



A GIS Analysis of Technically Recoverable Natural Gas and Oil from Challenged Lease Parcels in Utah

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On December 19, 2008, BLM issued leases covering close to 150,000 acres in Utah. Plaintiffs have challenged 77 of those leases, totaling around 103,000 acres. The potential natural gas and oil under these contested leases in Utah amounts to a miniscule amount of energy. At best (not taking into account prices or other obstacles to development), these leases could provide 0.02% of annual oil and just 0.5% of annual natural gas consumption.

Meanwhile, there are close to 33 million acres of federal minerals leased by the oil and gas industry, but not in production nationwide. More than 3.6 million acres in Utah are in the hands of oil and gas companies but not being developed.¹ The contested leases are equivalent to 1/3 of one percent of these undeveloped leases nationwide and less than 3% of those in Utah. Between 1998 and 2007 the number of permits to drill oil and gas wells on Utah's public lands nearly quadrupled. Furthermore, over 35% of those issued in 2007 were never used.²

The U.S. Department of Energy produces annual forecasts of energy prices which indicate that the overall price trend for both natural gas and oil is expected to be upward over the next two decades.³ There is no urgency to developing these resources; their value is likely to increase over time.

Based on the substantial surplus of both leased public lands to be developed and drilling permits issued, as well as the small amount of resources involved, issuance of these leases will affect neither the price, nor the supply of natural gas or oil. Further, development of these leases would not be without other costs.

Data Sources and Methods

The Wilderness Society has processed a substantial quantity of the most current USGS-developed projections for undiscovered oil and gas resources for the Rocky Mountains into a single dataset that represents the best available data for the region. This data has been used to estimate the volume of undiscovered technically recoverable resources located under these lease parcels.

This analysis is based on the best available data from the U.S. Geological Survey's (USGS) National Oil and Gas Assessment (NOGA) data.⁴ The initial NOGA, completed in 1995,

¹ House Appropriations Subcommittee on Interior, Environment, and Related Agencies: Written responses from Secretary Dirk Kempthorne to questions submitted for the hearing record by Rep. Maurice Hinchey, oversight hearing on the FY 2008 Department of the Interior budget proposal, March 1, 2007

² Ibid.

³ U.S. Department of Energy, Energy Information Administration, Annual Energy Outlook 2009 (Early Release) <http://www.eia.doe.gov/oiaf/aeo/index.html>

⁴ <http://energy.cr.usgs.gov/oilgas/noga/>

projected the volume of technically recoverable, undiscovered petroleum resources⁵ without regard for the time span that might be required to realize the assessed volumes. Subsequent to this effort, the USGS developed new analytical methodologies based on a 30-year time frame for development. The new methodology has been employed for “high priority” basins starting in 2000 to estimate the volume of undiscovered oil and gas resources that have the potential to be added to reserves over the next thirty years. All data is provided by the USGS in geographic information system (GIS) format. The most up-to-date data have been used to estimate the volume of resources in the 77 leases.

To compile large quantities of data across more than a dozen basins, we developed a series of scripts written in Python, the native scripting language of ArcGIS. The scripts formatted the data for automation, converted resource volumes to densities (volume per unit area) and then summed density values across overlapping resources. The final output of the scripts is a single data layer that represents resource density estimates for a combination of conventional and continuous (unconventional) accumulations of oil, natural gas, or natural gas liquids as a continuum across the entire region. This single layer can then be used to determine the resource volume under specific areas (such as the Utah leases) by using the boundaries of the area in question to clip out, or extract, the underlying resource density estimates. The extracted density estimates are resource estimates for the basin, which are then converted back to volumes (volume per unit area multiplied by area equals volume).

Oil and gas volumes are reported as probability of occurrence in the USGS data. A volume in cubic feet of gas or barrels of oil is given for 5%, 50%, 95% and the mean likelihood of occurrence of each petroleum resource. For example, a volume of natural gas provided at the 95% level indicates a 95% probability that the stated volume of gas is present. Smaller resource volumes are associated with the higher probabilities of occurrence. The Wilderness Society analysis results provided in this document use the mean probability because it provides a more unbiased measure of the energy potential of public land – as opposed to the 5 percent estimate which has a 95% probability of overestimating the resource.

It is important to emphasize that the analysis accounted for technically recoverable resources, not economically recoverable resources. Technically recoverable resources are "...producible using current technology, but without reference to economic probability."⁶ The volumes for economically recoverable resources would be notably smaller and are variable because they depend upon factors such as market prices for both the extracted resources and the costs to extract them and technology constraints.⁷ Consequently, our results substantially over estimate the amount of oil and natural gas that would actually be economical to produce.

⁵ Undiscovered petroleum resources are resources postulated from geologic information and theory to exist outside of known oil and gas accumulations.

⁶ U.S. Departments of the Interior, Agriculture, and Energy. 2008. Inventory of Onshore Federal Oil and Natural Gas Resources and Restrictions to Their Development, Phase III Inventory – Onshore United States. Appendix 2, Glossary of Terms, p. A2-13.

