

BOOK REVIEWS

The Emerging New Order in Natural Gas: Markets versus Regulation by ARTHUR S. DE VANY AND W. DAVID WALLS. (Westport, CT, USA: Quorum Books, 1995), 136 pages. ISBN 0-89930-944-5.

This work grew out of a three-year collaboration between Arthur De Vany and David Walls and represents the first attempt by economists to systematically examine the U.S. natural gas pipeline industry from the standpoint of competitive efficiency. The Federal Energy Regulatory Commission's (FERC) landmark Order 436 in late 1985 marks the starting point for the authors' work. It was Order 436 that transformed the natural gas industry from a collection of separate balkanized pipelines preventing consumers and producers from freely interacting, to an industry in which a highly interconnected grid of pipelines flows natural gas between producers, brokers and consumers, all of whom can deal with each other in a truly contestable marketplace. The authors trace this remarkable evolution through nine chapters, divided into three parts, providing a brief history of natural gas regulation and deregulation, an empirical assessment of competitive efficiency, and lastly, some policy recommendations and potential applications of their work to other industries in the infancy of deregulation.

Part one of this work, containing chapters one to three, outlines how the natural gas industry reached a point of critical mass that resulted in its eventual deregulation. As the authors describe, the natural gas industry, whose pipelines and prices had been controlled since the 1930s, experienced shortages of gas in the 1970s as a direct result of wellhead price controls. This brought about partial wellhead price decontrol in 1978 and culminated with FERC Order 436 in 1985 which encouraged pipeline companies no longer to own the gas they transported but merely to act as the medium for its transportation. This "open access" promoted more pipeline interconnections and more realistic pricing of gas since anyone could now buy or sell gas at any point on the system for transportation to other markets. This, De Vany and Walls contend, marks the starting point of a truly contestable marketplace for natural gas and also marks the starting point for their empirical work.

As explained in chapter three, in a network, more connections imply more paths for arbitrage opportunities. The network nature of the natural gas pipeline system allows De Vany and Walls to test their principal thesis that open access created conditions by which the price of gas at different locations could be arbitrated thus, creating a means by which it can be determined how efficiently the gas market is working. Empirically, conclusions regarding efficiency can be reached by examining the spatial distribution of prices and their dynamics.

Chapters four to seven comprise the middle part of the book and the most likely place where the non-economist, and perhaps, the non-econometrician, will find the reading to be difficult. In these chapters, De Vany and Walls examine the empirical behaviour of gas prices by relying upon two approaches that examine the issue of competitive markets for gas. The first approach uses vector autoregressions (VARs) to test the assumption that spot prices on various pipelines are part of the same network, which De Vany and Walls refer to as the test for the Network Law of One Price. By determining if the values of lagged coefficients in the VAR are not statistically different from zero, conclusions can be reached as to whether spot prices obey a Law of One Price relationship—the more zeroes, the greater the evidence for the Law of One Price and that pricing takes place within a single network. The second method uses cointegration techniques. These are relied upon due to the non-stationarity of the price data and do offer a means by which to test whether price differentials fall within the bounds dictated by arbitrage. If the price differential is stationary, then there is evidence that arbitrage between different points in the pipeline network will ensure that prices cannot drift too far apart.

These two approaches are applied to daily spot field prices, hub prices, and city-gate prices spanning 1987 to 1991. The results indicate that as the number of interconnections in the pipeline grid increased, consistent with the spread of open access approvals, field prices behaved more and more as though they were part of one network (the VAR test) and obeyed the limits implied by arbitrage (the cointegration test). With a few exceptions, similar results were obtained for combinations of field, hub and city-gate prices. Prices in the natural gas futures market are also examined in conjunction with spot prices. The results of cointegration tests indicate that natural gas futures do provide a viable hedging mechanism for spot prices spread across the pipeline network, except for those in the San Juan basin of New Mexico.

The end result of all the empirical work is that De Vany and Walls provide compelling evidence that the spread of open-access has resulted in a market structure that produces truly competitive prices. However, for a work that purports to be aimed at a wider audience than just economists, these chapters may be worth passing over in favour of the summaries provided in chapter one and then moving on to the policy recommendations in the last two chapters.

