Political and Economic Changes in the USSR: Energy Implications

by Alexander A. Arbatov (Committee for Productive Forces and Natural Resources, The USSR Academy of Sciences, Moscow, USSR)

The Soviet Union has played an important role in the European energy scene for more than two decades. The USSR is the largest oil and natural gas producer in the world and the largest coal producer in Europe. The USSR is also one of the largest oil and gas exporters. The main part of Soviet oil is directed to Europe. Despite the drop of oil production and exports during the last two years the USSR still remains a significant oil supplier and the largest supplier of natural gas to Europe. The USSR is standing at the turning point, both politically and economically, in the whole and also in its energy policy. Soviet energy recently experienced a drop in oil production, strikes in the coal industry and lack of investment in the gas industry necessary for the development of its huge resources.

Environmental Issues in the Future Development of the USSR Energy System

by V. M. Yudin and O.K Makarov (The USSR State Planning Committee, Moscow, USSR)

With today's scientific and technological breakthroughs, the well being of any society is strongly dependent on the scale of its provision of energy resources and on the state of its environment. These issues, both currently and in the long run, have become the most urgent ones demanding a joint endeavour from all the countries on the globe. The Soviet Union at present possesses 20% of the world's discovered reserves and accounts for 21% of world energy production. Resource availability has led to favourable conditions for a rapid development of the national energy system.

Barriers to Energy-Efficiency Investments

by Ronald J. Sutherland (Argonne National Laboratory, Washington, DC, USA)
Abstract

The conservation literature argues that numerous cost-effective conservation measures could be undertaken but they are not because market barriers discourage such investments. A review of these barriers indicates that, in general, they do not discourage investment and they are not market failures. A conventional investment model suggests that business investments in energy are made with the same decision rules as any other investments. Consumers who invest in energy efficiency require higher rates of return when the investments are illiquid and they are unable to diversify away the risk. The high discount rates required by consumers for energy-efficiency investments reflect real costs in a competitive market not artificial market barriers. Policies that encourage the dissemination of information such as appliance labelling, may promote energy efficiency and overall economic efficiency. Policies, such as appliance standards, that require consumers to invest according to lower discount rates, reduce consumers’ overall economic well being. Two market failures that illuminate the need for government support of conservation policies are the external costs of energy consumption and production and the lack of aggregate insurance against energy-related risks.

Pages 35-53

Horizontal Oil and Gas Wells: The Engineering and Economic Nexus

by John Lohrenz (Department of Petroleum Engineering and Geosciences, Louisiana Tech University, LA, USA)

Abstract

Horizontal oil and gas well drilling is booming while, overall, development drilling is declining. The engineering parameters and how they affect the economics of horizontal drilling, compared to vertical drilling, are examined here. As a new applied technology, horizontal drilling can promise economic advantages over vertical drilling, but with incremental risks that must be weighed carefully. In the long term, horizontal drilling will merge into the ever-growing inventory of technologies that create the economics that extend the lives of, and yield more reserves from, oil and gas fields that would otherwise decline. The result is the persisting pattern of fields yielding more production than early estimates even as it remains impossible to count which particular new technology gave rise to so much more production.

Pages 55-76

A Risk Analysis of Oil Development in the Arctic National Wildlife Refuge

by Stephen G. Powell (The Amos Tuck School of Business Administration, Dartmouth College, USA)
Abstract

The Arctic National Wildlife Refuge (ANWR) in Alaska is simultaneously the most promising onshore area for oil exploration and one of the wildest areas remaining in the USA. The conflict between the need to develop energy resources and the desire to preserve wild areas has led to a prolonged debate over the merits of programs to lease the region for oil exploration and development. In this study we report on a risk analysis of the oil potential of the ANWR. We develop a comprehensive simulation model of the oil exploration, development and production process in the ANWR based on publicly available data on the oil geology of the region. Compared to existing models of the ANWR, this model is unique in that it simultaneously takes into account the essential geologic characteristics of the region and the dynamic nature of the development process. The model projects the volume of oil production over time, oil industry profits and net national economic benefits, all in probabilistic terms. The model provides a unifying framework for evaluating the limitations of previous models. It also allows us to better assess the potential role of the ANWR in future U.S. oil production, to evaluate the effects of policies that would mitigate environmental damage and, in general, to better frame the debate between advocates and opponents of development.