⁷ The U.S. Geological Survey published a report in 1995 estimating the economically recoverable resources in the major U.S. oil and gas basins. Prices have fluctuated considerably since the publication date and are now (when adjusted for inflation) very similar to those used in the 1995 report. Approximately 70% of conventional natural gas in the Uinta-Piceance Basin would be economically recoverable at current prices and just over 91% of conventional oil resources. Coal-bed methane in the basin would 79% recoverable and continuous gas resources would be 13% recoverable. U.S.G.S estimated that none of the oil in continuous type accumulations would be economic to recover

Assumptions

First, we assumed that the USGS estimates of undiscovered gas and oil resources provide the best, unbiased estimate available to public land managers. As Gautier (1997)⁸ notes:

Data assembled by scientists at the U.S. Geological Survey for use in the National Oil and Gas Assessment are useful for other purposes as well. In fact, the U.S. Geological Survey is uniquely positioned to provide users, especially land-use managers, an historical view of a specified area of interest in combination with a look at possible future oil and gas activity. The capability to study an area prospectively and retrospectively is the real power of national assessment data files.

This assessment is further reinforced by industry experts (Shanley, Robinson and Cluff, 2004)⁹ who assert "The USGS conducts perhaps the most rigorous resource assessment..."

Second, we assumed that gas and oil quantities are distributed evenly across each USGS Assessment Unit – where assessment units consist of areas with common geologic characteristics. The U.S. Department of Energy (2001)¹⁰ and the National Petroleum Council (1999)¹¹ used the same assumption in their reports. More recently, the even distribution assumption was used in the 2003 Department of Interior's "EPCA" studies¹² of gas on public land in the Rockies, and in the Environmental Impact Assessment for the Jack Morrow Hills Coordinated Activity Plan (BLM 2004).¹³

Data Limitations

Our analysis has employed the best available data for estimating the volume of undiscovered oil and natural gas reserves for a regional assessment. It is the same data used by federal land management agencies. While the best available, this data has two inherent limitations:

- Our results over estimate the volume of resources that would actually be developed. Our data is for *technically recoverable* volumes of oil and gas rather than the more practical

at \$41.82 per barrel which is less than current world crude prices. (Source Attanasi E.D. 1995. "Economics and the 1995 National Assessment of United States Oil and Gas Resources" USGS Circular 1145).

⁸ Gautier, D. 1997. U.S. Fact Sheet FS-016-97, Energy Resource Surveys Program. U.S. Geological Survey. <http://energy.usgs.gov/factsheets/GIS/gis.html>.

⁹ Shanley, K.W.; Robinson, J.; Cluff, R.M. 2004. Tight-gas myths, realities have strong implications for resource estimation, policymaking, operating strategies. Oil and Gas Journal, August 2, 2004.

¹⁰ U.S. Department of Energy, Energy Information Administration. 2001. U.S. Natural Gas Markets: Mid-Term Prospects for Natural Gas Supply. SR/OIAF/2001-06

¹¹ National Petroleum Council. 1999. Natural Gas: Meeting the Challenges of the Nation's Growing Natural Gas Demand. A Report of the National Petroleum Council.

¹² United States Departments of the Interior, Agriculture, and Energy. 2003. Scientific Inventory of Onshore Federal Lands' Oil and Gas Resources and Reserves and the Extent and Nature of Restrictions or Impediments to Their Development.

¹³ U.S. Department of the Interior, Bureau of Land Management. 2004. Final EIS: Jack Morrow Hills Coordinated Activity Plan/Proposed Green River RMP Amendment.

economically recoverable estimates that take into a host of practical issues such as engineering constraints on extraction, distance to market and market prices for resources. *Technically recoverable* data significantly overestimate the volume of resources that are *economically recoverable* as is documented in the report by the Rand Corporation.¹⁴

- Inaccuracies in the GIS boundaries of the USGS basins may lead to small errors (under and over estimates) in the volumes of oil and gas at the edges of the basins. This error is on the order of 1 to 2% per basin. However, it is minor in computing regional oil and gas volumes and virtually insignificant for the 103,000 acres encompassed by the contested leases due to the lack of abutting basin boundaries in this analysis.

Results

Resources

Our analysis indicates that the contested Utah leases contain approximately 96.43 billion cubic feet of *technically recoverable* natural gas and 1.16 million barrels of *technically recoverable* oil (Table 1).

These estimates are based on current technology and do not consider economic factors. As such, they represent an upper bound on the potential resources that may exist in the challenged lease parcels. When such factors as the price of natural gas and oil, drilling costs, and the cost of transporting gas and oil to markets are included, the estimate will be lower than the technically recoverable estimates presented here.