The final two chapters provide some of the more fascinating reading for both the economist and the educated lay reader. De Vany and Walls argue that it is not the structure of the market that should be evaluated but rather its function. If a market produces competitive prices (as shown in the empirical work), then it is competitive, regardless of how it is structured. Furthermore, the regulatory process should abandon the notion of perfect competition as an ideal against which a market structure should be compared since perfect competition is, by definition, already in an optimal state and is not suited for industries which are continually evolving. The FERC should focus on function—competitive pricing outcomes—not arbitrary structural measures such as pipeline counts or the Herfindahl-Hirschman index. For De Vany and Walls, the natural gas industry has provided proof of the powerful dynamics and ready adaptation of market forces to answering the problem of coordinating flows and prices on a vast pipeline network—a dynamic efficiency that should be promoted and not restricted.

There are a few small problems in this work, most notably in chapter seven where the authors seem to believe that both the FERC and the Chicago Futures Trading Commission [sic] are responsible for the approval of futures contracts. This approval process is the domain of the Commodity Futures Trading Commission only and is completely unrelated to FERC activities. A lesser but more needling point is in chapter six where the authors claim to include prices from Northern Town Border station, a "market hub" on the U.S.-Canada border where Canadian natural gas is imported into the U.S. I am not now nor have I ever been aware of any U.S. import point that has been referred to as Northern Town Border station. In addition, at every point where Canadian gas is imported into the United States only a single Canadian pipeline connects with one or two interstate pipelines (and sometimes only intrastate pipelines). Such a small number of connections hardly fits the De Vany and Walls definition of a market hub as being "points where several pipeline systems intersect in a radial pattern of spokes" (page 75).

Aside from these small points, my only real problem with this work is that it needs an update. For instance, FERC Order 636 mandated that all interstate pipelines must be open access transporters of gas (rather than just apply for it under Order 436) and to completely separate their sales and transportation functions (rather than just be encouraged to separate them). This Order is given only passing mention in chapter six. In addition, wellhead natural gas prices were finally and completely deregulated in 1993 as a result of the Natural Gas Wellhead Decontrol Act of 1989, two years later than the endpoint of the De Vany and Walls dataset. As a result of these two pieces of legislation, it would be interesting to see how prices have evolved over the entire national pipeline network and not just the Texas/Oklahoma/Louisiana region upon which most of the empirical work is performed.

Overall, by focusing on the evolution of the natural gas industry, De Vany and Walls have done a great service in providing some compelling evidence on how market forces can shape and efficiently operate in a network structure. As they indicate, these lessons can be applied to other network structures, most notably, the electric transmission industry, now in its infancy of deregulation.

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*The opinions expressed in this article are those of the reviewer. No responsibility for them should be attributed to the National Energy Board or its staff.

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Economics of the Energy Industries, Second edition, by WILLIAM SPANGAR PEIRCE, (Westport, Connecticut, USA: Praeger, 1996), 318 pages. ISBN 0-275-95626-1.

The second edition is a lightly updated revision of the 1986 original. The book remains a broad, accessible, economically-oriented introduction to energy issues and industries.

New and changed material include analyses of trends following the mid-1980s oil price collapse, and increasing market competition in natural gas and electricity. Climate change is discussed briefly. Tables and figures include data from the last ten years. The focus remains on the United States.

The structure of the book is unchanged. Introductory chapters discuss energy measurement and availability, markets and efficiency, energy and economic growth, and forecasting. Chapters follow on reserves and the economic theory of the mine. This is followed by six chapters each discussing individual fuels and processes—coal, oil, natural gas, electric power, nuclear, and renewables and other sources. The last two chapters discuss environmental issues and energy policy.

The chapters on the individual fuels and electricity are the most useful. Peirce is best when discussing issues such as externalities in drilling fugitive oil resources, cost structures of gas pipeline transportation and electricity production and transmission, and concentration in the coal industry. These are discussed succinctly, with little or no mathematics.

Other topics are best found elsewhere. Tietenberg (1996) and similar books have clearer, more thorough discussions of markets and efficiency, the

theory of the mine, and environmental externalities. Peirce's policy views are strong, although his tone is more temperate than in the first edition. U.S. energy policy is characterized as "unfocussed" instead of the original "sheer stupidity."

