IA INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS
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Newsletter

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Fall 1996

President's Message

My term as President went by quickly thanks to the fortuitous experience that I was confronted with no major conflicts. I thank my good fortune and the diligence of the current Council, all the hard work of my predecessors as President and especially the management efforts of Dave Williams, Sr. and Dave Williams, Jr.

In 1996, we had a number of exciting affiliate meetings. I personally attended the Mexican, Danish, British and U.S. affiliate meetings, as well as the international meeting in Budapest. I was impressed with the quality of work and discussions at these events.

I am particularly proud of *The Energy Journal* which has maintained its high quality and has emerged as a premier publication.

I started my term with a call to improve our services, increase our membership and develop a long range plan. I end my term with the same call and a brief report on the year's progress in these areas:

- A task force I convened has identified a number of potential new member services.
- A draft World Energy survey, prepared by Mitchell Rothman, will be finalized and implemented in 1997.
- We have active interest of a handful of new affiliates and significant membership interest in Asia.
- The long range planning committee is due to present its findings at the Council meeting in San Francisco in late 1997.

Finally, I wish Dennis O'Brien every success as President in 1997. His vast experience on the international energy scene should help us advance our goals of broadening our membership.

To all members, best wishes for the rest of 1996 and for a prosperous 1997. May we all live in interesting times.

Tony Finizza

*****ATTENTION - URGENT - ATTENTION*****

20th IAEE International Meeting

The 1997 International Meeting is rapidly approaching. Be sure to note the details on page 2 and act promptly. Do not delay in making your attendance plans.

Editor's Note

In this issue we continue our reporting from the 19th International Conference held in Budapest last May.

Fereidun Fesharaki leads off with an article on the Asia-Pacific region in which he carefully examines each country in the area in terms of its demand for oil and then looks at those countries that are oil producers and projects what can be expected from each of them. He concludes that the area's import dependence will rise to about 72 percent by the year 2005 and that the dependence on Mideast crude will rise to about 92 percent at the same time.

Next, Jean Masseron and Jean Philippe Cueille look at the evolution and outlook for fossil fuel production costs. After looking at coal, oil and gas they come away optimistic that productivity improvements will continue to work to restrain cost increases at least through the year 2000.

Philip Swanson reports on an IEA survey of the South African energy sector as input to the development of the countries' energy policies. He looks briefly at electricity, coal and liquid fuels and concludes by noting that the IEA undertook this survey not only to help South Africa but to help the country provide a good example for other African countries.

The North American (United States and Canada) energy picture is reviewed by John Lichtblau. He notes that U.S. oil demand will grow by more than a million b/d through the period to 2005, but that Gulf of Mexico production will also rise as will imports from Canada. The net will be a continued shift in dependence from the eastern to the western hemi-

(continued on page 2)

20TH ANNUAL IAEE INTERNATIONAL CONFERENCE

New Delhi, India, January 22-24, 1997

ENERGY AND ECONOMIC GROWTH: IS SUSTAINABLE GROWTH POSSIBLE?

DETAILS ANNOUNCED

Focus

Continued economic growth in both the developed and developing world provides promise for the future, but, unfortunately, there exists a plethora of problems which may arise as a result of this very progress. Today's world is characterized by both a burgeoning human population base as well as a markedly increasing energy consumption intensity in all economic sectors. Although developing countries today have a per-capita consumption of 790 kgoe as compared with the world average figure of 1447 kgoe, they are experiencing a rate of growth of energy consumption of 7.8 percent, twice the rate of world average growth. These growth rates translate to a massive increase in the quantity of primary energy consumed, and the resultant problems of supply shortages, air pollution, global climate change, and political and economic security.

The 1997 International Conference hopes to address these issues with the intention of promoting sustainable energy use in harmony with continued economic development. To accomplish this, the conference will focus on the broad subjects of: 1) economics of achieving energy sustainability, 2) addressing the demand-supply gap, and 3) coping with environmental impacts from an expanding world energy system.

Planned Sessions

The opening sessions are planned to include addresses by Dennis O'Brien, President of IAEE, and James Gustave Speth, Administrator of UNDP. An invitation has also been extended to the Prime Minister of India to deliver a special inaugural address. Plenary sessions will be led by panels of distinguished keynote speakers and will consist of multi-sided discussions on topics of particular importance to the energy economics community. At present, speakers for three of the plenary sessions are confirmed, namely Mohan Munasinghe (University of Colombo, Sri Lanka) for the session entitled *Emerging Developing Paradigms and Rural Energy Needs*; Stephen Karekezi (African Energy Policy Research Network, Kenya) for *International Environmental Problems and Coping Strategies;* and Hachio Iwasaki (NEDO, Japan) for the session entitled *Emerging Markets and Environment-friendly Development.* Other plenary sessions are proposed for the following topics:

- Globalization: Challenges and opportunities in shaping a common future.
- Technology transfer and national capacity enhancement.
- Financing sustainable energy development.
- India: energy markets and policy framework.

Concurrent sessions consisting of paper presentations and discussions will be organized around the above topics as well as other areas of keen interest to IAEE members, including:

- Greenhouse gas emissions and global warming policy.
- Integrated resource planning for sustainable development.
- Energy demand-supply projections: How big is the gap?
- Implications of energy taxes and subsidies for sustainable energy growth.
- Consumption and technological changes in the 21st century.
- The energy cycle and environmental degradation.
- Energy efficiency and conservation.
- The scope for renewable energy and clean energy technologies.
- Valuing of environmental costs of the energy cycle.
- Achieving a balance between energy security and environmental security.
- Trends and developments in the hydrocarbons sector.
- Privatization and regulatory mechanisms.
- Urban growth in transportation.
- Air pollution.

Besides these organized sessions, the conference agenda includes several other events of interest. These include: moderated business meetings on current Indian energy topics between conference participants and industry representatives; a panel of South Asian government ministers examining the prospect of future energy cooperation in the region; and a variety of social and technical tours in and around Delhi.

Program related questions should be directed to:

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Editor's Note *(continued from page 1)*

sphere. Gas demand growth will be the largest and fastest in the electrical power sector as more electricity generation is switched to gas. By 2005 electricity generation may account for one-third of total gas demand, up from 24 percent in 1995.

Thorleif Enger discusses the opportunities for western countries in the former Soviet Union from the perspective of his company, Norsk Hydro, which has been active in this area for several decades. He cites a number of his company's specific experiences and concludes with recommendations drawn from these experiences.

The question of a possible third oil crisis before the turn of the century is reviewed by Mamdouh Salameh. He argues that this could occur as a result of increasing global dependence on OPEC oil, tightening production capacity, shortfalls in the replacement of oil industry capital stock and falling crude stockpiles.

Antoni Goszcz and Jerzy Michna discuss the problems of

liberalization and privatization of the Eastern European countries especially as they apply to the energy sector. They detail the steps taken, the problems that arose and the compensations made. They note that the western model cannot be adopted directly because of its impact on employment/unemployment.

Finally, Pieter Vander Meiren discusses the European Foundation for Cooperation in Energy Economics and explains its purpose and objectives. Also, we call your attention to a number of conference announcements, particularly the coming events in London in early December.

DLW

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London Energy Week

5& 6 December

11th Annual
RIIA, IAEE, BIEE Conference
Controlling Carbon & Sulphur: International Investment and Trading Initiatives
Chatham House, St. James's Square, SW1
See Adjacent Announcement

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7 December
EFCEE Executive Committee Meeting
Followed by
Annual Euro-Affiliates Dinner: Host BIEE

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8 December
Euro-Affiliates and EFCEE Meetings
Caledonian Club, Halkyn St., SW1: Host BIEE

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9 December
BIEE/EFCEE Workshop on Eastern Europe
Shell-Mex House, Strand WC2; Host Shell UK

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For further details contact Mary Scanlan, BIEE
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Cassedy Name President of King Communications

Joan Walsh Cassedy, former Executive Director of the IAEE, has been appointed president of King Communications Group, Inc. She joined King in May 1994 as associate publisher.

Cassedy spent 12 years with the National Petroleum Council where she was director of information and staff director of studies before she and her husband founded The International Management Group which managed IAEE.

The King Group's publications include *The Energy Daily, Defense Week, New Technology Week, and White House Weekly*. Llewellyn King, who founded the Group in 1973, will remain publisher and editor-in-chief of the King papers, focusing on *White House Weekly*.

THE ROYAL INSTITUTE OF INTERNATIONAL AFFAIRS

In association with

THE INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS

and

THE BRITISH INSTITUTE OF ENERGY ECONOMICS

Presents a Conference on:

CONTROLLING CARBON AND SULPHUR: INTERNATIONAL INVESTMENT AND TRADING INITIATIVES

To be held in London, England
5 & 6 December 1996

General conference sessions will cover:

- Political and institutional developments.
- International frameworks for controlling sulphur and carbon emissions.
- Government initiatives and institutional programs including:
  1. Transboundary initiatives for controlling sulphur and possible lessons for CO_2,
  2. US JI Program, and
  3. Japanese, German and other initiatives.
- Industrial investment and regional priorities including:
  1. An overview of industry initiatives and experience,
  2. Opportunities and concerns in Eastern Europe, and
  3. Opportunities and concerns in the developing world.
- Tradeable emission permits.
- The U.S. sulphur experience: successes, failures, lessons and prospects:
  1. Political evolution of the U.S. tradeable permit system,
  2. How does the sulphur market work? and
  3. Industrial and economic experience of the sulphur trading scheme.
- Tradeable emission permits for CO_2 control:
  1. Design and implementation of pilot programs for CO_2 trading,
  2. Options for the design of CO_2 trading systems; insights from IEA and OECD analyses, and
  3. Industrial perspectives and concerns.
- Trading and investment schemes in the context of intergovernmental negotiations:
  1. Extending the U.S. experience,
  2. Prospects for SO_2 and CO_2 trading in Europe,
  3. The political context under the climate change negotiations, and
  4. The possible evolution of developing country involvement in the international climate change regime.
- Business strategies and responses: Lessons from the past and thoughts for the future.

