Book Reviews

David A. Deese and Joseph S. Nye, eds., *Energy and Security* (Cambridge, Mass.: Ballinger, 1981).

Contents: Energy and Security, Joseph A. Nye. The Changing World Oil Market, Thomas L. Neff. The Persian Gulf, Gary Samore. The Role of Communist Countries, Marshall I. Goldman. Energy Security in North America, Fen Hampson and Kevin J. Middlebrook. Western Europe, David A. Deese and Linda B. Miller. Japan, Joseph S. Nye. The Oil-Importing Developing Countries, David A. Deese. Import Management and Oil Emergencies, William W. Hogan. Coping with Interruptions, Alvin Alm, E. William Colglazier, and Barbara Kates-Garnick. Financial Implications of Petroleum Disruptions, Philip K. Verleger, Jr. Military Force and Middle East Oil, Geoffrey Kemp. A U.S. Strategy for Energy Security, Joseph S. Nye, David A. Deese, and Alvin Alm.

This volume is the product of a series of seminars and workshops at Harvard University that brought together prominent energy experts from academia, government, and the twilight zone between. Funded by a grant from the Department of Energy and containing a laudatory foreword by John C. Sawhill, former deputy secretary of that department, this volume, more than any other, reflects the combined wisdom of the intellectual (as opposed to corporate) energy establishment. As such, it provides useful information and an interesting analysis of energy and energy-related issues. At least as importantly, it offers an insight into the preferences and prejudices of this wing of the energy establishment.

Unlike many multiauthored volumes, *Energy and Security* is not seriously flawed by various problems typically associated with integrating the differing specialties and intellectual proclivities of the contributors. A generally shared perspective on key issues, reinforced by extensive interaction in the preparation of the study, has led to an unusually systematic and cohesive work—a considerable achievement given the mix of economists and political scientists

The Energy Journal, Vol. 2, No. 3

involved in the venture. Because it is an unusually homogeneous collection, it can be reviewed almost as if it were the product of a single individual.

Although nowhere in the volume is *security* defined authoritatively and unambiguously, the authors clearly are working with a consensual definition of the term. To them it implies the continuation of oil supplies at affordable prices without associated "foreign policy costs," such as war, or being forced because of energy considerations to support the Arabs against Israel. In short, *security* as conceived here implies a presumed right on the part of the United States to continue operating at home and abroad much as it has in the post–World War II period, albeit with some attention being paid to stimulating domestic energy production and to its conservation. Right in turn suggests might. For some of the authors (most conspicuously Deese and Kemp), *security* is understood and argued for almost exclusively in military and closely associated terms. Indeed, the entire volume is predicated on a belief in and support for the force component of security. So, for example, in the concluding chapter by Nye, Deese, and Alm, in which a strategy for United States security is propounded, the foremost concern is that of "our political-military posture vis-à-vis the Soviet Union and the Persian Gulf" (p. 409).

Security is thus a code word, standing for a more elaborate series of assumptions and recommendations, and centered on a commitment to a hard-line, militaristic, anti-Soviet policy coupled with a veiled but nevertheless significant pro-Israeli and anti-Arab bias. Not surprisingly, all authors who comment on the issue also share a desire to keep the U.S. federal government out of most domestic energy activities, arguing that the energy companies are better suited to performing these tasks. Recommending militaristic virility overseas and unrestricted private enterprise at home, these authors have used the term *security* to legitimize and popularize their conservative political predispositions.

As most Americans are well aware, energy is a subject that excites political passions. Many of those who mourn the passing of the post–World War II American empire, including apparently the contributors to this volume, view a policy designed to restore our "energy security" as a more general means by which to turn back the clock and reestablish our disintegrating empire. Thus we find in this volume recommendations for covert operations against "Soviet-sponsored governments and organizations in the Middle East" (Kemp, p. 386); demands that our European and Japanese allies fall in behind our leadership and accept our policies vis-à-vis the Soviet Union and the Middle East; castigations of the Europeans for flirting with the enemy (e.g., buying gas and oil from the Soviet Union, Libya, and Algeria); and repeated suggestions that we work to upgrade the International Energy Agency (IEA) into an effective countercartel. While it is obviously difficult to disentangle a discussion of energy from perceptions of the global political system and America's role therein, these authors have failed even to attempt to disengage their political outlooks from the issue at hand. That this is a costly oversight can be seen from a brief review of alternative frameworks in which the issue of energy and security can and might have been conceptualized.

