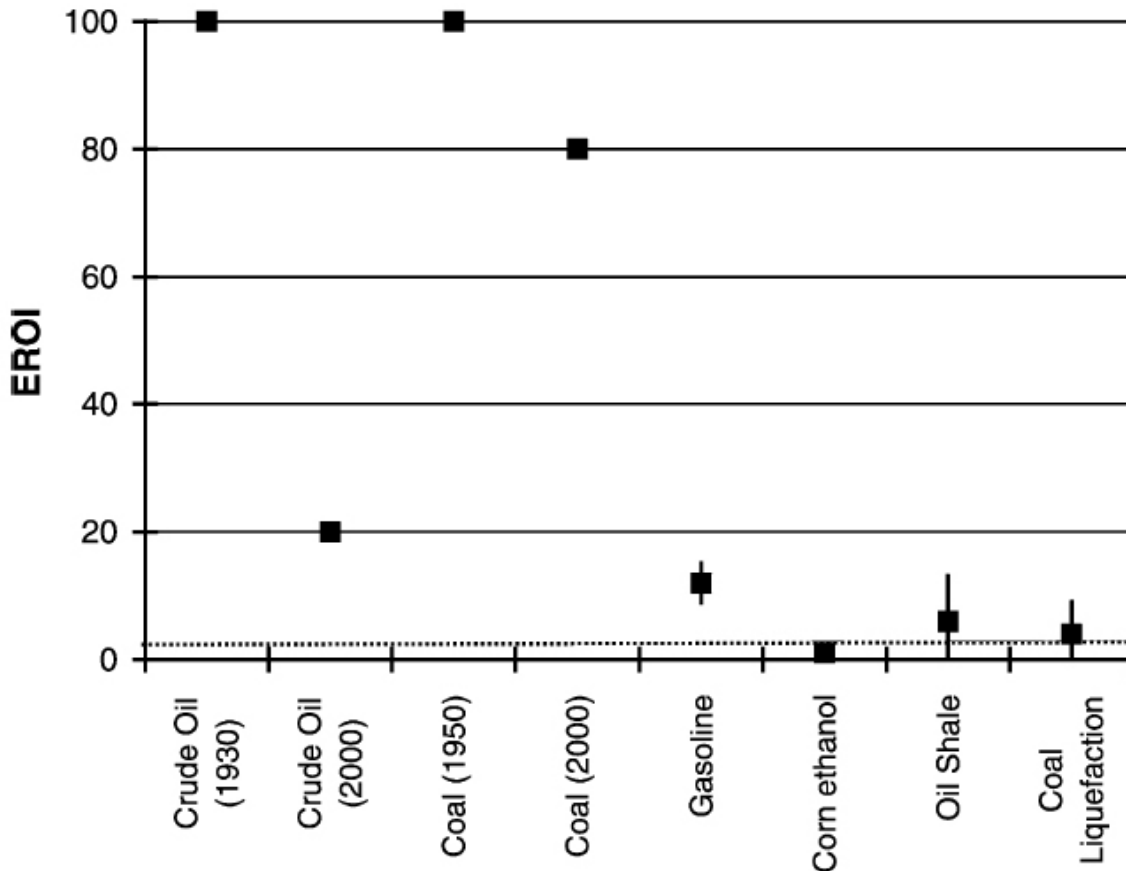
### **Recent forces are working to move oil shale development forward:**

- Recent and projected world oil prices are at or near the “hurdle prices” (ranging from \$30 to \$70 per barrel, depending on technology) at which industry proponents claim oil shale would be cost-effective.
- The potential volume of oil shale’s contribution to domestic fuel supplies is estimated at 500 billion to more than 1 trillion barrels. By comparison, the projected total yield from Saudi Arabia’s oil fields is estimated at 265 billion barrels.
- The BLM has completed the necessary preliminary steps for a national oil shale leasing program.
- Response to recent RD&D (research, development, and demonstration) lease offerings by the BLM demonstrates a high level of industry interest.
- Industry, specifically Shell, has invested large amounts of capital in developing *in situ* retorting (below ground liquefaction of oil shale) as an “environmentally friendly” and cost-effective approach to oil shale development.

