

## BOOK REVIEWS

***Fueling One Billion: An Insider's Story of Chinese Energy Policy Development*** by YINGZHONG LU. (Washington, DC: The Washington Institute, 1993) pp. 266. ISBN 0-88702-065-8 (paperback): \$19.95.

This book will be invaluable to those interested in China's energy sector, including China specialists, followers of international energy and energy equipment markets, the investment community and—because of China's large and growing share of global carbon emissions—to the environmental community.

Until quite recently data on the Chinese energy sector were difficult to come by and even more difficult to interpret. This book, written by a Chinese energy "insider"<sup>1</sup> who has also spent several years affiliated with energy and research centers in the United States, helps overcome these problems. The book has major strengths. It reflects the author's deep knowledge of all branches of the energy sector; familiarity with technology; statistical and modeling expertise; and long experience with Chinese energy policy making. The analysis is balanced, well organized and clearly written, with a wealth of tables and some outstanding figures (as in the Energy Flow Analysis of Appendix H).

The book consists of three parts: the Evolution of a Scientific Energy Policy; Some Case Studies on Critical Energy Issues; and a Statistical Appendix. The first, the Evolution of a Scientific Energy Policy, is the core of the analysis. It describes the change that took place in energy policy in the late 1970s from "ideological and political" policies to a "scientific" policy. The old policy, termed "patting the head process" meant that "major decisions were made by the supreme leader of the party based on only his intuition. As a result, political interests inevitably override all economic considerations. Furthermore, fear of political persecution inevitably distorts economic information." (Page 5) Changing this policy must have exposed the author and his colleagues to considerable political risk—a point that the author modestly forbears to make.

The new "scientific" policy was based on an analytical approach to problems and solutions, but implementation continued in large part to rely on administrative and regulatory approaches rather than market inducements. One step in the direction of reforming energy pricing policy, however, was the introduction of a dual pricing policy under which "most energy products were

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still allocated by the government at fixed prices but the rest could be sold on the free market at much higher floating market prices" (page 31). The rising share of enterprises operating under the free market in recent years will have driven average energy prices up, but tariffs charged by old power plants to industrial customers still remain highly subsidized.

The author examines the sectoral components of this "scientific" policy, beginning with a careful analysis of the high energy intensity of the Chinese economy and potential for its reduction through technology, structural change, and improved "house keeping" practices. Although the author gives pride of place to energy conservation, he realizes that large increases in supply will also be needed. He confirms that coal will continue to be by far the largest source of energy in China, and projects, in line with official Chinese government policy, a large and growing role for nuclear power—to account for 5 percent of total installed power capacity in 2010. An interesting proposal is for small nuclear powered district heating plants. The challenges of providing rural energy supplies are examined in some detail in a later chapter, suggesting substantial progress in rural electrification and the widespread introduction of efficient wood burning stoves. The stove program was apparently greatly helped by the growth of rural industry which was able to provide supplies and components, and even stove building and repairing services.

Inevitably, this book, whose statistical data stop at the late 1980s, is not fully able to incorporate the massive changes that have taken place in both the economy and the energy sector in the last six or seven years. However this analysis lays a solid analytical groundwork which will facilitate the incorporation and interpretation of new information as it becomes available.

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***Managing the Global Commons: The Economics of Climate Change*** by WILLIAM D. NORDHAUS. (Cambridge, MA: The MIT Press, 1994) pp. 213.

As recently as ten years ago, the subject of anthropogenic climate change was the exclusive preserve for meteorologists, with selected interventions by physicists, chemists, and other natural scientists. Since then, the subject has been invaded—first, by environmentalists, then by politicians, prompting more and more fanciful actions to mitigate the purported hazards of global warming. Only in the most recent years have economists become seriously involved in the debates, and William Nordhaus' work is the second comprehensive economic

analysis of the subject. The first one, by William Cline, was published in 1992 (Cline, 1992).

The issue under investigation is straightforward. Many human activities, and fossil fuel burning and deforestation in particular, yield greenhouse gas emissions whose warming effects could result in costly detriment. These detriments can be avoided by controlling the emissions at a cost. The aim of the benefit-cost analysis that is the essence of Nordhaus' book is to determine the optimal path of these controls. "Optimal" for the purpose of Nordhaus' analysis is defined as the path that will maximize the present value of global utility, represented in the computations by the present value of global consumption.