Security issues related to energy availability and price could be viewed, for

example, on a global level rather than through an American lens. The political ramifications of energy are universally significant and increasingly negative. The spiral of debt in nonoil LDCs and the associated breakdown of economic and political modernization processes suggest that the ethnocentric perspective of Deese, Nye, et al., could, if acted upon, lead to a fruitless search for energy security precisely because it is predicated on a bipolar world view. The breakdown of political order in "friendly" LDCs may well have more to do with pressure resulting from energy prices and availability than it does with Soviet meddling. The search for U.S. energy security, at least as advocated in this volume, implies potential insecurity for any who might be seen to be in the way, be they oil producers or consumers.

Rejecting a global perspective, the authors might still have found a more suitable domestic framework in which to have analyzed the topic. Economic dislocations caused by skyrocketing oil prices do lead to political instability, but that is not to say that the correct remedy is a more belligerent foreign policy. For one thing, such an approach requires enhanced U.S. military capabilities, a fact that the authors both recognize and recommend, thereby accepting unquestioningly the dubious linkage between military might and oil prices, as well as overlooking the domestic guns-versus-butter economic dilemma. All the more cause for worry is that this classic dilemma may have taken on a new form, with a third contender for national resources having entered the equation: the overall modernization of the American industrial plant, which has been accomplished partly in order to achieve greater energy efficiency. The United States continues to lag behind European, Japanese, and even emerging Third World manufacturers in terms of improving the ratio of energy input to unit produced. Thus, while the Germans, Japanese, Koreans, Formosans, etc., have successfully adapted their industries to higher energy costs through the infusion of capital, Americans, preferring guns and some butter, have allowed their plant to stagnate. This issue, with its obvious and direct links to overall national economic and therefore political well-being, remains undiscussed in this work on energy and security. For this and the reasons mentioned previously, it is a poorly conceived and overly politicized work, but, it should be added, one that is professionally written, compiled, and produced. The DOE got its money's worth in form, if not in substance.

Robert Springburg
University of Pennsylvania

Michael D. Yokell, *Environmental Benefits and Costs of Solar energy* (Lexington, Mass.: Lexington Books, D. C. Heath and Company, 1980).

This first-of-a-kind analysis uses a complex and sophisticated set of models to quantify the value of environmental damages from different assumed levels of solar technology implementation. The study illustrates the process, problems, and promises of using large-scale simulation models to measure the total

effect of many small effects. The purpose was to determine if the environmental benefits would make solar energy technologies socially, if not economically, competitive.

Simulation methodology is used to estimate the environmental damages of three assumed levels of implementation in the year 2000, a base case (9.3 quads solar), a maximum practical case (16.8 quads), and a maximum feasible case (27.5 quads). Also, high and low environmental control cases and individual technology environmental impacts are analyzed. This simulation involves first estimating pollutant emissions using a 200-sector input-output model that includes emission coefficients. A second model is then used to translate residuals produced into concentrations. A third model is used to estimate air and water pollutant damages and control costs. Sensitivity analysis is conducted on many of the key parameters.

Best available data appear to have been used, but (as admitted by the author) some of the relationships, particularly the damage functions, are based on very incomplete data. These data problems are considered in the results with the caution that the results indicate trends rather than hard data. However, small differences are discussed as if they were real and precise.

Although many pollutants and many damage relationships are analyzed, the results key on one pollutant (SO_x), which provides about 86 percent of the benefits and one effect (deaths). The maximum difference in SO_x emissions is 13 percent; since this is well within the uncertainty limits of the data, damage function parameters, and models, the results may not even correctly indicate trends.