For more information contact:

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The Outlook for Oil Demand, Supply and Trade in the Asia-Pacific Region to 2005

*By Fereidun Fesharaki**

The Asia-Pacific region has some of the world's fastest-growing economies. The International Monetary Fund recently estimated the real 1995 economic growth rate for the world at 3.7 percent and Asia's performance (9.3 percent) at more than double the global rate.[1] Although the GDP (gross domestic product) elasticity of energy demand varies from country to country and is not necessarily equal to 1, the increase in energy consumption[2] is significantly driven by economic growth, among other things. Because of this, the economically fast-growing Asia-Pacific region also serves as the "engine of growth" for global energy demand. During the past decade, primary commercial energy consumption[3] in the region increased at an average annual rate of 4.6 percent, nearly three times as fast as the annual growth rate of world primary commercial energy consumption, which was 1.6 percent on average. From 1984 to 1994, the share of the Asia-Pacific region in the world's total primary commercial energy increased from 19.2 percent to 25.7 percent.

During the past decade, nuclear power and gas consumption registered the highest annual growth rates averaging 8.2 and 7.4 percent, respectively, in the Asia-Pacific region, followed by oil at 4.7 percent. In comparison, the consumption of coal grew at an average rate of 3.9 percent per annum about the same as hydroelectricity consumption growth. The region as a whole relies on fossil fuels, especially coal and oil for its commercial energy needs. Nevertheless, the relative shares of different fuels have been changing. From 1984 to 1994, the shares of coal and hydroelectricity in Asia-Pacific primary commercial energy consumption declined from 48.5 and 2.1 percent, respectively, to 45.1 and 1.9 percent, while the shares of gas and nuclear power increased from 7 and 3.4 percent, respectively, in 1984 to 9.1 and 4.7 percent in 1994. The share of oil increased slightly during the period. The combined share of coal and oil in Asia-Pacific primary commercial energy consumption was 88 percent in 1984, and in 1994 these two energy sources still accounted for 84 percent.

When compared with global energy consumption patterns, the Asia-Pacific region is similar in its oil share but is substantially more dependent on coal than on gas. While the combined share of coal and oil in primary commercial energy consumption is 84 percent for the Asia-Pacific region it is about 67 percent for the world. Natural gas is underutilized in Asia and the Pacific, accounting for only 9 percent of primary commercial energy consumption, compared with 23 percent for the world. However, the use of natural gas continues to grow rapidly in the region, and its share in total primary commercial energy consumption varies from country to country. China has the lowest share of gas use at around 2 percent of primary commercial energy consumption while the respective shares are as high as 40 and 35 percent for Malaysia and Indonesia. In the Philippines, commercial use of natural gas has not yet materialized. However, development of gas fields is encouraged, and foreign investment is being sought by the government of the Philippines.

The energy demand structure for the Asia-Pacific region is heavily affected by the presence of China. In China, coal plays a dominant role in the country's primary energy consumption. The share of coal in total primary energy consumption in China has never fallen below 70 percent during the past four decades. However, after rapidly declining between the 1950s and the late 1970s the share of coal in China's total primary consumption has actually increased since 1990. In 1994, coal accounted for 76.6 percent of total primary commercial energy consumption in China, with the remaining shares comprising oil (19.2 percent), natural gas (2.0 percent), hydroelectricity (1.8 percent), and nuclear power (0.4 percent). China started to produce electricity from nuclear power in 1993. In 1994, 13.9 billion kilowatt hours of electricity were generated by the nuclear power sector, seven times more than what it produced in 1993. Nuclear power accounted for 1.5 percent of China's total electricity generation in 1994.

Excluding China, oil would account for 51 percent of primary commercial energy consumption in the Asia-Pacific region, followed by coal at 28 percent, natural gas at 12 percent, nuclear power at 7 percent, and hydroelectricity at 2 percent.

Oil Demand Outlook

For 1994, the high growth rate of oil demand in Japan outweighed both the slowdown of oil consumption growth in China and the declining absolute consumption in Indonesia.[4] As a result, regional demand (including direct use of crude oil) rose to 16.3 million barrels per day (b/d), 5.7 percent higher than the consumption level of 15.5 million b/d in 1993. Japan's total oil consumption increased by 5.3 percent in 1994. This growth rate, the highest since 1988, was largely due to the jump in crude burning as well as higher demand for the main refined products in Japan. During the past decade, regional oil consumption growth has been heavily influenced by the growth in Japan, with the two moving generally in the same direction.

In 1995, total oil demand in Japan is estimated to have declined by about 1 percent. Consumption growth in China, though higher than in 1994, continued to be moderate. As a result, the growth of total regional oil consumption in 1995 is estimated at 4.3 percent. The expected increase in 1995 of 700 thousand b/d is lower than it was in both 1994 (890 thousand b/d) and 1993 (780 thousand b/d). The regional consumption is expected to increase by 4.5 percent over the period 1995-1997.

Individual countries have shown varied performance in oil demand during the short run. Following is a brief assessment of the petroleum product demand situation in some of the largest oil consuming countries in the Asia-Pacific region for the period 1994-1997.

Japan

Japan is the largest oil consumer in Asia and the Pacific, accounting for about one-third of the region's total oil consumption in 1994. Of Japan's 5.5 million b/d of oil consumption in 1994, 435 thousand b/d was crude oil and natural gas liquids (NGL) that were directly burned for power

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* Fereidun Fesharaki is Director, Program on Resources, East-West Center, Honolulu, Hawaii. This is an edited version of his remarks at the 19th IAEE International Conference, May 27-30, 1996 in Budapest, Hungary.

[1] See footnotes at end of text.

generation and used for the petrochemical industry. Compared with 1993, the direct burning of crude and NGL in 1994 was 25 percent higher. Also in 1994, fuel oil consumption increased by 8.9 percent. The effects of the drought and hot summer of 1994 were the major reasons for drastically increased burning of crude and use of fuel oil for power generation. In 1995, both crude burning and fuel oil consumption declined. Total oil use in Japan is also estimated to have decreased by 1 percent in 1995. However, the average annual growth rate is expected to increase to 1.7 percent during the period 1995-1997, raising total demand to 5.9 million b/d in 1997.

China

China continued to demonstrate a unique consumption pattern for the period 1994-1995. The real growth rate of oil consumption in 1994 as well as 1993 is still subject to controversy. According to the recently published *China Statistical Yearbook 1995,* 1994 oil consumption is estimated to be 1.9 percent lower than consumption in 1993, while coal consumption was up 13.2 percent. We believe, however, that these data reflect a misunderstanding of the market situation during the period 1993-1995. After carefully examining all relevant factors, we estimate that petroleum product consumption in 1994 was 2.91 millon b/d in 1994, up 4.5 percent from 2.79 million b/d in 1993. Consumption in 1994 was inclusive of 110 thousand b/d of crude oil that were directly used in various industries. Led by LPG, naphtha and diesel, total petroleum product consumption is estimated to have increased to 3.07 million b/d in 1995. During the period 1995-1997, the average demand growth rate could reach 6.2 percent per annum. Diesel, gasoline, and fuel oil are three of the largest refined products consumed in China, though the official count of "four refined products" is limited to gasoline, kerosene, diesel, and lube oils.

Korea

South Korea surpassed India in 1991 to become the third largest petroleum product consumer in the Asia-Pacific region. In 1994, total petroleum product consumption in South Korea reached 1.71 million b/d. Consumption is estimated to have jumped 14.8 percent in 1995 to 1.97 million b/d and another 5.3 per annum on average during the period 1995-1997. While some believe that the rapidly expanding refining capacity in South Korea will have a significant impact on the product balance for the region, much of the additional capacity is likely to be absorbed by the domestic market. In 1994, fuel oil accounted for 26.3 percent of total petroleum product consumption in the country, followed by gasoil (23.5 percent), naphtha (19.7 percent), and others. Gasoline constituted only 8.2 percent of the refined product market, compared with 17.2 percent in Japan and 25.5 percent in China.[5]

India

India has maintained a healthy growth of refined product consumption in recent years. Total petroleum product consumption reached 1.36 million b/d in 1994, 8.1 percent higher than 1993 consumption of 1.26 million b/d. Diesel accounted for 42 percent of India's total product consumption in 1994, perhaps the highest share in the Asia-Pacific region. In comparison, gasoline accounted for only 7.5 percent of overall product consumption in 1994. India's product consumption is expected to have increased to 1.47 million b/d in 1995 and 1.69 million b/d in 1997.