Pages 77-93

Predicting the Discoveries and Finding Costs of Natural Gas: the Example of the Scotian Shelf

by M. Power and J. D. Fuller (Department of Management Science, University of Waterloo, Ontario, Canada)

Abstract

Predicting the discovery rate and marginal finding costs of natural gas resources requires a well-documented and long statistical history. For partially explored basins, the statistical history is often inadequate. Attempts at avoiding the problem have been made using probabilistic modelling approaches. These are used to estimate the parent population of pools available for discovery and the probable discovery rate. The phenomenon of economic truncation, however, calls into question the precision and utility of such estimates. Furthermore, exploration process is known to be biased toward larger pools, but no method of determining the extent of the bias has been discussed in the literature to date. To avoid these deficiencies, this paper employs the pool size distribution estimates routinely produced by geologists to drive a probabilistic modelling framework taking explicit account of the physical laws of resource depletion. The methodology is discussed and applied to Canada’s Scotian Shelf. In order to put the
predicted costs for the Scotian Shelf in perspective, the results are then compared to forecasts for Alberta.

*Pages 95-107*

**Is the World Oil Market "One Great Pool"?**

by Robert J. Weiner (Department of Economics, Brandeis University, and Business-Government Center, JFK School of Government, Harvard University)

**Abstract**

Is there one, global market for crude oil? This appears to be the assumption made by most petroleum economists, stated succinctly by Adelman in a recent issue of The Energy Journal: "The world oil market, like the world ocean, is one great pool" (July 1984, p.5). Policymakers have often implicitly held the opposite assumption -- that the world market is fragmented -- as evidenced by the efforts of many importing-country governments to seek special arrangements for "secure supply" from exporters in the 1970s and early 1980s. Likewise, oil exporters have sought "secure outlets" for their crude in the late 1980s and early 1990s. These arrangements make no sense if the world crude oil market is integrated. In a similar fashion a policy of diversifying suppliers, which is practised by many importers now, is senseless in a globally unified market. Surprisingly, despite the importance of this issue, there has been no research directed at examining the question of the degree of integration vs. fragmentation of the world crude market. This study makes the first systematic effort in this direction -- by analyzing patterns of price adjustment. The correlation and regression results on price adjustment across regions indicate a surprisingly high degree of regionalization, implying that the world oil market is far from completely unified. The findings could be due to the ability of crude oil sellers to engage in price discrimination. The findings imply that the world oil market is not "one great pool," as claimed by Adelman. The implications for SPR policy, and other policies based on assumptions of international crude oil market integration are discussed in the conclusion of the paper.

*Pages 109-135*

**The Value of Commodity Purchase Contracts With Limited Price Risk**

by Elizabeth Olmsted Teisberg (Harvard Business School, Boston, MA, USA) and Thomas J. Teisberg (Teisberg Associates, Weston, MA, USA)

**Abstract**

This paper describes and demonstrates the equilibrium market valuation of commodity purchase contracts with price ceilings or price floors or both. These contracts, which we
call "limited price risk" contracts, are significantly easier for buyers and sellers to agree upon than fixed price contracts when price uncertainty is high and buyers and sellers have inconsistent price expectations. Analysis of an actual natural gas contract as well as the existence of many brokers promoting limited price risk gas contracts, suggest that these contracts may be priced inefficiently in practice. Our example application should help managers to make use of modern financial techniques in assessing the value of these types of contracts.

Pages 137-148

Complementarity-Substitution Relationships in the Demand for Time-Differentiated Inputs under Time-of-Use Pricing

by Asher Tishler (Tel Aviv University, Israel, and University of Iowa, USA)

Abstract

In this paper we incorporate the non-synchronic responses of different inputs to changes in relative factor prices and develop sufficient conditions under which time-differentiated (over the day) electricity inputs are complements or substitutes. Similar sufficient conditions are developed for time-differentiated labor inputs. We also examine the strong, and sometimes one-directional, relationships between the distributions over the day of the demands for labor and electricity. These relationships depend, among other things, on the objective function of the firm (profit maximization, cost minimization) and on the specific time-of-use (TOU) schedules (of labor, electricity, etc.). Our results are also dependent on the assumption that firms can adjust inputs to changes in input prices on an hourly basis; more specifically, the underlying technology is assumed to be given by an hourly production function. Two issues are emphasized in the analysis. First we show that short-run cost minimization may be an inappropriate procedure for cost-benefit analysis. Second, under the model developed in this paper, the commonly used weak separability assumption (between electricity and other inputs) implies radically different relationships among the time-differentiated inputs under profit maximization and cost minimization.