While introductory texts on environmental economics proliferate, accessible economic discussions of the energy industries are rare. For those who find Griffin and Steele (1980) outdated or too mathematical, Peirce's book is a good alternative. In a course on energy economics, Peirce is best used in combination with a standard text on environmental and resource economics.

References

Griffin, James M., and Henry B. Steele (1980). *Energy Economics and Policy*. New York: Academic Press.

Tietenberg, Tom (1996). *Environmental and Natural Resource Economics*. Fourth edition. New York: Harper Collins.

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The Economics of Energy Security by DOUGLAS R. BOHI AND MICHAEL A. TOMAN with a contribution by MARGARET A. WALLS. (Boston: Kluwer Academic Publishers, 1996), 151 pages. ISBN 0-7923-9685-5.

Many policies ranging from quotas and tariffs to fuel mandates have been invoked in the name of energy security. Bohi and Toman with their usual care and rigor investigate when such a rationale is justified and when it is misused. Compilation of the book was funded by the American Petroleum Institute with much of the original research funded by the U.S. Department of Energy or Resources for the Future. Although their funding source causes the authors to focus on oil and the US, many of their theoretical arguments apply equally well to other energy products and other countries.

Energy security issues have changed over time. The first policies tended to focus on military preparedness in the form of the U.S. Naval reserves. Later energy security was associated with oil imports causing the U.S. oil quota of 1959 to be implemented and Project Independence to be proposed in 1974. Many of the energy policies implemented during and in the years immediately following 1974 tended to perform so poorly that beginning in 1978 energy deregulation was begun and still continues. As a result, we find that market solutions to energy allocation have come to be preferred unless externalities or imperfections prevent the market from performing optimally.

It is in the framework of energy externalities that the authors investigate arguments for energy security. In chapter one, they nicely categorize such externalities into those that relate to the level of imports and those that relate to fluctuations in petroleum prices. In the import category are direct effects that relate the level of oil imports to price and the indirect effects that relate imports to inflation, the trade balance or other macroeconomic effects. Physical shortages that were once the primary worry are no longer considered so, since price has served well to allocate physical shortages across users. In the price fluctuation category, they include the ill effects of price shocks on the macroeconomy in the form of unemployment, balance of payments deficits, obsolescence of capital and lower investment as well as externalities that can arise from poorly developed markets for hedging and insurance.

In chapter two, they consider the theoretical arguments for energy security externalities and in later chapters they review the recent history of the oil market and consider a wide array of empirical work that has attempted to measure energy externalities. Two direct effects related to oil imports include market power exercised by exporters that would warrant countervailing market power or monopsony power on the part of the US that could be used to force import prices lower. The authors dismiss the second argument immediately arguing that gains from beggar thy neighbor policies are usually transitory and end up making everyone worse off. When they review the evidence for OPEC exercising market power, they find the evidence so mixed with more recent evidence suggesting less market power that they would not encourage the exercise of countervailing monopsony power.

Indirect effects of oil imports on the macroeconomy could include increases in price that increase the deficit in the balance payments, lower the value of the dollar and increase the costs of all goods. But again studies are ambiguous whether such an effect would occur in the long run. Other indirect effects discussed include negative effects of higher oil prices on investment, innovation and productivity growth. However, in a competitive market such effects would be the same for an increase in the price of any factor and are simply market effects rather than energy externalities. Similarly if higher imports in a competitive market displace domestic energy producers and cause structural unemployment, the problem should be attributed to imperfections in the labor market rather than labeled as an energy externality.

Higher oil prices could contribute to inflation as well, but unless oil prices continue to rise the effect on the inflation rate will be transitory. If continued inflation is caused by monetary authorities overreacting and trying to offset the rise in oil prices and possible unemployment, the problem lies more with improper policy than with the initial price rise.

The second types of externality considered are those that are related to rapid fluctuations in price. One externality could arise from a socially inefficient amount of hedging. For example, private oil stocks may not be efficient because

of economies of scale in storage, the deviation of the social from the private discount rate, or imperfections in energy price forecasting. For similar reasons, poor decisions could be made on capital investment. Oil price fluctuations could also cause adjustment costs in other markets with rigid prices such as price controlled utility markets or labor markets. Such imperfections would cause actual economic output to be below potential output.

Their investigation of the empirical evidence on macroeconomic externalities finds mixed results and they suggest that if they exist, we do not know their magnitude.