Table 1. Estimates of Technically Recoverable Natural Gas and Oil Resources in the Protested Leases

	Technically Recoverable Undiscovered Resources	Resources Compared to Annual U.S. Consumption
Natural Gas	96.43 Billion cubic feet	0.50% of total annual consumption; would meet U.S. needs for 1.8 days
Oil	1.16 Million barrels	0.02% of total annual consumption; would meet U.S. needs for 1.4 hours

Source: U.S. DOE, Energy Information Administration (www.eia.doe.gov)

US natural gas consumption in October of 2008 was 52.5 billion cubic feet per day

US petroleum consumption the week of 12/26/08 was 20.21 million barrels per day

These estimates are the most recent available from the U.S. Dept. of Energy

¹⁴ The RAND Corporation estimated economically recoverable natural gas resources for the Greater Green River Basin. Their estimates indicated that conventional resources would be recoverable at about 53% at current prices, tight sands resources at about 59% and coal-bed methane at 45%. (Source: Tom LaTourrette, Mark Bernstein, Mark Hanson, Christopher Pernin, Debra Knopman, and Adrian Overton, 2003. *Assessing Natural Gas and Oil Resources: An Example of a New Approach in the Greater Green River Basin*. Prepared by Rand Science and Technology for the William and Flora Hewlett Foundation.)

The oil and gas in these leases amounts to a drop in the bucket of U.S. consumption. Developing these leases would have, at most, an imperceptible impact on the supply and thus consumer price of natural gas. It is unlikely that the development of the oil in these leases would have any impact on supply at all.

Furthermore, oil and gas companies currently hold leases on millions of acres of public lands in Utah and across the nation. Nearly three quarters of these are not producing, but are sitting idle (Table 2). The 103,000 acres of Utah wildlands in the contested leases amount to a miniscule amount compared to the current stockpile of public lands leased but not in production..

Table 2. BLM Leased Acres for Fiscal Year 2007

	Total Leased Acres	Producing Leased Acres	Surplus Leased Acres	Contested Utah Lease Acreage as % of Surplus
Utah	4,681,529	1,014,474	3,667,055	2.8%
Nationwide	44,479,478	11,629,625	32,849,853	0.31%

Source: House Appropriations Subcommittee on Interior, Environment, and Related Agencies: Written responses from Secretary Dirk Kempthorne to questions submitted for the hearing record by Rep. Maurice Hinchey, oversight hearing on the FY 2008 Department of the Interior budget proposal, March 1, 2007 (See the Appendix to this report for additional data on the nationwide lease surplus)

The relatively minor amounts of oil and gas in the contested leases are also a drop in the bucket of acreage already under lease that is not being developed.

Costs of Oil and Gas Drilling

Extraction of the very small amount of oil and gas in the contested leases would not come without costs. Utah has been prized as a destination for outdoor recreation and pursuing industrial development on wilderness quality lands will have impacts on this tourism. The Utah Tourism Industry Coalition estimates that in 2007 visitors spent over 6 billion while vacationing in the state. The industry generates \$617 million in state and local taxes and creates over 113,000 jobs.¹⁵ These revenues and employment benefits would be at risk if the 77 leases were developed.

Developing wilderness quality lands will also result in the loss of substantial non-market values. These values have been estimated by economists for over 4 decades and are an important aspect of the total value associated with public lands. To ignore these costs results in an incomplete and one-sided picture of the value of the 77 contested leases.

The Bureau of Land Management has estimated these values for certain lands within the Price Field Office by applying the results of prior research in what is arguably a very conservative manner. They arrive at an estimate of an annual non-market value of \$38.50 per acre for

¹⁵ Utah Tourism Industry Coalition, 2008 "The State of the Utah Tourism Industry" ftp://ftp.xmission.com/pub/users/u/uttour/outgoing/TourismReport2k8v1r2_print.pdf

wilderness quality lands.¹⁶ With just over 103,000 acres of lands with wilderness quality, the contested leases are worth nearly \$4 million annually in non-market values. Certainly, there is a substantial cost associated with the proposed industrial development of these leases which is highly likely to outweigh the potential benefits. And it should be noted that these are just two examples of the costs of oil and gas development which must be considered in order to create a complete analysis of the net benefits of such development.

Conclusions

The Wilderness Society's analysis above shows that drilling the contested leases in Utah would not make a substantial contribution to the supply of natural gas or oil or have an effect on the price of these commodities. Further, a delay in issuance of the leases, if they are found to be valid, would not recommend a significant cost to the leaseholders. Although there are potentially valuable natural resources under these contested leases, the development of these contested leases also puts at risk many other public lands-related values. The possible benefits of drilling do not, therefore, necessarily outweigh the associated costs and these costs should be considered in any decision pertaining to the permanent destruction of the wilderness character of these lands.

Appendix A – Data Used for Economic Analyses and Detailed Calculations

Appendix B – Lease Surplus Data for FY 1988 – FY 2007

¹⁶ U.S. Department of the Interior, Bureau of Land Management, Price Utah Field Office 2008. West Tavaputs Plateau Natural Gas Full Field Development Plan Draft Environmental Impact Statement UT-070-05-055 (Chapter 3, pages 3-181 to 3-183)