Indonesia

It is unusual to see a drop in oil consumption in Indonesia, but it happened in 1994. Overall petroleum consumption decreased by 0.7 percent to 759 thousand b/d in 1994 from 764 thousand b/d in 1993, mainly caused by decreases of 27.7 percent in fuel oil consumption and 4.3 percent in gasoil consumption. Other products all exhibited positive consumption growth. A further examination of the 1994 consumption pattern reveals that the decline of fuel oil and gasoil consumption was due to fuel diversification in the electricity sector – away from oil and toward other fuels, especially natural gas.[6] In 1995, it is likely that fuel oil consumption will have remained at the same level as in 1994. Nevertheless, demand for all other products is expected to have increased, raising overall consumption by 5.7 percent to around 800 thousand b/d in 1995. During the period 1995-1997, the growth rate is forecast to average 5.7 percent, raising overall product consumption to 896 thousand b/d in 1997.

Australia

Petroleum product demand growth in Australia averaged only 2.3 percent per annum during the period 1990-1994. However, total consumption was up 4.4 percent in 1994, reaching 708 thousand b/d. Gasoline accounted for 43.3 percent of overall petroleum product consumption in 1994, followed by gasoil at 27 percent, kerosene and jet fuel (kero/jet) at 10.2 percent, and LPG at 9.4 percent. Jet fuel constitutes the majority of the kero/jet pool. For LPG, while the demand is large, the country produces even more and remains a net exporter of it. Fuel oil accounts for less than 5 percent of the demand barrel in Australia, and so do other products, which include lubricants, asphalt, solvents, petroleum coke, waxes, and others. In 1995, the demand for fuel oil and other products declined, while that for gasoline, LPG, gasoil, and kero/jet continued to increase, raising the total consumption by 2.3 percent to 724 thousand b/d. During the period 1995-1997, the growth of petroleum product demand in Australia is forecast to be modest, averaging only 1.6 percent per annum.

Taiwan

For a number of reasons, the growth rate of petroleum demand in Taiwan has accelerated in the past two years, increasing by 8.3 percent in 1993 and 8.1 percent in 1994. The leaders in growth were naphtha (17.1 percent) and kero/jet (13.3 percent) for 1993, gasoil (18.1 percent), gasoline (13.9 percent), and naphtha (11.7 percent) for 1994. In 1994, petroleum product demand in Taiwan reached 704 thousand b/d. Fuel oil has the largest share in Taiwan's petroleum product demand, accounting for 30.9 percent of the total, followed by naphtha at 19.1 percent, gasoline at 18.1 percent, and gasoil at 14.9 percent. The strong growth of naphtha and gasoil will have continued to push up overall consumption to 746 thousand b/d in 1995, up 6.7 percent from the previous year. Owing mainly to the unique consumption pattern of the high fuel oil share in Taiwan, overall consumption growth is expected to slow down as demand for fuel oil grows slowly

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Evolution and Outlook for Fossil Fuel Production Costs

*By Jean Masseron and Jean Philippe Cueille**

In the early 1970s, the club of Rome drew people's attention – in a manner which has gone down in history – to the finite nature of world energy resources and to the inevitability of a crisis, in view of the consumption trend prevailing at the time. Twenty-five years later, the energy scene has changed completely and present concerns are very different, and yet paradoxically very similar. True to the spirit of the club of Rome, we are today concerned with global conservation, with stabilizing CO_2 emissions and more generally with sustainable development.

I don't need to tell energy specialists that our industry is a long-term one, with periods of adaptation that last decades and fundamental characteristics that shape its structure and prevail in spite of all the evolutions that the industry has undergone. The share of fossil fuels in the world energy balance was around 95 percent in 1970 and today stands at 90 percent. Within a foreseeable future, that is within the next 25 years, scenarios predict only a slight decrease to the 80-85 percent level. We are today faced with energy prices, before tax, that are similar, in real value, to those of 1973, and questions, that were pertinent at the beginning of the 1970s, may perhaps still be valid today, in a different context.

The subject of the evolution of fossil fuel production costs is certainly a key factor with respect to the future mobilization of energy resources. It is vital to study the way in which energy industry costs, and those of the oil and gas industry in particular, have evolved and will continue to evolve in response to further demand.

Future increases in production seem to be more a question of economics than of the availability of resources. Even if uncertainty prevails with regard to the amount of energy reserves and the possibility of new discoveries, there is a certain consensus on the abundance of resources. There are significant reserves of coal and they will last for several centuries at the present rate of production. Oil and gas reserves are obviously less plentiful but they should meet energy needs for a large part of the next century. In spite of alarmist forecasts at the beginning of the 1970s, reserves have grown considerably over the last 25 years while at the same time satisfying sizable cumulative oil and gas consumption requirements. If we take nonconventional sources (extra heavy crudes, oil shales, tar sands) into account, it is clear that the resources exist.

From the economic standpoint, satisfying consumers' fossil fuel requirements will depend on both their production costs and on the ability to make them competitive on the consumer market. The foreseeable evolution in the CIF costs of the different fuels seems to be the relevant economic indicator. Logistics are an expensive item where solid fuels and natural gas are concerned, and provide a way in which to structure these comments. I shall start by analyzing coal from both angles, that of production costs and that of logistic costs. However I am not, as you know, an expert on this energy source so I shall be brief. I then propose to examine the question of oil and gas.

Over the last 15 years international coal trade has developed strongly, whereas CIF costs to the port of unloading in the importing country have decreased. An analysis of some coal industry characteristics will help us to understand the situation.

Current coal production costs vary greatly from one country to another, and within the same country from one mine to another. Leaving aside exceptional cases, costs may range from $10/ton in open cast American mines to around $100/ton in less accessible European mines. This cost range is not so very different from that of oil and gas, except that much of world coal production (especially in Europe) is heavily subsidized. Of course international competition does not operate fully for social reasons and because solid fuel is often the country's sole domestic source of energy. This practice is nevertheless being gradually phased out insofar as subsidies are becoming an increasing burden in the present unfavorable economic context, and the principle itself is everywhere proving incompatible with the current liberal and global trend. Coal production worldwide should, therefore, become increasingly competitive, with reduced costs compatible with international price trends.

At this point I think I should analyze the performance of coal producers and exporters. The cost of coal is influenced by a number of factors, causing it to rise or fall. First, there is no international coal market cartel, hence competition is fierce among exporting countries. This has led to significantly improved performance in all segments of the coal industry (production, domestic transportation, international transportation). Second, another important feature of coal production is the high cost of manpower. Since 1980 the latter has increased significantly in most countries. However the trend toward open cast mining, the mechanization of a number of mines, more intensive use of more effective production methods (longwall mining systems, draglines, etc.) have enabled considerable gains in productivity. In the space of 15 years the latter has been multiplied by a factor of 2 in the USA, by 2.5 in Australia and by 3 in South Africa, resulting in an overall reduction in production costs.

Similarly, domestic and international transportation costs, which account for a large share of the CIF cost of coal, have decreased. Shipping costs have decreased due to the use of larger ships and also on account of existing overcapacity. Domestic transport competition (rail or waterway) is generally less fierce than on the international scale, due to monopolies, but gains in productivity have been achieved and they have had their repercussions on freight rates. In the United States, for instance, productivity gains in rail transport have increased by 50 percent since 1980, through the use of aluminum cars, longer trains, automation and computerization.

It is difficult to foresee exactly what coal production costs will be in the next 10 years, but the falling trend in costs, related chiefly to improved productivity, should prevail and compensate for the factors that increase costs (manpower, more stringent regulations). Furthermore, outsiders have appeared on the market (Indonesia, Colombia, Venezuela, etc.), further increasing competition, and the move toward open cast mining will continue. It is estimated that, worldwide, open cast mining will account for 50 percent of coal

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*Jean Masseron is Director and Jean Philippe Cueille is Professor at the Institut Français du Pétrole, Paris, France. This is an edited version of Masseron's remarks at the 19th IAEE International Conference, May 27-30, 1996 in Budapest, Hungary.

produced in 2000. The trend is, therefore, likely to be toward more capital-intensive mines. Similarly, the gradual modification of ports to enable them to accommodate large ships will provide economies of scale with respect to transport. CIF coal costs, in constant money, should, therefore, decrease slightly. I must point out, however, that the International Energy Agency sees things a little differently. In all events, if coal is increasingly used for electricity generation it is the cost of clean technology rather than that of production that is likely to be predominant.

I will now come to the heart of my subject - oil and gas. I should like to make a short incursion into the past in order to throw some light on the present and the future. The first oil shock increased the price of oil and made consumers aware of their dependence on it and of the vulnerability of oil supplies. This feeling was intensified by the Iranian revolution in 1978 and was the prelude to the second oil shock.

In an attempt to replace the resources they lost during nationalizations by producing countries, the international oil companies launched into exploration and production in a manner that might be termed frantic. The higher prices of crude allowed them to return to more costly, mature areas such as the 48 lower states of the United States, and to prospect and develop fields in new, more difficult and geologically uncertain areas (North Sea, non-OPEC developing countries, etc.).