The value of net benefits from 1975 to 2000, between the base case and most practical case at a 2.5-percent real discount rate, ranges from $25 billion to $77 billion as the value of life ranges from $30,000 to $300,000. As is usual in damage studies, "number of dead" is used rather than the more appropriate "length of life lost," and an economic value for life is assumed rather than the more appropriate estimate of how much society is willing to pay to avoid a premature death. This distinction is particularly important in this study, because most of the deaths from SO_x are elderly, already ill persons, and for these cases society has shown little interest in spending large sums of money to extend length of life. If these adjustments were made, the net benefit estimates would be greatly reduced.

The analysis appears to be objective, although one would have to examine the emission factors and damage function parameters (not included in the book) to be sure. However, the book is written to put solar technologies in the best possible light. The book opens with the words, "The principal conclusion of this book is that, on a national basis, rapid deployment of solar energy would make a significant net contribution to environmental quality during the 1975–2000 period." So solar energy is a good thing for society, right? Wrong! The book does not assess the social desirability of using solar energy technologies, but only the environmental benefit! The extra (marginal) cost to the consumers of solar energy is not considered. In fact, based on the 1981 Mitre Corporation Study, "Toward a National Plan for the Commercialization of

Solar Energy," consumers would have to spend $185 billion extra between 1975 and 2000 to obtain the $43 to $133 billion in possible environmental benefits (maximum feasible case, 2.5-percent real discount rate). A second issue is whether market penetration to obtain the 16.8 quads (most practicable case) and 27.5 quads (maximum feasible case) is economically feasible. In fact, accomplishing either amount would bankrupt the country. It would require an investment of over $500 billion (1976 dollars) to obtain 16.8 quads of solar energy output, and over $1 trillion to obtain 27.5 quads of solar energy output. This is one-third to two-thirds of the total energy investment by the economy as a whole from 1975 to 2000. So the cases considered are economically neither practical nor feasible, and the quantitative results are of academic interest only. Given the uncertainty in the data and model relationships and the unrealistic market penetration goal, these large model simulations produce almost no useful information for public decisionmaking.

This book will be very useful to those who are interested in how a set of large computer simulation models can be used for analysis. The description of the models will be useful to those trying to quantify environmental damages, an activity that may have increasing importance with the new interest in cost/benefit bases for government decisions. Most of the data supporting the analysis are not included in the book.

Fred H. Abel
U.S. Department of Energy

Stephen L. Feldman and Robert M. Wirtshafter, *On the Economics of Solar Energy* (Lexington, Mass.: Lexington Books, D. C. Heath and Company, 1980).

Feldman and Wirtshafter tell us that "the development of a more comprehensive methodology was a major focus of this book. The goal of the methodology was to establish a 'total system' framework which considered the perspectives of the individual, the electric utility, and society." To this extent, the book is a qualified success, its success demonstrated by the fact that application of the methodology in specific examples yields intuitively satisfying results. The limitation is that not all the options were considered, and some refinements in the methodology's submodels would be useful.

This book is primarily concerned with the economic efficiency of investments in alternative approaches to building space conditioning. Through the application of an hourly solar heating and cooling simulation model (TRNSYS), and the consideration of the impacts of different space conditioning designs on an electric utility, the authors demonstrate that investments in conservation and passive design features are often more cost effective than are investments in active solar systems or new electric generation capacity. The authors then go on to discuss the various social, institutional, and economic interactions that take place between the individual, the electric utility, and society. These in-

teractions revolve around the issues of utility rates, solar tax credits, and utility financing of solar energy systems.

Chapter 1, "An Introduction to the Problem," provides background information on solar heating and cooling (SHAC) techniques and their qualitative impact on electric utilities. This information is the basis for the methodology development of Chapter 2, "The Systems Model—A Conceptual Overview," which describes the specific models that translate the qualitative impacts into quantitative numbers. The components needed for a "total systems" approach include: a building energy performance model, electric utility production cost, reliability, and generation expansion models, load forecasts and estimates of the cost of various SHAC and generation alternatives. Instead of the direct use of the utility models (which this reviewer was disappointed to see overlooked), the authors rely on multiple runs of TRNSYS to simulate the backup energy and demand requirements of the building. Multiple-year simulation of the building performance on peak days is used to determine average peak demand contribution. Using this approach, the authors demonstrate which combinations of building design and SHAC hardware minimize the total cost of meeting the space conditioning requirements, including a first-order accounting of utility backup costs. Insufficient information is provided for the reader to feel comfortable that the utility long-run marginal costs have been adequately treated due to the lack of presentation of the utility expansion scenario and associated costs.

