Oil Tomorrow: Supply Conditions in the Coming Decade
(IAEE Presidential Address)

by Alirio A. Parra (Petroleos de Venezuela)

The events of the recent past serve to underscore the cyclical nature of the petroleum business. From the boom years of the 1970s to the bust years of the 1980s, the oil industry has struggled to adapt to changing circumstances. The condition of stagnation and contraction masked the real long-term investment requirements of the industry and narrowed investment opportunities. All in all, the period wreaked havoc on investment budgets, the industry’s most strategic component. In spite of the advances made in computer and statistical methods, many forecasts have consistently lagged a pace or two behind market reality, and have been quite conspicuous in their failure to anticipate peaks and troughs. It seems most irregular that for a business punctuated by ebbs and flows, we tend to rely so heavily on short-term trends to plan investment outlays. Moreover, if the experience of the past decade is any indication, these fluctuations in the business environment appear to be increasing in severity. As I see it, one of the most important challenges facing the industry as we enter into the 1990s is the task of anticipating the inevitable cycles and taking the necessary steps to mitigate their negative consequences with a view to ensuring supplies for the end consumer over the longer term.
Energy Supply in the 1990s and Beyond
(Luncheon Address)

by Subroto (Secretary General, Organization of the Petroleum Exporting Countries)

President Carlos Andres Perez, Distinguished Ladies and Gentlemen, I am both honored and pleased to be invited to address this, the 11th Annual Conference of the International Association for Energy Economics. Honored, because your Association is a body whose gatherings are always marked by the distinction of the participants, drawn from the ranks of the oil industry, other energy sectors, the academic world, international institutions and government departments. Accordingly, the presentations of the speakers have an impact which extends far beyond the bounds of your membership. Pleased, because your Association has seen fit to choose an OPEC Member Country, Venezuela -- one of the five Founder Members of the Organization -- for this year's Conference. Venezuela, as you know, is one of the highly-endowed oil-producing countries, with reserves of more than 58 billion barrels, as well as substantial reserves of natural gas and solid fuels. The main theme of your Conference -- "Energy Supply in the 1990s and Beyond" -- is, of course, one of the most vital issues confronting the world today, for we must prepare now for the future, and be ready to meet the challenges and problems it will undoubtedly bring. You will regard it, I hope, as natural, if I, as Secretary General of OPEC, concentrate mainly on the prospects for OPEC oil in the future energy mix, and the significance which must inevitably be attached to the Organization as the most important supplier of what is likely to remain for many years to come, the world's most strategic, versatile and, comparatively speaking, cheap and abundant energy resource.

Pages 17-18

Excerpts from the Remarks of Andres Perez

by Andres Perez (President of the Republic of Venezuela)

It is a testament to the importance of this Association that both producers and consumers of energy can meet together to discuss and analyze two of the most vital issues of our time, namely, the need to find a formula by which to guarantee a continuous and smooth trade of energy that all countries need for economic growth, and the increasingly urgent requirement that the production and consumption of energy do not threaten the long-run environmental balance of our planet. The independent producing nations are openly working with OPEC members to establish a healthy and desirable level of cooperation. For it is no secret that abrupt price fluctuations are in the interest of no one. Hopefully, this realization will be the beginning of an era of enhanced global understanding, an ideal we have defended and sustained in spite of a good deal of skepticism. Our objective is to foster a new international economic order, one with justice
and equity, one which not only creates worldwide business relationships but also establishes a reasonable balance between the value of our products and the value of the capital goods we must import.

**Pages 19-24**

**Solving the Energy Problems in Developing Countries**

by Jose Goldemberg (Rector, University of São Paulo, São Paulo, Brazil)

The industrialized nations have shown a remarkable ability to face the energy crisis of the 1970s by a combination of strategies which led in effect to the destruction of the OPEC cartel. The most important of these strategies was the reduction in oil imports made possible by the adoption of energy conserving technologies. In addition to that there was a remarkable shift from the use of oil to electricity which implies also a more efficient use of energy. While thermal cycles such as internal explosion motors used in automobiles convert only some 30 percent of the energy of the fuel into motive power in the wheels, electricity (once produced) can be converted into motive power with an efficiency of almost 100 percent. Of course the production of electricity from coal or oil goes also through a thermal cycle where energy is lost but the efficiency of conversion has been rising continuously, as shown in Figure 1. This shows the evolution of the thermal efficiency of British electrical generating stations (56 thermal power plants burning coal with a total generating capacity of 46.7 GW). In the period 1970-1985 the efficiency increased from 30 percent to 35 percent, equivalent in reality to an additional 10 mW of coal burning capacity.