This resulted in a sharp increase in investment. Between 1973 and 1982, investment in exploration and production worldwide doubled in constant money. Operating costs also increased sharply. Consequently, there was a significant rise in total production costs. There were virtually no incentives to control costs, crude prices were high and were expected to rise even higher, and in addition, the bulk of the increase in expenses was borne by the drastic tax systems instituted by the host countries (goldplating). The idea in everybody's mind was to produce as fast as possible, at any price (or rather at any cost!). Experts predicted a constant and unavoidable increase in technical costs. What counted was access to reserves - and expensive, sophisticated enhanced recovery techniques were contemplated. The increased costs could at best be only slightly attenuated or deferred due to technical progress. The economic theory of exhaustible resources further strengthened the idea.

This picture of the pre-1980 oil industry that I have just painted is admittedly something of a caricature. I, nevertheless, feel that it reflects the ideas and modes of behavior that prevailed at the time. Moreover, in that high-cost environment, the oil industry strongly intensified scientific research. The extended research and development budgets made it possible to explore a whole series of new techniques, to establish a base of new knowledge that would pave the way to current achievements.

Let us now return to the present situation. At first glance, compared to the end of the 1970s and the start of the 1980s, we might think we were living in another world. In the space of 15 short years, we have moved from a period of intense oil-related nationalism with high crude prices to a very liberalized environment with moderate crude prices. The international oil companies have extended their activity to virtually the entire planet (ex USSR, Venezuela, onshore China). Strong competition developed for the benefit of their know-how and the source of funding that they represent. Only a few countries, that can be counted on the fingers of one hand, (Saudi Arabia, Kuwait, Mexico, etc.) are today closed to foreign upstream activity - and for how much longer? The idea of supply security has been abandoned in favor of the tyranny of cost cutting. The oil and gas industry has become fundamentally cost conscious, and this is in itself a cultural revolution. Between 1945 and the beginning of the 1980s, corporate power and efficiency was measured in terms of volume rather than cost. In the 1950s and 1960s, the accent was on developing the cheap supply of Middle Eastern oil and finding outlets for it, and after the first oil shock the major concern, as I pointed out, was in finding new crude sources. It took the price collapse of 1985/1986 and the realization that its effect was lasting to fundamentally modify the industry's pattern of behavior.

In ten years considerable change has taken place. With regard to costs, there has been a complete reversal in trends. Admittedly there was considerable scope for savings and a series of measures resulting in relatively marked reductions in costs were implemented without much difficulty. Nevertheless, the really significant savings were achieved by major changes involving the use of more efficient techniques and a complete overhaul of work methods and corporate organization.

The most important technical advances on an industrial scale concern seismic, drilling and production methods and schemes. 3D seismic has made it possible to discover smaller accumulations or more elusive traps, to considerably decrease the number of dry exploration and delineation wells, and to improve knowledge of the reservoir during production. With respect to drilling, which is often the largest item in upstream expenditure, great progress has been made and has led to increasingly complex well architecture, making it possible to exploit thinner geological formations providing access to hydrocarbons previously considered to be unrecoverable. In addition to horizontal wells which are now common practice, we also have 2D multidrain configurations, then 3D multibranch configurations, along with highly deviated wells with complex trajectories. Furthermore, the use of slim hole drilling, chiefly for exploration purposes, is also a cost reducing factor. With respect to offshore, technological progress has mainly resulted in lighter platforms. A platform offering comparable technical performance is 30 to 50 percent lighter. Multiphase flow pumping is also starting to develop in some favorable cases, and this could in the long run replace offshore production platforms.

The recent period is characterized not so much by revolutionary technologies as by the rate at which technological innovations have spread. In harsh geological and climatic conditions, the upstream oil sector tended to prefer proven technologies and innovations were brought in very gradually. However, necessity prevailed. In order to remain competitive in a context of durably moderate prices, the companies had to reconsider their traditional development schemes. But the process did not stop there, because at the same time the companies completely overhauled their organizational and operational methods and refocussed on their core business. They gave up those activities that did not coincide with their intrinsic skills or for which they did not have the critical size. Internally, in order to avoid the repetition of tasks and to promote an interprofessional approach, they abandoned the

(continued on page 24)

Asia-Pacific Region Outlook *(continued from page 5)*

during the next couple of years. The average annual growth rate is forecast to be 2.6 percent during the period 1995-1997.

Thailand

In terms of oil consumption, Thailand and South Korea are perhaps the world's fastest growing countries in the early 1990s. During the period 1990-1994, overall petroleum product consumption in Thailand grew at an average annual rate of 11.8 percent, increasing from 402 thousand b/d in 1990 to 628 thousand b/d in 1994. Nearly every type of petroleum product had a double-digit consumption growth rate in 1993 and 1994. Gasoil accounts for 41 percent of total petroleum product consumption followed by fuel oil at 24 percent and gasoline at 15 percent. Led by the strong performance of gasoil, gasoline, and LPG, total product consumption is expected to have increased by another 11.8 percent in 1995, reaching 702 thousand b/d. Consumption will increase rapidly in every category, especially gasoil, gasoline, and LPG, during the next couple of years. The annual growth rate is forecast to average 12.2 percent during the period 1995-1997, raising overall consumption to 884 thousand b/d. By 1997, Thailand is expected to surpass Taiwan and Australia in overall oil consumption.

Singapore

Singapore's overall demand[7] is affected by the demand for fuel oil, gasoil, and jet fuel which in turn reflects events in regional and international markets. The country had unusually high growth rates in petroleum product demand during the past two years, up 15 and 10.4 percent, respectively, in 1993 and 1994. The increases were largely caused by higher demand for fuel oil, gasoil and kero/jet. In 1994, the consumption growth rates were 11.9 percent for fuel oil, 10.5 percent for gasoil and 11.5 percent for kero/jet. Fuel oil accounts for about 63 percent of total petroleum product demand in Singapore, followed by gasoil at 12 percent, and kero/jet at 10 percent. Gasoil and LPG, which are consumed exclusively in the domestic markets, account for only 3 and 2 percent, respectively, of overall product consumption. In 1995, Singapore's oil consumption is expected to have been 519 thousand b/d, a drop of 2.4 percent from 531 thousand b/d in 1994, due mainly to the drop in fuel oil demand and a slowdown of gasoil and kero/jet consumption growth. Over the next two to three years, demand for fuel oil is expected to go up again, and that for naphtha is likely to increase dramatically. The average annual growth rate of petroleum product consumption is forecast to be 5.2 percent during the period 1995-1997.

Malaysia

Malaysia's double-digit growth in oil consumption persisted for several years but came to a complete halt in 1994. Despite a growth of 12.3 percent for LPG, 6.4 percent for gasoline, and 4.7 percent for kero/jet, overall petroleum product consumption in Malaysia stood at 318 thousand b/d in 1994, the same as in 1993. The major reason for this non-growth in total consumption was the dramatic reduction of fuel oil consumption by 39 percent, reflecting the Malaysian government's continuous efforts to carry out fuel switching in the power sector. In the meantime, the demand for gasoil, which accounts for about 36 percent of total product consumption, did not increase in 1994. As the decrease of fuel oil consumption slowed down, overall petroleum product consumption started to increase again in 1995, and it is expected to have reached 330 thousand b/d, up 3.8 percent. During the following years, the strong growth of LPG, kero/jet, and gasoil consumption will outweigh the continuing reduction of fuel oil consumption and raise overall consumption by an average of 5.2 percent a year during the period 1995-1997.

Philippines

In 1994, petroleum product consumption in the Philippines was 305 thousand b/d, up 3.5 percent from the 1993 consumption level. The largest use of refined products in the country is gasoil, accounting for nearly 40 percent of total consumption. The transportation sector accounts for more than half of the gasoil use, followed by the industrial sector and the power sector. Owing to the effects of the struggling Philippine economy, demand for refined products is expected to have increased only slightly in 1995, up 0.5 percent from the 1994 consumption level. For the next two to three years, the growth rate of oil consumption is forecast to go up, averaging 4.2 percent a year during the period 1995-1997.

Other Asia-Pacific Countries

Among other countries, Pakistan's petroleum product consumption reached 249 thousand b/d in 1994 and is likely to have increased to 275 thousand b/d in 1995. At 115 thousand b/d, Vietnam's oil consumption was up 9.7 percent from the previous year, and is expected to have increased to 125 thousand b/d in 1995. New Zealand's consumption reached 109 thousand b/d in 1994, but is expected to have increased to only 110 thousand b/d in 1995. For the rest of the Asia-Pacific region, oil consumption in all of these countries amounted to more than 440 thousand b/d and will continue to increase in the future.

Looking at the longer term, our most recent forecast of oil demand to the year 2005 is robust for the Asia-Pacific region. Regional oil demand is projected to grow to 20.9 million b/d in 2000 and 25 million b/d by 2005. This translates into an average 4.2 percent annual growth rate in oil demand over the remainder of the decade and 3.6 percent for the period 2000-2005, averaging 3.9 percent for the entire forecast period 1995-2005.

Over the next 10 years, high average annual growth rates of oil consumption are expected to be seen in Vietnam (7.5 percent), Pakistan (6.6 percent), Thailand (6.5 percent), Malaysia (6 percent), India (5.7 percent), China (5.6 percent), and Indonesia (5.5 percent). Within the petroleum product categories, diesel will grow fastest at a 4.8 percent per annum rate during 1995-2005, followed by gasoline also at 4.8 percent, kero/jet at 4.5 percent, and LPG at 4 percent. During the same period, fuel oil demand – including direct use of crude oil – is expected to grow at 1.7 percent annually. For the region as a whole, oil demand is forecast to grow by 7.9 million b/d over the next 10 years. Under this circumstance, oil supply remains an important issue for the future.