The resolution of this issue, however, is far from straightforward. It involves formidable complexities and yields extraordinary ranges of uncertainty in numerous dimensions. The author's heroic effort to derive conclusions of relevance for the policy maker seems to me to be premature. For while Nordhaus' way of structuring the problem and analytical approaches are instructive and likely to be re-employed in coming attempts at tackling the issue, his results are almost bound to be overridden by the massive amounts of empirical observations that will emerge next year or the year after.

Nordhaus' analysis begins by combining the best state-of-the-art climate model with a suitable macroeconomic model and by adjusting and manipulating the integrated model structure for the purpose at hand. The model is then employed to assess (a) the anticipated change in global climate, (b) the economic loss likely to arise in consequence of this change, and (c) the cost of controlling climate change—primarily by reducing CO<sub>2</sub> emissions with the help of carbon taxes. The economic loss due to climate change and the cost of control are both increasing exponential functions of climate change and extent of emissions reduction, respectively.

Adopting an infinite time horizon, the author derives the path for optimum policy action. He argues, convincingly, for a 6% (real) discount rate to obtain the present value of the costs and benefits. Many would consider this excessively high when very distant time horizons are involved. Cline, for instance, chose a discount rate of only 1.5% in his investigation of the greenhouse issue. Nordhaus retorts in defense of his choice that any investments, including in the mitigation of climate change, have to yield a marginal return that is closely related to the observed rates of return on capital, for otherwise, waste is bound to occur. More important perhaps, the higher present value of future climate detriment due to the choice of a lower discount rate is compensated for in Nordhaus' analysis by the faster economic growth that results from the ensuing higher rates of saving.

The optimum policy action that emerges from Nordhaus' analysis, involves a reduction of emissions by 9% at the end of this century and about 15% 100 years later, from what these emissions would have been in the absence

of any greenhouse policies. The carbon taxes needed to accomplish this task amount to about \$6 per ton C in 2000, and more than \$20 in 2100, all in constant 1989 money. Such actions are seen to raise the present value of global consumption by \$270 billion, or 0.04% compared with the case of no controls. Nordhaus also uses the model to derive the results of other policy objectives: Stabilization of emissions at the 1990 level yields a present value loss of \$7000 billion, while the goal of keeping the global temperature rise at below 1.5° C would result in a consumption loss of \$41,000 billion. The differences between these options are significant, though not overwhelmingly large, in relative terms.

These results, based on a multitude of assumptions and structural features of the model, are obviously subject to very large ranges of uncertainty. As the underlying features are allowed to vary, so will the results. For instance, in 2095, the standard deviations of such key variables as greenhouse gas emissions, or the need to control emissions or level of carbon tax, are substantially greater than their expected values in the optimum policy runs. Variations in each of these variable outcomes will significantly change the optimum policy structure. Such a policy will carry no resemblance at all to the one described in the preceding paragraph, if all these variables tilt in the same direction by one standard deviation, as they very well might.

Nordhaus, nevertheless, attempts to bring some order into the confusion from these uncertainties by deriving five *representative scenarios* for further optimization and decision analysis. But he does it after reiterating that:

*This is largely uncharted terrain, full of subjectivity, largely devoid of an accepted methodology, with little precise data from which to derive useful estimates, and with no easy way to assess the potential errors of our estimates.*

At this stage, I must admit that I get lost. I fail to see how a further analysis of the extreme and multidimensional uncertainties can help in policy planning. In my view, the designation of rational policies is simply not possible until further observations and insights have narrowed down the uncertainty ranges. In this, I do not believe that there is much difference between my view and that of the author.

Climate change is only one of many plausible threats to human welfare and comfort. Costly insurance against all such threats is not feasible, for it would leave little resources for current consumption. Economic analysis is extremely important for the choice of threats that should be insured and for determining the level of insurance coverage.

Nordhaus' treatise throws some cool skepticism onto an increasingly dogmatic and politically inflamed debate suggesting large expenditures now to save the world from future pains which may or may not occur. It is valuable in

that it shows that the base case of the best state-of-the-art analysis of the greenhouse issue, combining climate and macroeconomic modelling, suggests very limited intervention in the foreseeable future. It is also valuable by pointing to the urgent need to improve our knowledge of the issue, and so to narrow down the extreme uncertainties that inhibit rational greenhouse policies.

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***Energy in Latin America: Production, Consumption and Future Growth*** by KANG WU. (Westport, CT: Praeger, 1995) pp. 310, ISBN 0-275-94844-7.

This useful volume is based partly on the fourth report of the *Latin American Project, Program on Resources: Energy and Minerals* of the East-West Center in Honolulu. It analyzes the current situation of energy production and consumption, focusing on hydrocarbons, in ten selected Latin American countries and the region as a whole. It examines the determinants of energy supply and demand growth; and it forecasts until the year 2000 the growth of energy production and consumption, as well as presents future energy balances.