Chapter 4 is a case study. By evaluating the backup energy and demand requirements imposed on a specific winter peaking utility by a building with a specific floorplan and varying degrees of conservation, passive and active solar, certain conclusions are reached. For the systems studied with the assumptions made, the authors clearly demonstrate that conservation and certain passive design techniques are more economical than either active solar systems or the installation of new capacity by the utility. In general, the methodology and example are very good, if not entirely new.[1] Only through consideration of all of the alternatives can total costs be minimized. However, the potential for other design options such as load management has been largely overlooked by the authors, and will prove to be additional competition for onsite solar from a total systems approach. As this methodology gains acceptance, more sophisticated utility models will be used than those used by the authors. This will refine the answers, but it is unlikely that the general conclusion—that a well-designed building should be top priority in energy use management—will change.

Chapter 5 is titled "Policy: The Impact of Utility Rates, Solar Tax Credits to Consumers and Utility Financing of Solar Energy Systems." A portion of this chapter is dedicated to describing a few of the recent precedents that have

1. The *EPRI Methodology for Preferred Solar Systems* (EMPSS), originally published in 1978, is a self-contained model that incorporates both building and utility parameters in a total systems approach. As the authors point out, the original version of this model did not contain passive and load management options. This deficiency is currently being remedied, and the code will be verified through actual application.

been set in these areas. The rest of the chapter discusses these issues in a more general context. The space limitation of this review is entirely too restrictive to address adequately the many provocative comments made by the authors on these topics. The issues are difficult, the interpretations are many, and the impacts of various choices are unclear. And until we understand, much more clearly than we do today, the basis on which consumers make energy purchase decisions, our ability to forecast the impact of rates, taxes, and financing on energy choices is severely limited.

There are two short chapters in this book that were not written by the authors. Chapter 3 deals with methods of forecasting electric energy and demand and how those forecasts may be influenced by SHAC. Chapter 6 deals with institutional economic considerations such as utility involvement in sales of SHAC equipment, some basic economic theory of average and marginal costs, and a proposal to print coupons that will "establish entitlements among consumers to cheap energy sources . . . and . . . allow energy prices to reflect marginal costs." These two chapters, while interesting in their own right, are not well integrated into the main theme of the book, and could have been incorporated into the major chapters or as appendixes.

The lasting contribution of this book will be the exposition of the methodology, not the policy statements that are of current interest but that are also presented from a strong advocacy viewpoint. If the methodology is applied rigorously, the answer will not always be prosolar and anti–central station, but it will always contain a strong emphasis on good building design.

Roger W. Taylor
Electric Power Research Institute

Gregory A. Daneke and George K. Lagassa, eds. *Energy Policy and Public Administration* (Lexington, Mass.: Lexington Books, D. C. Heath and Company, 1980).

Editors Daneke and Lagassa state that the objective of this book is to show that the energy future should be a balanced mix between hard-path (centralized, high technology) and soft-path (decentralized, small, user-controlled) systems. Daneke explains (at the beginning of Chapter 2) why a collection of articles on public administration is being used to show this: "In a very fundamental sense, the energy crisis really is not an energy crisis at all; rather it is an institutional crisis."

A majority of the articles are written by soft-path advocates. The dominant theme is that the existing power structure of the federal government and large industries inhibits rapid adoption of the soft-path technologies. Contributions have been included by authors with apparent differences of opinion, but there is a lack of confrontation over the salient issues, and this lack is one reason why the resulting book is merely a group of disparate articles in one binding.

Part I, "Managing the Energy Problem," begins with an article in which Daneke indicts both the federal government and industry for their failure to

develop a sound and comprehensive energy policy. His suggested solution is to be more responsive to state and local innovation and interpretation of end user demands. He also voices the common theme of the soft-path advocate: that the energy transition is part of a societal evolution, and energy policy should be an instrument to speed this change.