Outlook for Regional Oil Supply and Export Availability

The major oil producers in the Asia-Pacific region are China, Indonesia, Malaysia, India, and Australia. These five

countries account for over 90 percent of total proven oil reserves and annual production in the region. Minor but important producers include Brunei, Vietnam, and Papua New Guinea (PNG). Currently, China, Indonesia, Malaysia, Australia, Brunei, Vietnam and PNG all export crude oil. While exporting crude, Australia and China are net oil importers. Regional crude oil production in 1994 amounted to just under 7 million b/d, and is expected to have risen to slightly over 7 million b/d in 1995. Of the region's total 1994 crude oil production, 4.77 million b/d were used to supply the oil producers' own local demand, and only 2.21 million b/d were exported. About 15 percent of the exported crude was destined for outside the region mostly to the United States. The remainder was exported to other countries within the Asia-Pacific region. The regional crude oil production increase will be moderate but steady over the next few years, reaching just under 7.2 million b/d in 1997. Crude production additions during the period 1995-1997 are expected to mainly come from India, China, and Australia, whereas production in Indonesia and Malaysia is declining. By the end of this decade, regional crude output will peak at around 7.2 million b/d, and is forecast to decline after that year, to approximately 6.9 million b/d in 2005.

Rapidly rising local demand within the oil-producing countries will result in a decline in crude export availability.[8] Available crude exports from the region are projected to fall from 2.2 million b/d in 1994 to 1.8 million bid in 1997, to 1.5 million b/d in 2000, and to around 650 thousand b/d by the year 2005, while total regional output stays at the same level. At the level of 650 thousand b/d, the crude export ability in 2005 will be 70 percent lower than the 1994 level.

Dramatic changes will likely occur among the seven traditional exporters of crude oil over the next 10 years. A further discussion of each of these countries is useful to understand the pattern of regional crude exports for the period 1995-2000.

China

China became a net overall oil importer in 1993. China's exports of crude oil peaked in 1985 at 601 thousand b/d and subsequently declined to 389 thousand b/d in 1993. China started to import crude oil in 1988, and imports quickly increased from 17 thousand b/d that year to 313 thousand b/d in 1993. In 1994, China produced a total of 2.92 million b/d of crude oil, exported 370 thousand b/d, and imported 247 thousand b/d. Production is likely to have reached just under 3 million b/d in 1995, and is forecast to rise slowly to 3.1 million b/d in 1997, 3.2 million b/d in 2000, and 3.3 million b/d in 2005. The production of the Daqing field is likely to be maintained at over 1 million b/d up to the end of the decade, but it will decline gradually beyond 2000. Production of the Shengli fields will be stabilized. Most of the expected incremental production is, therefore, likely to come from West China, the offshore area (by 2000), and other fields. Owing to rising demand by domestic refineries for crudes, crude export availability is forecast to decline to 310 thousand b/d in 1997, 200 thousand b/d in 2000, and only 20 thousand b/d by 2005.

Indonesia

We expect that Indonesia will become a net oil importer during the first half of the next decade. In 1994, Indonesia produced a total of 1.6 million b/d of crude oil (including NGL) and exported 888 thousand b/d of crude oil making it the largest exporter in the Asia-Pacific region. Currently, Minas crude accounts for about one-quarter of Indonesia's crude production, but output from the field is likely to decline. Overall crude production is forecast to decline to 1.4 million b/d in 1997, 1.2 million b/d in 2000, and 1.1 million b/d in 2005. By the same token, the crude export availability from Indonesia is expected to decrease to 600 thousand b/d in 1997, 400 thousand b/d in 2000, and 240 thousand b/d in 2005.

Malaysia

Tapis crude accounted for half of Malaysia's crude and condensate production of 660 thousand b/d in 1994. However, the output of Tapis crude is likely to decline over the next 10 years. Overall production is expected to decline to 530 thousand b/d in 2000 and 440 thousand b/d in 2005. Currently more than two-thirds of Malaysia's crude is exported. The combination of declining crude production and gradually increasing domestic needs for these crudes will lead to a declining export availability from Malaysia, from 420 thousand b/d in 1994 to 170 thousand b/d in 2000 and approximately 50 thousand b/d in 2005.

Australia

Australia's crude production jumped nearly 9 percent in 1994 to reach about 540 thousand b/d. The country managed to export one-quarter of its 1994 production, and compensated for the deficit of crude by importing more from the Middle East. Forecasting Australian crude production in the future is risky because exploration activities are strong in this country. Over the next five years, the downturn of Australia's crude/condensate production in the early 1990s is set to be reversed - owing mainly to the addition of new crudes from the Timor Gap[9], light crude from Cossack, and condensate from the Northwest Shelf. Crude and condensate production is expected to increase to 590 thousand b/d in 1997 and 710 thousand b/d in 2000. Australia's crude/condensate export availability is also expected to increase to 185 thousand b/d in 1997 and 300 thousand b/d in 2000. However, after 2000, production is forecast to decrease dramatically, down to approximately 340 thousand b/d in 2005 - unless additional discoveries are made. While a certain amount of crude oil may still be exported from Australia by 2005, the country needs to import more for its domestic refineries.

Vietnam

Prior to 1994, Bach Ho was the sole producing field in Vietnam. In 1994, the majority of the country's 142 thousand b/d of crude output was still from Bach Ho, though partial production started in Dai Hung by the end of the year. Total production in 1994 was up 15.7 percent from the 1993 production level. Nearly all of this crude was exported. In 1995, the Rong field also joined the ranks of Bach Ho and Dai Hung to produce oil. Some other fields will come on stream in 1997, as will the Rang Dong field in 2000. Over the next year or two, the overall production level is likely to be affected by reduced estimates of reserves and production from the Dai Hung field. By 2000, Vietnamese crude production is likely to increase to 200 thousand b/d, and stay

(continued on page 18)

What is the EFCEE?

Over the past few years this acronym has gradually become known to energy economists in Europe where the activities of this organization are concentrated. On the contrary the EFCEE is virtually unknown elsewhere. Therefore, this article.

To lift the veil immediately for those who do not know and are curious to look behind it, the EFCEE stands for *European Foundation for Cooperation in Energy Economics.*

Background

Over the post-war years national affiliates of the IAEE were set up in a many European countries. At present there are 22 European IAEE affiliates (13 in the West and 9 in the East) with 1,713 members.

Representatives of these national affiliates met regularly to discuss energy problems of common interest and conferences of European scope were organized around specific themes (Berlin 1991, Tours 1992 and Kaunas 1992). Thanks to financial sponsoring of the European Commission, economists of Eastern Europe and the former Soviet Union countries were able to attend these conferences.

Wishing to promote and intensify the cooperation between energy economists in Europe, the European IAEE affiliates decided to go a step further and set up a special framework to channel and coordinate efforts made in this respect.

Toward the end of 1992 the EFCEE was created as an international non-profit association with offices in Brussels. The Foundation has been operational since then. An Executive Committee as well as Executive Secretary were elected.

Objectives

The objectives of the Foundation are as follows:

- To foster the establishment and activities of existing and new national affiliates of the IAEE in Europe.
- To promote, in general, professional communication on energy economics among members of the European affiliates and similar bodies of the IAEE and, in particular, to transfer know-how as well as skills in energy economics, energy accounting and management, among these members.
- To provide financial assistance to European IAEE affiliates and similar bodies in order to help them to achieve the aims set out above.

In brief, this means that the Foundation intends:

- to promote the establishment of national affiliates in countries where they do not yet exist;
- to provide financial help for the organization of international meetings and specialist workshop by its members;
- to assist members of European affiliates, in particular from Eastern or Central European countries, to attend these meetings; and
- to provide financial help for the exchange of information and dissemination of technical literature on energy economics.

Management

The bylaws of the EFCEE contain a number of juridical safeguards which provide for the efficient organization and operation of its program, namely:

- The *General Assembly* of members (the European IAEE affiliates) establishes the guidelines for the functioning of a project, including the criteria for disbursements of funds. It reviews the efficiency of the project and approves the budget.
- The daily management of the proposed project is left to an *Executive Committee* and an *Executive Secretary*. These are responsible to the General Assembly.

As to the practical management of a project, a number of basic rules are applied:

- Financing is to be provided on a project-specific basis. No funds are to be transferred to local affiliates for an unspecified use.
- Projects are selected based on merit whereby the importance and the practicality of the subject as well as its impact on the furthering of energy economics are the basic criteria.
- In selecting projects for funding, the principle of broad regional balance will be taken into account.
- The local affiliates are expected to participate in the financing of the projects so that EFCEE financing will only be complementary.

Funding

The EFCEE is supported by (1) contributions - individual, corporate and European Commission and (2) pro bono services rendered to the Foundation by its members.

Contributions come primarily from three sources:

- A rather symbolic contribution of 1 ECU per member paid by each Western European affiliate.
- Sponsorships by large energy corporations for specific projects.
- Financial help from the European Commission.

It is especially the financial help from DG XVII which makes it possible for the EFCEE to function smoothly. Over the last few years a yearly subsidy of 45,000 ECU ($58,000) has been received (50 percent of the budget).