Military expenditures are sometimes considered an externality. The authors argue against this on several grounds. Military expenditures are a cost of mitigating energy security not a measure of the insecurity itself. It is difficult to measure how much military expenditure should be attributed to oil security as well as how many barrels to spread it over. Also, a reduction in imports would probably not reduce military expenditures on the margin.

Although their survey of estimates of oil security premiums tends to find most estimates to be quite large, the authors from their investigations find little compelling reasons to support such large costs. They contend that there are weak grounds for the support of import controls, conservation of oil consumption, or large oil stockpiles. Further, they contend that recent institutional changes such as futures markets add more price transparency and more stability to global oil markets.

The two chapters on policies on specific sectors, electricity and transportation, although interesting, do not fit in as well as the other chapters. They argue that given the small amount of oil used for electricity generation, energy security problems in this sector are probably limited. For transportation, they tend to argue against energy security externalities using the same arguments as earlier. Their literature review in this chapter suggests that if energy security is an issue in transportation, CNG vehicles are the best alternative.

The book contains an index. It is fairly nontechnical, except for some appendices, and has the advantage of being suitable for a general audience that is interested in energy security. The authors come down firmly on the side of the market, except for encouraging the government to continue investment in energy R&D particularly aimed at diversifying fuel sources. However, their extensive and careful review of the literature gives readers some leeway in coming to their own conclusions.

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Gas and Oil in Northeast Asia: Policies, Projects and Prospects by KEUN-WOOK PAIK. (London: The Royal Institute of International Affairs, 1995), 274 pages. ISBN: 0-905031-94-6.

This book deals with oil and gas in Northeast Asia—China, Japan, North and South Korea, Taiwan, and Russian Asia. Energy demand in Northeast Asia has grown explosively in parallel with its rapid economic growth. Substantial energy resources are located within the region. However, these resources are unevenly distributed. Russia and China have relatively huge gas and oil reserves, while Taiwan, Korea, and Japan are energy-short. However, both Russia and China currently face difficulties in developing their energy resources, especially in maintaining their present oil production levels and allocating their oil for export. Investment capital, technology and equipment are required, but political obstacles and other uncertainties may stand in the way. This subject of oil supply problems lies at the heart of the book and poses the complex setting of the analysis.

The first chapter outlines the book's objectives and sketches the Northeast Asian energy scene: high economic growth, high energy demand, but declining oil production throughout the region. In other words, the region's crude oil production is believed unable to satisfy regional demand. The projected gap between regional supply and demand will widen rapidly in the future and will be filled with imports from the Middle East. The forecast of heavy dependence on Middle East oil imports forces the Northeast Asian countries to diversify their energy supplies.

The second chapter examines how political relationships interact with the region's energy developments. The author concentrates on four important international relationships: *Japanese-Russian*, centered on the dispute over the Kurile islands; *Japanese-Chinese*, centered on the still unresolved, dispute over the Senkaku islands; *North-South Korean*, focused on their changing relations with Russia and the unresolved offshore boundary issue between the Korean peninsula and China that frustrates oil and gas exploration and development in the Yellow Sea; and *Taiwanese-Chinese*, centered on their respective stances towards reunification, obstructing development of oil and gas in the East China Sea.

Chapters 3 and 4 focus on the potential oil and gas reserves and constraints on both Russia's and China's energy industries. The most serious problem facing Russia is the sharp decline in oil production and the stagnant production of natural gas. This critical performance of the Russian energy industries is blamed on the declining volume of development and exploration drilling, the rise in the number of inoperable wells, and the sharp reduction in the number of new fields brought into production. On top of this, energy

planners in the former Soviet Union always gave top priority to European Russia where the core of its oil and gas industries and massive consumption are located (p.111). Now, Russia's lack of investment capacity left the Russian Far East with the option to accelerate development of oil and gas in cooperation with foreign partners.

In China, oil and gas are not so important compared to coal. Coal remains the principal energy source representing 71-74 percent of energy production, and 72-76 percent of energy consumption (p.112). Nevertheless, China's oil production cannot satisfy its growing demand. Most of the supply and demand gap eventually will have to be covered by imports. Next to the uneven distribution of oil and gas resources and the corresponding infrastructure and transport problems, the Chinese energy industries are plagued with declining real prices, rising taxes and production costs, low productivity, low efficiency, and a high debt burden. China's large fiscal deficit prevents a huge investment in the oil and gas industries to increase oil production. This internal situation forces China to take a more flexible stance towards attracting foreign investment.