**Pages 25-26**

**Excerpts from the Remarks of Celestino Armas**

by Celestino Armas (Minister of Energy and Mines, The Republic of Venezuela)

Allow me to briefly review Venezuela's existing energy potential. Our conventional crude oil reserves stand at 59 billion barrels, while our reserves of extra-heavy oil and natural bitumens are in the order of 260 billion barrels. At its present production rate, Venezuela holds conventional oil reserves for 94 years, while the life-span of its non-conventional crude resources is 360 years. Potential resources of natural gas are approximately 20 billion barrels of oil equivalent, coal resources amount to 46 billion barrels of oil equivalent, or 9.2 billion tonnes, and hydroelectric potential represents 84,000 megawatts, which is equivalent to 27 billion barrels of oil. As a sovereign state, Venezuela must be the architect of its own oil policy. While this policy should reflect the geological and social conditions in our country, it must also be flexible enough to interact with the oil policies of the other petroleum producing and exporting countries. We must
not forget that this is possible only through satisfactory cooperation among all oil producing and exporting countries, and as a result of their concerted action that we will succeed in obtaining fair and equitable prices for our non-renewable resources. This will prevent harmful competition which only serves to work against international market stability.

Pages 27-63

The Target Capacity-Utilization Model of OPEC and the Dynamics of the World Oil Market

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

Introduction

Modeling the world oil market became a widespread concern after Arab oil embargo of 1973-74 and the resulting four-fold increase in price of crude oil. By the late seventies, when the Energy Modeling Forum began its study of world oil models, at least thirty publicly available models were in existence. The pace of development of new models slowed somewhat in the eighties, a result of reduced funding for energy studies and probably a better appreciation within the modeling community of the difficulties inherent in the activity. World oil market models have been developed for a variety of purposes. Economists have built models to test theories about the structure of the market (such as whether OPEC is in fact acting as a cartel). Another set of models specified the structure of the market and attempted to evaluate various government policies, such as import tariffs or strategic stockpiles. Yet another set of models was constructed for forecasting future oil prices, supplies and demands. A comprehensive review of modeling activity in this field is beyond the scope of this paper. Two excellent reviews are Energy Modeling Forum (1982) and Griffin and Teece (1982).

Pages 65-86

Cost Effectiveness of Future Fuel Economy Improvements

by Carmen Difiglio (U.S. Department of Energy), K.G. Duleep (Energy and Environmental Analysis, Inc.) and David L. Greene (Oak Ridge National Laboratory, TN, USA)

Abstract

U.S. petroleum use today is 2 million barrels per day lower than it would have been if automobile fuel economy had not improved since 1975. This paper explores the potential for and cost of further increases in domestic passenger car fuel economy using market-ready technologies and sales mix shifts. Using technology already included in
manufacturers' production plans and based on consumers' willingness to pay for increased fuel economy, domestic auto mpg could be increased from the 1987 level of 27 mpg to 31.6 mpg in 1995 without reducing vehicle size or performance from 1987 levels. By 2000, 34.3 mpg can be justified on the same basis. A higher level, 36.4 mpg, is cost-effective, based on fuel cost savings over the entire expected vehicle life. The maximum level achievable with the technology included in this analysis is 39.4 mpg, but this level would not be cost-effective. Sales mix shifts stimulated by price subsidies for efficient cars and surcharges on inefficient models can cause about 1 or 2 mpg of higher fuel economy before becoming too costly.

Pages 87-99

On the Economics of Cogeneration: Pricing and Efficiency in Government Owned Utilities

by Jae-Cheol Kim and Byong-Hun Ahn (Korea Advanced Institute of Science and Technology, Seoul, Korea)

Introduction

Cogeneration has been gaining increasing importance in the provision of electric power. When a utility purchases electricity produced by independent cogenerators and resells it to consumers, the question of whether or not a certain payment schedule of purchased power is "just and reasonable" becomes an immediate concern to each party concerned -- the utility, cogenerators and possibly regulatory agencies. The U.S. regulatory agencies generally have endorsed avoided cost pricing since the passage of the Public Utility Regulatory Policies Act (PURPA) in 1978, the rule requiring that the utility pay avoided costs -- the difference between total costs incurred by the utility before and after cogenerators' production. In Korea, on the other hand, a different rule has been implemented in pricing hydroelectric power purchased by the Korea Electric Power Corporation (KEPCO), Korea's only electric utility company from Korea Water Resources Corporation, a multi-reservoir dam corporation. The latter is currently paid based on actual costs incurred by its individual hydroelectric plants. The main purpose of this paper is to analyze the economic consequence of various rules of purchased power pricing of a government owned electric utility that maximizes social welfare.

Pages 101-118

Integration of Short and Medium/Long Term Planning in the Indian Power Sector

by Kapil Thukral, S. Ramesh and Bindu Kaul (Tata Energy Research Institute, New Dehli, India)

Abstract
The power supply situation in India is characterized by shortages. In response to this situation, many industrial consumers have invested in captive generation facilities for their own use. Although the use of small, expensive, diesel-based captive generator sets may be rational from the viewpoint of the industrial entrepreneurs, their use is not the least-cost option for the Indian economy. While it is recognized that medium- to long-term planning is essential, it is realized that additional shortages will emerge in the short term if the utilities prefer to invest largely in hydro, nuclear and steam thermal technologies -- all of which have relatively long gestation periods of over five years, but are more economical than small decentralized diesel generators. The relative economics of gas turbines in the combined cycle mode (which may be commissioned within three to four years) is demonstrated by using a linear programming approach.