The pro bono contribution of time and effort on the part of the Foundation officers and members cannot be underestimated. Though financial contributions are a necessary first ingredient to carry on the work of the Foundation, the time and effort contributed by the many volunteer individuals is the grease the makes the system work. The network of members established in practically all European countries, willing to contribute to the furthering of energy economics is most noteworthy.

The EFCEE establishes a yearly budget on the basis of requests for financial help from its members for organizing and/or attending energy conferences and workshops, the estimated cost of the "information program" referred to above and administrative expenses.

The 1995 budget was 90,000 ECU ($117,000).

Analyses and Reports on European Energy Problems

The financial help the EFCEE now receives from the EU is not a straight subsidy but rather a quid-pro-quo. Whereas in the first years the EU grants could be considered as subsidies, over the last few years the EFCEE and DG XVII met toward the end of each year and worked out a program

(continued on page 30)

First Call for Papers

The International Energy Experience: Markets, Regulation and Environment

April 14-15, 1997, University of Warwick, Coventry, UK

This academic energy conference, convened by the British Institute of Energy Economics (BIEE) and the Department of Economics at the University of Warwick, follows the December 1995 conference on *The U.K. Energy Experience: A Model or a Warning?* This second conference will provide an unique opportunity to review international energy experience, in the light of recent progress in energy, environmental and regulatory economics. The conference will bring together, from the U.K. and elsewhere, university economists and others with specialization in energy issues, postgraduate students and also economists and policy-makers working on energy issues in industry, government and related organizations.

Topics

As well as keynote talks, the conference will include coverage of five main areas: Environment, Finance and Investment, Pricing and Regulation, Networks (Wires and Pipes), and Centralization vs. Decentralization. Within these areas, possible sessions include: the interaction of economic and environmental regulation; energy-environment regulation and trade; efficiency and environmental opportunities in the supply chain; investment appraisal and modern asset pricing methods; financial and contractual innovation in energy markets; finance and investment, risk and technology; different experiences with electricity pools; competitive markets and energy security; new forms of energy taxation; models of liberalization; liberalization in countries in different development situations; energy in the developing world; networks, natural monopolies and third-party access; decentralization vs. economies of scale; differing techniques of modeling. Papers on other topics will also be considered.

Conference Organization and Proceedings

Papers are invited for presentation at the parallel sessions:

- One-page abstracts should be submitted by Friday 29, November 1996, and you will be notified whether your paper has been accepted by Monday 23, December.
- Accepted papers will be published in the conference proceedings, provided that the completed paper is received by Friday 7, March.

It is also hoped that, as with *The U.K. Energy Experience: A Model or Warning?* (edited by Gordon MacKerron and Peter Pearson, and published in March 1996 by Imperial College Press), papers presented at the conference will be able to be considered for inclusion in an edited volume from a major publisher.

Location and Costs

The conference will be held at the University of Warwick Conference Park. Campus accommodation is offered. Fee, to cover the cost of the conference, including accommodation on the night of Monday 14, April, meals, VAT and conference proceedings: $80 (academic participants and paper presenters), $150 (nonacademics). It is intended to offer reduced rates for postgraduate students.

Further Information

Please address any inquiries and send abstracts (by 29 November) to : Carol Henderson (W2) Corporate Affairs, Shell U.K. Limited, Shell-Mex House, Strand, London WC2R ODX, England. Tel: +44-(0)171-257-7887; fax: +44-(0)171-257-7874.

☐ Please send further information about *The International Energy Experience*, on 14-15 April 1996, as it becomes available.

☐ I would like to submit an abstract entitled:

_____

Name: _____

Address: _____

_____

Send to: Carol Henderson (W2), Corporate Affairs, Shell U.K. Limited, Shell-Mex House, Strand, London WC2R ODX, England.

Finland Telephone Code Changes

Beginning 12 October, the metropolitan area telephone codes will change for most important cities in Finland. The country code remains 358, but the following city code changes should be noted:

City	New Code	Old Code
Helsinki Metropolitan Area	9	0
Jyvaskyla	14	41
Lahti	3	18
Lappeenranta	5	53
Oulu	8	81
Tampere	3	31
Turku	2	21

Energy Policies of South Africa

*by Philip Swanson**

Last year the South African government requested the IEA carry out a survey of its energy sector as an input into the government's efforts to develop a new energy policy white paper. An IEA team of experts held over 75 meetings with South African energy sector officials in government, industry and academia. The result is the IEA report, *Energy Policies of South Africa*, published in May 1996. The Government's draft white paper is to be published this Autumn.

Policy Making

Some of the report's most important recommendations deal with creating the framework conditions for policy making. Apartheid-era energy policy usually was made in a nontransparent manner, for the most part by the energy industry itself. One legacy of such "off-campus" policy formation is that the Department of Mineral and Energy Affairs (DMEA) now finds itself under-staffed and under-skilled for the enormous new policy making agenda it faces. The IEA advises the government to strengthen the professional civil service, ensuring its competence to perform the policy making role.

The IEA commends the government for the amount of policy debate now taking place, involving groups that previously had little or no voice in the process. However, it cautions against letting the consultation process become an end in itself, delaying the taking of urgent policy decisions.

Electricity

South Africa generates over half the electricity on the African continent - though the majority of its own people has no access to grid electricity. The government plans to increase the level of electrification from around a third of the population in 1993, to 72 percent by the turn of the century, via some 2.5 million new connections. This plan will be difficult to fulfill as electrification extends to areas that are more remote, and hence more expensive to electrify. Moreover, some fundamental questions regarding the government's overall strategy remain unanswered, including priorities (e.g., which areas and dwelling types to electrify first), financing, and the structure of the electricity supply industry.

For much of the country, electricity is distributed by municipal electricity departments, many of which use electricity sales to subsidize other municipal functions. Since larger distribution units will probably be needed in order to handle electrification financing, alternative sources of income for local governments must be found. However, any future involvement of municipalities in electricity distribution (e.g., via taxation), should be transparent and appropriately ring-fenced.

At this stage the immediate introduction of fully developed competition or privatization in the electricity supply industry would probably not accelerate the electrification program - and might even divert government and management attention from it. Nevertheless, the IEA believes there would be long term benefits from introducing greater transparency in order to allow competition in the longer term. Competition should be reconsidered in, say, five years, when the present phase of electrification should be completed.

Coal

Most electricity in South Africa comes from burning coal. Coal dominates the country's energy system, accounting for more than 70 percent of primary energy demand and nearly a quarter of final energy consumption.

A small number of companies dominate the industry. Since mining companies usually do not have to relinquish mineral rights over time, it is difficult for new companies to enter the market. The IEA recommends that development conditions establish the principle that rights be relinquished progressively unless development proceeds at an agreed pace.

South Africa is one of the largest coal exporters in the world, reemerging as a mid- to high-cost producer by international comparisons. Additional export capacity is likely to be slow in development and constrained by the rail and port facilities which are dedicated to a single group of companies. The IEA advises the government to ensure fair competition in the provision of, and access to, transport and export infrastructure services.

Liquid Fuels

About a quarter of coal production is used for the production of synthetic fuels. Altogether over 30 percent of South Africa's liquid fuels consumption comes from synthetic sources, either manufactured by Sasol from coal, or by government-owned Mossgas from natural gas.

Previous South African energy policy was dominated by the pursuit of a secure supply of oil in response to the UN oil embargo (lifted in 1993). The petroleum industry, from exploration to retailing, has been enveloped in a complicated web of informal arrangements, market sharing agreements, trade restrictions and pricing controls. Much of this remains in place. Important elements include financial supports for the production of synthetic fuels.

In December 1995, the government reduced the subsidy to Sasol by lowering the "floor price" used to determine the subsidy, and promised to phase it down thereafter to a point where, given oil prices prevailing at the end of 1995, Sasol would not receive any protection by mid-1999. The IEA supports the elimination of subsidies to liquid fuels.

The government has also been active in the procurement of conventional oil, importing it through the Strategic Fuel Fund, and searching for it through the state-owned E&P company, Soekor. The IEA supports moves by the Government to diminish its role in oil purchases for the privately held refineries. Experience in IEA countries shows that companies perform this role best themselves. Regarding Soekor, the IEA points out that allowing this state-owned E&P company to also perform the regulatory role for offshore activities presents a conflict of interest.

The government, through Soekor, holds the exploration license for almost the entire offshore territory. Last year Soekor invited the international petroleum industry to make sub-license exploration bids. The IEA interviewed a number of those who bought information packages. Although companies felt terms were generally competitive with those offered elsewhere, they were concerned about low geological prospectivity and the uncertainty of some terms, especially

* Philip Swanson is Administrator, Division for Europe, Middle East and Africa, International Energy Agency, Paris, France.

those regarding gas – which are important considering the high likelihood that any discovery is more likely to be gas than oil.

Gas

South Africa has few gas resources besides the small deposits of natural gas offshore Mossel Bay, currently being synthesized into liquids, and some undeveloped coal bed methane deposits near Waterberg. Most future gas is likely to be imported, either from Mozambique or Namibia. However, development of these deposits will depend on markets in South Africa, which are uncertain due to competition from cheap coal. Further holding back development is uncertainty regarding government policy, including fiscal treatment for pipelines, etc.

The IEA advises the government to take into account its limited capacity for enacting a sophisticated regulation regime, and to aim for as simple a system as possible which meets the objectives of encouraging development, leaving open the possibility of future regulatory intervention, and providing safeguards to avoid monopoly abuse.