Chapter 5 reviews the goals of Russian and Chinese oil and gas policies in Northeast Asia. Both countries want to prevent any delay in economic development from oil and gas shortages (p.170). However, Russia's oil and gas policy seems to be conditioned by two elements: first, improvement of its uneasy relations with Japan and second, nationalistic demands from Siberia and the Far East for economic, political, and cultural autonomy. The Far East was hardly integrated into the Soviet economy. The remoteness and the harsh environment prevented the development of the region's oil and gas resources. Now, the area is reluctant to provide resources for the Russian economy at the expense of its own development. However, the region simply does not have the financial or technical resources to undertake the massive development, nor can Russia. Consequently, plans cannot be realized without very extensive foreign investment. And that, in turn, will depend upon Russian relationships with its Pacific neighbours, including the resolution of disputes such as that with Japan over the Kurile islands (p.157). China, on the other hand, seems unlikely to be affected by political considerations.

The sixth chapter explores the interests of the importers of oil and gas and their policies towards the oil and gas development in both Russia and China. The chapter focuses on Japan and South Korea as the main beneficiaries of Russian and Chinese development because of their geographical proximity (p.171). Japan and South Korea have a deep interest in Russia's and China's frontier oil and gas development, but differ in priorities toward development. Japan's policy seems to favor China's frontier oil and gas development, while its stance towards the Russian Far East is influenced by the territorial dispute.

South Korea's commitment is limited by capital constraints and the sheer scale of the market.

Three giant oil and gas projects—Sakhalin, Sakha and Tarim—could fundamentally affect the region's future oil and gas supply structure. These major prospects are analyzed in chapter 7. This chapter examines each project and offers a brief historical, political, and economic review.

The final chapter brings together the previous analyses. The study concludes that the region's oil and gas resources offer huge potential benefits, but many political and economic obstacles stand in the way of their realization. The author pleads for the establishment of a Northeast Asian Energy Forum (NAEF), whose aim is not to make a self-reliant energy system but to lay down guidelines for multilateral energy cooperation in Northeast Asia based on mutual benefits. All the region's frontier oil and gas resources are located in remote and environmentally harsh areas where no infrastructure exists.

Russian Asia and China with huge oil and gas reserves certainly need capital, technology, and equipment for their exploration and development, while Japan, Taiwan, and South Korea, with capital, technology and equipment, need to lessen their heavy dependence on Middle East oil and diversify their energy supplies. The uneven distribution of oil and gas reserves paradoxically indicate that mutual benefit can be derived from cooperation in oil and gas development among countries concerned. In other words, space for multilateral energy cooperation exists in Northeast Asia.

This is a thorough, comprehensive and well-written book. The study provides a wealth of interesting information and presents an excellent and clear assessment of the interplay of energy economics and politics that is fundamental to the Northeast Asian energy paradox. The book is recommended to everyone who wants insight and clarification on the topic of Asian oil and gas.

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A New Order for Gas in Europe? by Michael Stoppard (Oxford Institute for Energy Studies, 1996), 118 pages, ISBN: 00-948061-93-6.

The Oxford Institute for Energy Studies, like its well-known founder Dr. Robert Mabro, has established a reputation for penetrating and sophisticated analysis of energy subjects of great current interest. Its latest book confirms the Institute's skill in selection of subject. Yet the reader is left with an unsatisfied hunger for specific detail and original research. Natural gas, for years past

sidelined as a by-product if not a positive nuisance for the oil industry, is now recognized as the fastest-growing and environmentally most benign of the fossil fuels. Reversal in recent years of the long decline in the energy share enjoyed by gas in the United States is not explored by author Michael Stoppard. Lagging gas consumption in Western European countries—with the notable exception of The Netherlands—is presented more as a failure to ‘reform’ the market than as the outcome of complex and doubtless enduring political tensions. The Institute’s latest offering is best if read not as an analytical work but as a description of the structure of the gas industry in the leading European nations. The compilation of data on networks from Portugal to Poland is impressive. But there are gaps. No reference is made to the important formative years of the manufactured ‘town gas’ era nor to the potential price-smoothing effects of refrigerated and underground storage. A reference, for example, to Amoco’s plan to convert its Dutch gas field into a peak-shaving storage site would spice up an otherwise bland recital of national lay-outs.