Pages 119-125

Forecasting the Demand for Electricity in Saudi Arabia

by Mohammed A. Al-Sahlaw (King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia)

Introduction

Electric power in Saudi Arabia is an essential tool for modern economic development. Thus, forecasting electricity demand is vital for planning and investment purposes. In estimating future electricity demand, it is important to assure high responsibility that there will be no supply shortages. Nonparametric analysis techniques like bootstrap, the jackknife, and crossvalidation are becoming increasingly popular in the estimation of probability density function of a variable or its function (see Efron (1979) and Efron and Gong (1983)).

Pages 127-146

A Structural Decomposition Analysis of Changes in Energy Demand in Taiwan: 1971-1984

by Chia-Yon Chen (Department of Mining and Petroleum Engineering, National Cheng Kung University, Taiwan) and Adam Rose (Department of Mineral Economics, The Pennsylvania State University, PA, USA)

Introduction

Taiwan represents an interesting case study of a nation that has been able to adapt to the energy crisis remarkably well, registering sustained economic growth despite increased oil import expenditures. Certain characteristics of Taiwan's economy set it
apart from a number of other developing countries. First, Taiwan's economy is very closely interlinked with international markets. It is a major exporter of goods, and it has had to rely heavily on imports of energy since its indigenous energy resources are so meager. Second, the nation has had an unusually high rate of growth over the past 30 years. For example, Taiwan's GNP grew at an average rate of 9.1 percent per year during the period 1952-1980, as opposed to growth rates of generally below 5 percent experienced by many other LDCs during that period.

Pages 147-150

Do Volatile Oil Prices and Consumer Adjustment Costs Justify An Additional Petroleum Tax?

by Franz Wirl (Institute of Energy Economics, Technical University of Vienna, Austria)

Introduction

A number of papers have considered different reasons for defending or refuting additional crude oil taxation directly or indirectly via an import duty. Hogan-Rahmani (1987) refer to "national security of supply" in advocating an oil import fee. This relates to another work of the authors (see Hogan-Rahmani-Jorgenson-Cooper (1988)), in which they state that energy demand (and in particular U.S. oil dependence) will dramatically rise due to prevailing low crude oil prices. An extensive discussion of this controversial issue has gone on in this journal, e.g., see Wright (1988), Singer (1988), Huntington (1988) reviewing the DOE report on Energy Security and the "American Debate" by Curlee, Tussing and Vactor (1988), Nesbitt and Choi (1988), and the defense of Broadman and Hogan (1988). Bizer and Stuart (1987) address a different aspect of an oil import fee, namely as an instrument of public finance. However, they dismiss import duties as an inefficient instrument for raising revenues.

Pages 151-165

Flexibility Benefits of Demand-Side Programs in Electric Utility Planning

by Eric Hirst (Energy Division, Oak Ridge National Laboratory, TN, USA)

Abstract

Electric utilities face a variety of uncertainties that complicate their long-term resource planning and acquisition. Many utilities deal with these uncertainties by pursuing flexible strategies that allow changes to be made incrementally with little difficulty and at low cost. Thus, utilities today avoid construction of large, baseload power plants because of their long construction times and high capital costs. On the other hand, utilities view
combustion turbines as flexible because they have small unit sizes, take only a few years to build, are inexpensive, and can later be converted to combined-cycle units (to increase capacity and improve performance). Energy-efficiency and load-management programs, because of their inherently small unit size and opportunities to adjust participation over time, are attractive for the same reasons. My paper compares the benefits of flexibility provided by resources with short lead times and small sizes with the costs of these alternatives. The focus is on utility demand-side management programs, primarily because the flexibility benefits of such programs have not yet been quantified. Utilities can adjust participation in their demand-side programs over time. This flexibility yields substantial economic benefits because these electricity savings can closely match future load growth.

Pages 167-174

Estimating the International GNP-Energy Relation: A Further Note

by John R. Moroney (Department of Economics Texas A&M University), Terry G. Seaks, and Donna P. Vines (Department of Economics, University of North Carolina at Greensboro, NC, USA)

Introduction

Energy enhances the productivity of capital, labor, and other factors of production, and generally promotes higher living standards. International cross-sectional studies of aggregate output per capita are often hampered by the absence of qualitatively comparable capital and labor services. And numerical measures of cross-country differences in technology are notoriously scarce, primarily because technological differences (at a macro level) are a pretty vague concept. Thus, it is often desirable to draw a simple relationship between broad international aggregates such as GNP and energy per capita. This Note extends and modifies some results of an earlier paper linking GNP per capita to energy per capita for several middle-income and advanced market economies (Moroney (1989)). The original sample employed GNP per capita or its logarithm (measured in current U.S. dollars) as the dependent variable, and aggregate energy consumption per capita or its logarithm (measured in standardized kilograms of coal equivalency) as the independent variable. These data were taken exactly as reported from World Development Reports, published by the World Bank for forty three countries for the years 1978, 1979, and 1980.