Environment

One advantage of gas use is environmental. In South Africa, the coal fuel cycle is the dominant source of air pollution and overall waste generation. This includes pollution from coal combustion in power generation and indoor pollution from its use in low income dwellings. The latter raises serious health concerns. Nonsustainable use of wood fuel is also becoming an important problem. Nevertheless, it is unclear how much attention South Africa will be able to devote to environmental concerns in the near-term, given its economic development priorities.

Energy Efficiency

Little attention to pollution and other externalities has contributed to low energy prices, as have low energy taxes and abundant cheap coal. Low energy prices have in turn contributed to a low priority for energy efficiency. More efficient use of energy could provide an opportunity to cut costs and improve, or at least maintain, industrial competitiveness at a time when many sectors in the economy face competitive pressures as tariffs are removed.

Residential electricity demand, at present less than 20 percent of the total, is projected to double by 2015 as a function of economic growth and substantial new infrastructure investments in housing and electrification. This will make the electricity demand load profile more peaked. Efficiency measures could help reduce utility costs for peak demand, while lowering overall consumer costs and reducing pollution. The construction of new housing under the Reconstruction and Development Program (RDP) provides a "one-off" opportunity to build in basic energy efficiency measures in one million new homes. The IEA recommends that criteria for receiving government subsidies under this program include some basic energy efficiency guidelines.

Conclusion

The energy sector will have an important role to play in South Africa's economic and social transition, for example, in electrification of households. Moreover, other African countries are looking to South Africa as a role model. The IEA undertook this survey not only to help South Africa, but to help that country provide a good example. Hopefully, success in South Africa can lead to an economic "virtuous spiral" upward from the Cape of Good Hope.

IA
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European Foundation for Cooperation in Energy Economics

In cooperation with

The IAEE and the Austrian Association for Energy Economics

First Announcement and Call for Papers
for

THE THIRD EUROPEAN CONFERENCE ON ENERGY ECONOMICS

THE INTEGRATION OF CENTRAL EUROPEAN BALTIC AND BALKAN COUNTRIES INTO THE EUROPEAN ENERGY ECONOMY

To be held at the Vienna Hilton Hotel
Vienna, Austria
2-4 July 1997

Topics to be addressed will include:

- The economic and legal background of East-West energy integration.
- Pricing policies, international trade, taxation and state aid.
- Privatization and foreign investment in the energy sector.
- The future European energy market.

High-level speakers will be invited to address these subjects. IAEE members wishing to present a paper dealing with one of the topics should submit a one-page abstract to:

EFCEE Secretariat
35/1105 Electricity Street
2800 Mechelen
Belgium
Telephone/fax: +32-15-20-48-57

The basic registration fee for IAEE members is 4,500 ATS (±450 US $). A discount will be granted to paper authors. An attractive accompanying persons program will be provided. Favorable hotel rates are available.

Mark your calendar now and for further information call or fax the above number.

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The North American Energy Scene

*By John H. Lichtblau**

The North American energy market (United States and Canada) contains 5 percent of the world's population and consumes 27 percent of the world's energy. It is the world's largest regional energy market, i.e., larger than Western Europe or South and South East Asia (including China). It is self-sufficient in all fuels except oil in which it has a 65 percent self-sufficiency. This makes it the world's largest oil importing region. Its energy consumption has grown at an annual rate of about 1.7 percent in the last ten years (1985-95), or about two-thirds its economic growth rate. This was similar to the European energy/GNP ratio for the same period.

United States-Canadian Energy Relations

Numerically, the two-country region is, of course, totally dominated by the United States, which has nearly ten times the population of Canada and eleven times as many motor vehicles. But in the energy sector there is a real symbiosis between the two countries which I would like to discuss briefly before looking at the region's future developments. In the oil sector the United States has the world's largest net import requirements (7.9 mmb/d in 1995) while Canada is both an exporter and importer of oil. Last year it exported just over 1 million b/d of crude, all of it by pipeline to U.S. refineries, while importing nearly 600 mb/d of crude from overseas sources to supply the refineries in its eastern maritime provinces.

The United States is also the only export outlet for Canadian natural gas, absorbing about 52 percent of total Canadian production, and virtually the only import source of U.S. natural gas, supplying about 12.5 percent of total U.S. requirements. However, there is an essential difference between Canadian oil exports and Canadian gas exports to the United States: the oil exports displace U.S. imports from overseas sources while the gas exports displace U.S. domestic gas production which has substantial spare capacity and deliverability.

Canada also exports 6-8 percent of its electric power production to the United States. These imports have an environmental benefit for North America since they are generated primarily with hydropower, Canada's principal electric generating source (62 percent of total generation last year).

The Outlook to 2005

Now let us look at the ten-year period to 2005.[1] As I mentioned before, the United States will, of course, continue to dominate North America's economic and energy developments. We expect U.S. economic growth to continue at approximately the same 2.5 percent annual rate of the past ten years.

The trend of progressively slower growth in energy demand than in GDP should continue throughout the period, reflecting further government and private conservation efforts and improved technology in energy utilization, and assuming flat prices in real terms. From 1995 to 2005, the U.S. GDP can be expected to rise by 25-30 percent but total energy demand by only 10-12 percent.

Even at this slower growth rate in energy consumption, the United States will fall short of its committed target to reduce its greenhouse gas emissions to the 1990 level by the year 2000. Nor are we likely to achieve it by 2005. Of course, the impact of global warming on the earth is still debated within the scientific community. However, the States' steady improvement in energy efficiency, which can be expected to continue, should contribute to reducing its share in greenhouse gas emissions.

Oil

Oil will continue to be the dominant fuel in the U.S. energy sector, accounting for only slightly less than its current share of 40 percent of total energy demand by 2005. Thus, oil demand will grow throughout the 10-year period. By 2005, it should be more than one million b/d higher than its 17.9 million b/d level of 1995.

Oil Demand: Transportation is Still the Key

Gasoline will continue to be the prime oil product and will grow annually to at least 2000 after which it may level off at around 8 million b/d. But a slight further growth to 2005 is also quite possible. The U.S. Energy Information Administration, for instance, projects in its latest long-term forecast a U.S. gasoline demand increase from 8.2 million b/d in 2000 to 8.5 million b/d in 2005.

It may be difficult to comprehend why total miles driven and gasoline consumption keep rising in a country where everyone who wants a car has one. One major reason is the recent widespread, partly image-driven, shift from passenger cars to sports utility vehicles and other non-traditional passenger cars whose gasoline efficiency is substantially lower than that of regular cars. About 40 percent of all new vehicle sales are in this category.

Regarding alternative fuel vehicles (natural gas and electric) we foresee a growth from the current very low level to about 5 million units by 2005. However, during the same period the total U.S. vehicle fleet is likely to grow by about 25 million units. Only government mandates – for which there is little public or political support – could bring about a significant growth in electric vehicle sales. So far, these mandates are quite limited and contain many exemptions.

Demand for other transportation fuels, diesel and jet fuel, will rise faster than for gasoline, so that the transportation sector will maintain its two-thirds share of total U.S. oil consumption.

Oil Supplies: Gulf of Mexico Will Be the Star

U.S. crude oil production, which has been declining steadily from nearly 9 million b/d in 1985 to about 6.5 million b/d in 1995, will continue to decline in the next 10 years but at a much slower rate. The slow-down and even temporary reversal of the decline in the late '90s will be due primarily to sharp production increases in the Outer Continental Shelf (OCS) area of the Gulf of Mexico. New technology and reduced operating costs have recently opened up this area to large actual and planned production increases. Last year's production of nearly 1 million b/d may double by 2000 and then stay there until 2005 and beyond. This would briefly

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*John H. Lichtblau is Chairman of the Petroleum Industry Research Foundation, Inc., New York City. This is an edited version of his remarks at the 19th IAEE International Conference, May 27-30, 1996 in Budapest, Hungary.

[1] See footnotes at end of text.

offset declining production in the rest of the country.

Some of the new technologies and techniques may be applied in onshore production and over time could possibly change the long-held standard image of inevitably declining U.S. production and, hence, ever growing reliance on crude imports. However, for now, we still see total U.S. production rising only slightly to about 2000 and then declining again to 2005. (By contrast, the EIA in its latest long-term reference case sees an unabated decline in U.S. production to 2005 but an increase thereafter). On the basis of the above supply/demand projections, net U.S. oil import requirements should rise from 7.9 million b/d last year to about 9.5 million b/d by 2005, an increase in U.S. net import dependency from 46 percent to 50 percent.

However, the North American *regional* import dependency will remain lower because of the substantial volume of U.S. imports from Canada. In 1995 North America's net import dependence was only 38 percent (excluding intra-regional trade of crude and products). Whether the substantially lower regional import dependency is meaningful for the United States is a function of the reliability of imports from Canada. Given the physically integrated nature of Canadian crude oil imports and the NAFTA treaty, the availability of Canadian crude to U.S. refiners can be rated very highly. Furthermore, Canadian exports to the States can be expected to rise over the next 10 years since production is likely to grow faster than consumption. This will be due in part to the coming on stream of offshore production in eastern Canada. Total Canadian production by 2005 could be 400-500 thousand b/d higher than last year's 2.4 million b/d.