### **However, significant obstacles to a commercial industry persist:**

- Predictions about the commercial viability of oil shale depend on developing an industry at a volume that would rank the oil shale region of the Western U.S. among the top 10 oil producing nations in the world. The vast scale of its operations underlies the many obstacles the industry faces.
- Neither existing production techniques nor new technologies that are in development have ever actually functioned at the scale that industry and government experts predict would be required to make Western oil shale financially viable.
- Predictions of the cost-effectiveness of oil shale assume that crude oil prices will continue to rise and that investment in and development of alternative fuel and energy sources (as well as energy conservation) will not have an effect on fossil fuel dependency.
- Regardless of mining technology, environmental impacts to habitat, ground and surface water, and air quality from oil shale production conflict with existing federal environmental statutes, including—but not limited to—the National Environmental Policy Act (NEPA), the Clean Air Act and the Clean Water Act.
- Anticipated new federal legislation capping greenhouse gas emissions would severely impinge on the viability of oil shale by penalizing high carbon energy sources.
- Creating energy to extract and produce oil shale may be difficult, as coal-fired and nuclear power plants face approval hurdles themselves. (See Figure 1).

**Figure 1. Energy Returned on Energy Invested (EROI) for Conventional and Alternative Energy Systems, from Cleveland, 2005.**



Source: Cleveland, C. J. “Net Energy from the extraction of oil and gas in the United States.” *Energy* 30 (2005): 780.

- Existing refinery and pipeline infrastructure would require major upgrades to accommodate oil shale distillate.
- The projected water usage demands of oil shale development—hundreds of thousands of acre-feet per year—greatly exceed water availability in the Colorado River Basin, an already over-adjudicated water source of which municipalities as well as agricultural users from across the West are fiercely protective.
- Affected state agencies in Utah, Colorado, and Wyoming vary in awareness and preparedness for their role in oversight and administration of oil shale leasing.
- Local governments and communities in Northwest Colorado, Southwest Wyoming and Northeast Utah are overextended as a result of swings in the current oil and natural gas economy and would likely struggle to accommodate growth on the scale anticipated for a booming oil shale industry.

## **14 Unanswered Questions:**

### **Regarding mining operations and their impacts:**

1. Will mining activities on a scale rivaling the world's largest mines stand up to federal regulatory review such as NEPA?
2. Can new retorting technologies avoid the operational difficulties that plague existing operations?
3. Can a technology that has to date produced only 1,500 barrels of oil upscale to produce 200,000 barrels per day?
4. Can freeze-wall technology be deployed to contain groundwater contaminants effectively during and after production?
5. Will it be possible, from both economic and regulatory standpoints, to construct new power generating facilities to support the substantial electricity needs of this technology?
6. Can as yet unproven technologies realistically expand to produce at a level more than 150 times greater than current worldwide oil shale production?
7. Could the already over-allocated Colorado River Basin support cumulative new water demands that rival the volume used by the nation's largest cities?
8. Will oil shale, as a significant carbon emitter, somehow be exempt from (possible) greenhouse gas emission legislation?

### **Regarding economic and structural feasibility:**

9. Will (historically volatile) future crude oil prices behave as modeled (rise steadily)?
10. Will economies of scale offset the costs of first-of-a-kind mining operations and processing facilities as predicted?
11. Is government support of oil shale in the form of tax exemptions and generous land leasing terms is a better investment than spending comparable money on other fuel and energy alternatives?
12. How will advances in other alternative energy sources affect projected increases in the value of crude oil?
13. Can existing refinery and pipeline capacity be modified and expanded to accommodate oil shale distillate?
14. Do the benefits of oil shale outweigh the social costs to local communities, in terms of pressure on housing, infrastructure, local government budgets, and employment?