Walter Mead contributes a succinct account of the problems caused by government's interference in the market and its regulation of the oil industry. Richard Worthington next defines the issue as a class struggle, with American energy development a history of the exploitation of people and natural resources by big corporations and their government allies. He proposes a reversal of the economic growth process and a return to individual and community-level self-sufficiency. Andy Lawrence and Daneke conclude Part I with a discussion of policy methods for moving toward the soft path, including consumers' adoption of requisite behavioral changes.

Part II, "Applications," deals with local programs and relationships with the federal government. Henry Harmon writes on creative grantsmanship, in practical terms based on his experience as a city administrator. Lagassa and Elaine Hussey examine the unusual record of state–federal cooperation in the development of geothermal energy in California. Yudelson proposes an all-out approach for adopting small solar technologies, and Sumner Myers presents an informed analysis of the innovation and commercialization process. Then Marc Ross suggests a strategy for promoting energy efficiency rather than additional supply.

In Part III, "The Problem of Electricity," Lagassa defines the problem as "the political and economic power and force of habit that sustains existing hard path energy strategies." As an advocate of the soft path, he considers electric power rather than oil as the main obstacle. Most soft-path supply technologies replace other sources of electricity, so to advocate any of them one must agree that neither centralized coal-fired nor nuclear power are viable options.

In Chapter 13, Brown, Plitch, and Ringo discuss obstacles to small-scale hydroelectric power. They suggest relaxed regulation to make it competitive, noting that "the relative cost of regulation may be the only one which has increased as fast as the cost of oil." The editors appear to avoid confrontation deliberately, since an article at the end of the volume, by John Carroll, is about the enormous large-scale hydroelectric power potential in Canada, which could serve the Northeast. A large segment of the small-scale hydro resource is located in the same region, yet the two articles are in different parts of the book, and cost comparisons are not presented. An interesting article by Douglas Jones discusses the response of state officials to the Public Utility Regulatory Policies Act of 1978 (PURPA).

The three concluding articles in Part IV, "Constraints and Opportunities," are a rather strange mixture. The final article by Carroll has been mentioned already. Hanna Cortner provides an excellent summary of the soft-path advocacy position: that the public does not yet understand the energy crisis and the resulting need for basic changes in our long-established social and political structures. David Rosen's examination of public attitudes could be taken as

evidence for Cortner's contention that there is a lack of understanding. However, another possibility is that the public simply does not agree, and the articles in this book do little to resolve this issue.

Jick Myers
U.S. Department of Energy

Michael A. Crew, *Issues in Public-Utility Pricing and Regulation* (Lexington, Mass.: Lexington Books, D. C. Heath and Company, 1980).

Contents: Introduction to Issues in Public-Utility Pricing and Regulation, Michael A. Crew. Hope against *Hope,* Roger Sherman. Regulatory Pricing Procedures and Economic Incentives, David P. Baron and Robert A. Taggart, Jr. Public-Utility Regulation and Reliability with Applications to Electric Utilities, Michael A. Crew and Paul R. Kleindorfer. Fuel-Adjustment Clauses and Profit Risk, Frank A. Scott, Jr. The Demand for Telecommunications: A Nontechnical Exposition, Lester D. Taylor. Alternative Measured-Service Structures for Local Telephone Service, Bridger M. Mitchell. Spatial Considerations in Public-Utility Pricing, Roger E. Dansby. Implementing Time-of-Day Pricing of Electricity: Some Current Challenges and Activities, J. Robert Malko and Ahmad Faruqui. Demand for Electricity by Time of Day: An Evaluation of Experimental Results, Wallace Hendricks and Roger Koenker. Measuring the Potential Impacts from Lifeline Pricing of Electricity and Natural-Gas Services, Dennis Ray and Rodney Stevenson.

The impacts of regulation are being closely scrutinized by the new administration as it seeks to relax market-impeding phenomena, to raise productivity, and to reduce the rate of inflation. While industries with production technologies that foster monopolies—e.g., electric power production and telecommunications—cannot anticipate deregulation, the Reagan administration's refocusing of attention on the benefits and objectives of regulations provides a new opportunity to evaluate the optimal design and characteristics of regulations in these special markets.