Stoppard gives a useful summary of the leading gas companies and their activities. However, he omits the much more interesting Eastern European and Russian participants. Moreover, amazingly for a study published in mid-1996, he relies on 1993 company reports.

The supply potential of liquefied natural gas has been repeatedly examined in the various European markets and is generally taken for granted in the new study. Cost comparisons with pipeline transportation are urgently needed, but are not offered. A table shows the breakdown of delivered gas costs in Europe, with transmission accounting for the astonishingly low share of 1.6 percent. The source of such estimates is not revealed. By contrast, British Gas, for example, claims that transportation charges make up 43 percent of its charges to residential consumers.

Stoppard’s study recognizes that the European gas economy can no longer be understood as if it were to stand on its own feet, independent of supplies in the Former Soviet Union. Without attempting an estimate of the vast scale of the FSU’s reserves, the study infers that supplies from that source are in effect limitless. It concludes lamely, about completion of the Yamal pipeline from Northern Russia, that this could be ‘a potentially destabilizing force.’ The same approach is taken to new supplies to the Continent from Britain, through the Interconnector line expected to be in service by 1997.

The emergence of Russian gas as the largest and fastest-growing part of Western Europe’s supply has attracted much less attention than it deserves. Stoppard focuses, somewhat academically, on the resulting cartelization dangers. He even infers (oblivious of political realities) that Gazprom’s tight monopoly of the entire Russian gas network should be broken up ‘in the interests of a balanced market.’ Western Europe’s gas consumers must be starting to worry, for much more practical reasons, when they realize that more than one-quarter

of their vital supply already comes from Russia and Algeria. Price spikes as well as delivery breakdowns are now recognized as ingredients in the security debate, even in the absence of a cold war.

The new study correctly identifies third party access (TPA) as the key to a more competitive gas market. For cost and administrative reasons, the Adam Smith argument that a new producer can always force an entry by building new pipelines can no longer be seriously offered. Yet Stoppard dwells at length on the reluctance (of course) of companies to accept TPA, and of governments (of course) to enforce it.

The build-up of the European Union's competition rules will eventually reinforce the drive toward TPA. In the meanwhile, however, the German Cartel Office is using an appeal to Brussels as a delaying tactic in dealing with the Thyseengas/Ruhrigas 'demarcation pact.' In France, Gaz de France president Pierre Gadoneix has rejected the latest EU directives on the ground that 'France has done well enough without the help of Brussels technicians.' In Britain, the principle of TPA has been ungraciously accepted by British Gas—but only over some 25 percent of its market. Despite this foot-dragging over TPA, Stoppard believes that competition—though certainly not perfect competition—can be introduced to solve most of the problems of the European gas market. He, therefore, downplays the role of official regulation, as practiced for so many years in the USA by the Federal Power Commission (not mentioned) and the Federal Energy Regulatory Commission. He evidently dislikes the regulatory influence of 'bodies foreign to the gas business.' So, of course, do the producers—but for practical rather than ideological reasons. Shell managing director, Mark Moody-Stuart, recently lamented that the dismantling of controls could leave the industry lacking the mechanisms required to ensure the financing of major future pipeline ventures. On the thorny issue of prices, the study relies too much on index levels, too little on \$/mcf figures. Take-of-pay cases, such as that now being bitterly fought by British Gas, have helped to shed light in areas that were once hidden, in the author's words, by 'the confidential nature of international gas contracts.' Similarly, specific examples of price escalation clauses are now available, and would prove revealing.

To the reader looking for a general introduction to the subject, this study can be warmly recommended. But a future edition, which will no doubt soon appear, should be better and more currently documented. Where, for instance, is the researcher to track down the (incompletely) listed journals? A glossary of conversion factors and company names and addresses, a few more maps, and even an index might be added.

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REFEREE ACKNOWLEDGMENTS

All papers received and published by *The Energy Journal* are regularly sent to international referees for anonymous peer review. Without the help of many expert reviewers, the quality and standards of this journal could not be maintained. Below is a list of referees who have volunteered their time and talents to appraise submissions during the previous year. The editors sincerely thank all referees for their important contribution.

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