The study is important since the region is the largest oil supplier to the North American market and a potential provider of oil and gas to Asian markets for the purpose of diversifying supply. As such, the future development of Latin America's hydrocarbons sector will have considerable impact in these two regions. However, the lack of investment in the sector, as Latin America's own oil demand rises with the renewed economic growth of the 1990s, could pose serious supply problems for the United States and Asia, where dependence on Middle East oil is growing. This study presents several different scenarios (base, high and low) to deal with the problem of Latin America's future net energy supply. While the entire region is within the scope of the study, the book considers in detail only the ten countries of Mexico, Venezuela, Brazil, Argentina, Colombia, Ecuador, Trinidad and Tobago, Peru, Bolivia, and Chile—comprising the largest oil, gas, and coal producers and consumers in the region. While this is understandable, it is unfortunate because it would have been extremely useful for academics and professionals to have every country in the region analyzed in the same way in a single study.

Using 1991 data, as well as developments in 1992-93, the volume is well-illustrated with the same set of clearly readable tables in each of the region and country chapters, each of which is organized in the same fashion (introduction, primary energy supply, primary energy consumption, downstream

oil sector and product consumption, natural gas utilization, and important hydrocarbons policy issues). This allows for ease of comparison and transparency in considering the forecasts.

The study's forecasts of primary energy and oil product consumption are done for each country, and the regional projection is derived from them. Many factors are considered (e.g., population growth, GDP increase, energy price changes, energy policy implementation, historical changes in energy intensity and per capita consumption, domestic energy market conditions and energy availability), but no single one dominates the projections. Income elasticities are not used.

Forecasting primary energy supply is more complicated, since the determining factors are more policy-related (e.g., national policies on privatization and direct foreign investment in the sector). However, the author deals with this by examining the current situation, the policy strategy, the investment climate, and possible price changes within each country.

The energy balances for 1991 for the region and each of the ten countries analyzed found in the Appendices are themselves extremely useful. It is usually quite difficult to find comparable balances of such detail, and many researchers will find them to be helpful.

This volume can best be seen as a concise compendium and summary of issues and recent developments in the region, as well as a good source of easy to use aggregated data. It would have been nice to have included a technical appendix of the model used for the national forecasts to see the level of detail in the base data for many factors and how they were aggregated in the model (e.g., the national energy intensities). More in the way of policy analysis would have improved the balance of the study and made for more interesting reading. Overall, it is a worthwhile reference book to have in any library on energy.

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***Regulating Regional Power Systems*** by CLINTON ANDREWS. (Westport, CT: Quorum Books, 1995) pp. 405, \$65.00.

The Andrews book is an anthology of 27 papers on electric utilities. These are divided almost equally between discussions of basic concepts and case studies. The cases relate to seven portions of the electric power industry. Three concern a single large entity—the Tennessee Valley Authority, American

Electric Power, and Pacific Gas and Electric; the others to regions—the Pacific Northwest, New England, New York, and the European Community [sic]. For each case, a main paper and a commentary are provided. The authors of the three papers on individual utilities were employees of the utility. While the New York case was co-authored by people from the power pool and the state energy agency, academicians wrote the other two papers. This made no difference. All six main papers deal too much with description and provide little evaluation and no criticism.

The discussion papers treated whatever issues interested the authors. Only in one case, Kenneth Costello's comments on the Pacific Northwest, are the essentials considered. Costello well delineates how the battle over how to share the economic rents realizable from the federal hydroelectric facilities misshapes the allocation of Northwest electricity resources. Costello breaks ranks in other important ways by noting that enthusiasm for demand side management and integrated resource planning, which permeates the book, is not universally accepted. It is characteristic of the book that Allan G. Pulsipher's muted comments on the TVA chapter are the next most daring of the comments. Pulsipher, a former chief economist at TVA now at Louisiana State University, presents with limited comment suggestions that TVA and by inference public power has many inefficiencies. (Coincidentally, a book-length review of TVA problems appeared about the same time as the anthology.)

The general papers range drastically in scope but unfortunately not in outlook. The basic problem is endemic of all too many conference proceedings. Stress is on securing many contributions, most of which necessarily are far too short. The first paper is a summary by the editor of the book; he also provides a concluding chapter. The eight papers after the introduction deal with broad concepts such as competition, planning, regulation, and federalism. Only the examination of electricity federalism by O'Neill and Whitmore at FERC rises above superficiality. The remaining papers have the opposite fault of too narrow focus—a scheme for tradable NO<sub>x</sub> emissions, a description by its president of the North American Electric Reliability Council, and two papers on forecasting.