Michael A. Crew has compiled a list of articles, derived from two seminars, that are a timely addition to the regulations literature. Although not designed for the novice, this volume covers a broad spectrum of issues in the regulated utilities area. Among other topics, there are two articles on the direct impacts of utility regulation, two telecommunications articles (on demand and rates), two articles on time-of-day pricing, and three articles on alternative utility methods—pricing (lifeline rates), price determination (fuel adjustment clauses), and rates of return.

The articles by Baron and Taggart (B&T) and Crew and Kleindorfer (C&K) deal with the impacts of rate-of-return regulations. Both present versions of the Averch–Johnson model, and then introduce other factors that focus on naive versus sophisticated regulation (B&T) or power supply reliability (C&K). Both articles use nondeterministic demands.

B&T are concerned with whether there is room for strategic behavior by utilities to increase profits when confronted with alternate regulatory styles. They show that naive regulation and the AJ formulation result in identical capital stocks, while sophisticated regulation induces the ex-ante efficient capital stock level. However, sophisticated regulation requires that "the regulator know as much about the firm's production function and expected demand curve as do the firm's own managers." One approach mentioned for dealing with this information requirement is to increase the scope of regulator's control. A second approach advocates creating incentives to make utilities reveal private information.

While there is merit in the latter proposal, the former idea is out of step with current thinking. Perhaps an even bigger question is whether in fact there is room for strategic behavior by utilities. If there is, why was no major regulated utility able to realize its allowed rate of return in 1980?

C&K present an appealing model of rate-of-return regulation with stochastic demands. Profits are nondeterministic because of demand variations. Expected profits depend on the frequency of demands that cause profits to rise above or fall below the rate-of-return constraint. Three useful parameters are part of the model: an incentive parameter (the proportion of excess profits that the utility is allowed to keep), a reliability parameter (the probability that capacity is sufficient to meet demand), and a rate-of-return parameter (the probability with which the firm must meet its rate-of-return constraint).

The model is then used to derive the result that both the capital–labor ratio and the level of reliability increase as the allowed rate of return increases; an empirical test of the result, however, fails to reject the hypothesis that reliability and allowed rates of return are unrelated.

Regarding the econometrics: reserve margin, a surrogate for reliability, is regressed on (among other variables) "reported" rate-of-return lagged five periods. During periods of continued demand conservation and insufficient regulatory relief, reserve margins tend to be pushed upward (demands are lower than expected), and reported rates of return tend to be pushed downward (revenues are lower than expected). That the regression model did not confirm an inverse relationship between reliability and rates of return, even with this built-in relationship, is surprising (the data covered the period 1971 to 1978).

In terms of the telecommunications industry, both the Taylor and Mitchell articles are worthwhile reading for interested but not currently active readers. In particular, Taylor's piece is as helpful as his classic *Bell Journal* article on electricity demand. He presents the consumer's decisions as involving a two-part sequence: first a demand for access to the network, and then a demand for use. Network externalities, call externalities, and option demand are explained in a concise and coherent fashion.

Mitchell's article is slightly more technical, as it analyzes the long-term welfare effects of various forms of measured-rate service for telephones, as distinct from the flat rates most consumers are accustomed to. He concludes with a discussion of ex-post pricing, in which consumers would be given a choice between deciding ex ante between a flat rate, a measured rate, or a rate set after the billing period to be the lesser of the flat or measured rates with

a small premium charge added. This proposal has a great deal of appeal, since many consumers choose a higher rate than necessary, since they (1) lack accurate information, (2) are unaware of alternatives, or (3) have substantial variation in demand levels between billing periods. If in fact the cost of calculating charges ex post were prohibitive, this proposal would not be justifiable, but they are not. If the utility needs to be given a higher return to compensate it for the extra risk placed on it by this proposal, the lost consumer surplus resulting from the higher return would need to be compared to the gains resulting from more consumers having prices that reflect cost.

Finally, Mitchell acknowledges but mainly ignores redistributive aspects of offering only flat rates. Small users then subsidize large users. This inequity is hard to justify, given digital switching technologies.