The book is heavily tilted toward preference to continued regulation outside perhaps generation. At least one author (Richard E. Schuler of Cornell and a former public utility commissioner in New York State) wants the regulators to establish the wholesale markets. Demand side management and integrated resource planning are advocated with disregard of the errors in forecasting documented in the book.

This bias is a less serious flaw than the lack of substance. The general articles as well as the case studies are overly mired in reviewing history. This is not helped by periodic flights of fancy (or at least loose language) such as the assertion (p. 288) that the National Gas Policy Act had the same market creating impacts as the Public Utility Regulatory Policies Act.

The intrinsic problem is that the vast majority of the participants are industry or regulatory agency insiders. As nearly as can be determined from the substance of the papers and the references provided, the writers with the stellar exception of O'Neill and Whitmore fall far short of recognizing enough of the enormous literature on the economics of electricity regulation. This neglect of economics proved a fatal flaw. The proposals lack adequate justification. The book then is only of interest to relentless students of the debate.

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***Prisoners of Myth: The Leadership of the Tennessee Valley Authority, 1933-1990*** by ERWIN C. HARGROVE. (Princeton University Press).

The Hargrove book is an interesting contrast to the one by Andrews above. The author is a political scientist at Vanderbilt and presents an analysis of the political dynamics of the Tennessee Valley Authority. The story is that of the movement from a supposedly multifaceted agency to promote economic development in the Valley, to an agency mired in the consequences of an overambitious, mismanaged nuclear power development program.

The original idea of TVA emphasized construction of multipurpose dams on the Tennessee River to provide electricity, flood control, and improved navigation. By World War II, the feasible projects had been completed. However, the commitments to provide electricity inspired undertaking construction of coal-fired plants. TVA then decided to become a leader in the development of nuclear power. An ambitious program of adding nuclear plants was announced and maintained after many private utilities began scaling back their plans. Ultimately, most of the planned units were canceled, and the remaining four still under construction were under indefinite delays (that culminated in the 1994 cancellation of three of them). Questions about the quality of construction and operation of the five completed units forced their shutdown. Two of these were still not operating in 1995. The expansion in electricity and the absence of comparable options in other sectors made power the dominant TVA activity.

Hargrove's dominant concern is the politics of TVA, particularly the developments within the agency. A split quickly developed between the first head of the board and the other members who emerged victorious. (David E. Lilienthal, who became chairman and a vigorous advocate of the TVA model,



was one of these two dissenters). A product of the battles was the establishment of a strong general manager. Three of these general managers succeeded to chairmanship of the authority.

Then the Carter administration brought in new leadership. In particular, S. David Freeman, a veteran of U.S. energy bureaucracy whose career began at TVA, was added to the board and later elevated to the chairmanship. As Hargrove does not indicate, Freeman had become a controversial figure in energy economics through his work on the Ford Foundation-funded energy policy project. Freeman began making policy suggestions long before the project's information gathering process provided information. The final report strongly endorsed extensive government efforts to alter energy patterns.

As reported by Hargrove, the Freeman era at TVA began with efforts to use TVA to promote some of these changes in energy. (It was actually doubly a Freeman era; Richard Freeman, unrelated to David, was also added to the board). The effort floundered over lack of enthusiasm both in the region and by the national government for TVA's assumption of these roles.

However, the nuclear program proved even more troublesome for S. David Freeman. Despite his reservations, Freeman initially took a public stand that continuing TVA's expansion was necessary to fill the void created by the reluctance of the private sector to build capacity. Hargrove indicates that the public works impact of the program created interests in preserving the effort. Hargrove understandably cannot provide a definitive explanation of this inconsistent behavior. What is provided is review of the plant cancellations, efforts to alleviate safety concerns about existing units, new appointments, and still incomplete efforts to overcome the political and financial impacts on TVA of the effort.

Hargrove's study is interesting political history and very useful within the limits of its coverage. These limits are severe and well illustrate why what has been termed "economic imperialism"—economic explanations of nonmarket phenomena—has emerged. Such economic appraisals fill a gaping analytic hole in the traditional political science approach such as that used by Hargrove. The standard economic assumption that some form of rational maximizing behavior prevails proves powerful in explaining such outcomes as that at TVA. Hargrove does very well at demonstrating what went wrong; an economist would have told why.

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