Harlan D. Platt
Northeastern University and Data Resources Inc.

Robert F. Conrad and R. Bryce Hool, *Taxation of Mineral Resources* (Lexington, Mass.: Lexington Books, D. C. Heath and Company, 1980).

This book is one of a series sponsored by the Lincoln Institute of Land Policy. Although its title does not make this clear, it is concerned only with state and local taxes on minerals—severance, property, and income taxes. Chapter 1 summarizes, with the help of handy tables, the mineral taxes levied by state and local governments in the United States. (Unaccountably, Texas is omitted from two of the tables.) Basic mining decisions (e.g., rate of extraction) are discussed in Chapter 2. The effects of mineral taxation are treated in Chapter 3 under the assumption that the mine operator seeks to maximize the present value of expected proceeds. Chapter 4, on policy implications, concludes the text. There is an appendix giving state minerals tax receipts, 1971–1978, and a comprehensive bibliography.

The premise of the analysis and policy recommendations is that mineral taxes, at least in combination, should be neutral with respect to mining decisions so as to avoid inducing an inefficient allocation of resources. The authors show that severance and property taxes generally are not neutral—the former, if on a unit basis, tending to induce a transfer of extraction from present to future, and the latter tending to induce a reverse transfer. All variants of the severance tax lead to an increase in the cutoff grade of ore, while the property tax has the opposite effect. A proportional income tax, without special deductions such as the percentage depletion allowance, is viewed as the most neutral of the mineral taxes.

Considerations of possible distortions, administrative costs, and stability of income (to the taxing jurisdiction) lead to the following conclusions. A proportional profits tax should be the "cornerstone" of state and local taxation of minerals. It has the ability to recognize cost as well as revenue, to avoid inducing "high-grading," and to capture rents. To prevent allocative distortions, the tax should not allow percentage depletion or the expensing of capital

expenditures, two common features of mineral income taxation. A property tax, based on the present value of expected proceeds, is recommended where stability of tax revenues is a major consideration. If a severance tax is employed, as it may be for reasons of administrative simplicity, it is recommended that it be of the ad valorem type. This type, based on quality-adjusted ore values, causes the least allocative distortion.

The book is clearly written with a minimum of jargon, several helpful numerical examples are given, and the algebra of the present value model is not difficult. Its message is accessible to the legislator or the tax administrator as well as to the economist. The economic analysis is sound, and the conclusions follow readily from that analysis. I have only two quibbles.

The analysis of the property tax seems to place too little emphasis on the pyramiding effect of the tax and the consequent inducement to accelerate production. This effect is mentioned but not particularly emphasized. It should be emphasized especially in the case of oil taxation, because accelerated production often results in loss of ultimate recovery. The property tax is "bad" for oil conservation. It might also have been emphasized that a pyramiding property tax adds an unnecessary cost to each additional year of production, which leads to early abandonment. These adverse effects could be avoided if there were one lifetime assessment and lump-sum levy at the beginning of production, with the tax to be paid in installments that sum over the life of the mine or well to the lump-sum levy.

A second quibble is that the entire text and all the examples seem to contemplate hard-rock mining. There is no explicit discussion of oil and gas production, although the tables report oil and gas taxes and revenues from them. Oil and gas production involves several peculiarities that call for some modification of the analysis and conclusions; one of these is the loss of ultimate recovery from accelerated production. State regulation of well spacing and production rates based on allowable schedules or maximum efficient rate (MER) are constraints that limit adjustments to economic incentives. Finally, world pricing by OPEC, presumably independent of taxes in the United States, affects the incidence of oil taxes. With such pricing, the incidence of the oil severance tax, for instance, is on landowners in the taxing jurisdiction, not on consumers inside or outside that jurisdiction.[1]

Despite these quibbles, the book is a very good one, solid and meaty. It is recommended reading, particularly for legislators and tax authorities.

Stephen L. McDonald
The University of Texas at Austin

1. Stephen L. McDonald, "The Incidence of an American Oil Severance Tax under World Pricing by OPEC: A Note," *Natural Resources Journal* 20, No. 3 (July 1980): 547–550.