The growth in imports from Canada will be part of the ongoing shift of U.S. oil imports from the eastern to the western hemisphere. Other reasons are the growing export capacity in Latin America, including such newcomers as Colombia, all of which are located closer to U.S. markets than Middle East and African supply sources. Meanwhile, Middle East suppliers are redirecting their exports to the rapidly growing Asian markets.

From a security point of view the shift to Latin American supply sources may not be significant since there is only one world oil market and a disruption anywhere affects prices everywhere. However, the closer supply sources are preferable logistically to U.S. importers and may reduce their inventory requirements.

One more point on U.S. oil imports. We can expect to see a moderate but noticeable shift in the composition of imports from crude to products during the next 10 years. This will reflect the fact that no new refineries have been built in the Unted States for many years, while a number of existing ones have been shut down and that operating plants whose capacity has been raised, operate at an annual average of 90 percent of capacity.

Natural Gas

The North American natural gas market is strictly regional, i.e., almost no trade with other regions, and will remain that way for the next ten years and probably longer. Currently, its annual consumption of 25 tcf is split 88/12 between the United States and Canada. The production split is directionally the same – 78/22 – while the proven reserves split is about 70/30. Over the next 10 years, we expect U.S. gas demand to grow at an annual rate of about 1.5 percent and Canadian demand at twice that rate. But by 2005, U.S. gas demand will still be six times as high as Canadian demand.

Gas Demand: The Story is Electricity

In both countries gas demand growth will be largest, and fastest in the electric power sector, both in the utilities and the nonutility generators in industry and commerce. The underlying reason is the growth in electric power demand, reflecting the growing intensity of electric utilization of new equipment in home and business in North America. However, there are some uncertainties. The electric power industry in both the United States and Canada is undergoing basic restructuring from regulated utility status to competitive enterprise. This is likely to make electric power more competitive with other fuels, primarily gas, in certain end-use markets. However, if electric power demand rises more rapidly as a result of greater competitiveness and lower rates, more fuel will be needed to generate power. Gas is the preferred growth fuel for this purpose. As of now, we see combined gas demand for electric utility and nonutility power generation rising 50-60 percent over the next 10 years. By 2005 electric power generation may account for one-third of total U.S. gas demand compared to 24 percent in 1995. In Canada too, electric power generation is the fastest growth market for natural gas.

The growing use of gas as a generating fuel is, of course, an environmentally positive development since it curbs the growth in coal, still the principal power generating fuel in the United States. However, gas, together with oil, must also make up for the leveling off and decline in nuclear power which is about to stop growing and will start to decline after the year 2000. Whatever the problems with nuclear power, it does not contribute to global warming or air pollution. It currently accounts for 20 percent of U.S. electric utility power generation, slightly more than gas's share. Thus U.S. coal demand for power generation (coal's only major market) will continue to grow at nearly the same rate as in the last ten years. But its sulfur emissions will be much reduced, both by additional desulfurization facilities at power plants and the shift from high-sulfur eastern to low-sulfur western coal in the United States.

Gas Supplies: Alberta and the Gulf Coast Will Compete

On the supply side the aggressive competition in the U.S. market between domestic and Canadian gas will continue in the long-term but may be curtailed in the short-term because of pipeline constraints in Canada. Canadian exports are currently close to their pipeline capacity so that for the next few years there will be very little room for incremental exports. After 2000, enough new pipelines will have been constructed to permit once again substantial growth in Canadian gas exports.

Meanwhile, the U.S. competitive position has improved substantially by a recent "sea change" in U.S. gas finding and production costs. The Gulf of Mexico OCS, the only growth area in U.S. oil production, will also be the major, but not the only, source of growth in domestic gas production. OCS Gulf production and Canadian imports will provide 75 percent of the approximately 3.5 tcf increase in U.S. gas demand over the next 10 years. After a 2-3 year hiatus due to the Canadian pipeline constraint, there will again be fierce competition between these two major supply sources.

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Opportunities for Western Companies in the Former Soviet Union

*By Thorleif Enger**

The opportunities for international companies in Central and Eastern Europe (CEE) and the Former Soviet Union (FSU), is a theme high on the agenda of most companies and this is also the case for my company, Norsk Hydro. Norsk Hydro has been active in this area for several decades. During the last 2 to 3 years, however, we have substantially increased our involvement, both in trade and domestic investments.

Benefits of Internationalization

International trade and economic cooperation is vital to the generation of wealth among nations. The diversity of natural resources throughout the world, as well as the uneven distribution of capital and skills, have encouraged the development of international trade, cooperation and investment. The challenge for governments is to provide a level playing field that allows fair opportunities both for the national and international participants.

The host country should capitalize on the presence of international companies in its economic development; internationalization provides more competition and, hence, a more cost-effective industrial development. However, governments as well as domestic companies may have objections to the establishment of international companies in their country. For domestic companies, this may entail increased competition and lower margins, while for governments, internationalization may be perceived as a threat to their national sovereignty of domestic resources.

Therefore, the long-term success of any international cooperation is dependent on the mutual benefits of the parties involved. The investment must provide benefits both to the host country, the international investor and the cooperating companies in the host country.

Opportunities for Western Companies in CEE and FSU

Resources, Markets and Other Advantages

The different countries in this large region each have specific characteristics. They are also in distinct stages of transition, and the investment climate for international companies differs widely. I will, therefore, deal with this subject in general terms.

In Russia and the region of the Caspian Sea, the huge reserve base of oil and gas represents interesting opportunities. Besides the region offers a huge market potential. As the centrally-planned regime is gradually diminishing, the growth potential within the private sector is substantial. In this respect, the general economic improvements are particularly evident in several of the countries in CEE. From a market perspective, this part of the region is of special interest. However, the market potential is not only found within the region. Following a successful restructuring, the region should become a price-competitive and high-quality supplier to the nearby markets in Western Europe as well as the general world market.

Besides there are several area specific advantages. There is generally a high level of education and labor costs are low compared to countries in Western Europe and North America. Another positive feature is the well established industrial setting in the region. The availability of inexpensive energy may still prevail. However, with most energy prices gradually escalating to international levels, this may only serve as a short-term phenomenon. For a long-term investor, one should bear in mind that some of the attractive market features in CEE and FSU, like inexpensive energy and low labor costs, may not be everlasting.

Opportunities in Oil and Gas Production in FSU

Russia possesses about 5 percent of the world's proven oil reserves and about 34 percent of the proven reserves of natural gas. The country's large oil and gas provinces are also likely to include a substantial base of undiscovered fields. Within some of the main old oil provinces in Russia, like Western Siberia, the Urals and the Timan Pechora, there is an abundance of well-appraised but underdeveloped fields. The region of the Caspian Sea also provides a large potential of proven and unproven reserves. The geological risk in these areas is considered to be less critical compared to several other exploration opportunities available for international companies.

Many of the international oil companies have their main activities in more mature oil regions in the western part of the world. Entrance to these large oil and gas provinces in the FSU, may serve as an attractive opportunity to expand their business. It is also important to remember that the Russian oil and gas industry is generally characterized by relatively high technical competence.

Most international oil companies in Russia have not yet started development and large-scale production. Relations with central and local authorities as well as Russian partners are generally good. However, the political risk is still considered to be too high.

The passing of the federal law on Production Sharing Agreements, in January of this year, is regarded as a major step in the right direction. The law, however, has some fundamental shortcomings regarding the safeguarding of the investors' rights and obligations, which has to be corrected before western oil companies are willing to make major investments. The most important problem is that many of rights and obligations are not regarded as contractual rights, but are rights deriving from administrative laws which can be unilaterally changed by Russian authorities in the future. The requirement of a well-defined jurisdiction prior to major investments has been a strong concern to the international oil industry. The shortcomings of the PSA have to be solved before foreign investors are ready to proceed with large commitments. The situation is somewhat different in other countries, such as Azerbaijan and Kazakhstan, where the securing of reliable transportation outlets is the main problem.

Market Opportunities in CEE

For the first time since the late 1980s, recorded economic output is growing in most countries in transition. In some countries, real GDP has surged far above its low point, while in others, economic recovery has been slow. As the reform process and economic recovery gathers pace, companies with

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their main activities in the more mature markets in the west will show greater interest in the market opportunities in CEE. However, the rapid economic developments in other regions, such as parts of Asia, the Middle East and South America, will provide ample opportunities for international companies and create strong competition for internal resources.

We have already witnessed considerable interest from western oil companies in establishing gasoline stations in CEE. The prospects of increasing car ownership in the region offers an opportunity to develop new markets. However, in some countries an overcapacity in gasoline retailing may already be evident. Domestic refineries in the region, designed to serve the predominant heavy industry, are on the other hand not able to meet the growing demand for gasoline. At the same time, West European refineries are plagued by overcapacity, particularly in the light end of the barrel. Thus, by entering new retail markets close to their refineries in the west, they can secure outlets for their gasoline production at reasonable transportation costs.

Domestic demand for products from energy-intensive industrial segments, like petrochemicals, including fertilizers and metals, has dropped dramatically. For some of these products, the market potential in the domestic sector is considered to be substantial as the economy and the standard of living improve. The increase in food production and the development of infrastructure and housing, should in particular provide substantial market growth. The considerable rise in energy prices has burdened many of these industries with high production costs, particularly due to inefficient energy use. Western companies possessing capital, technology and management expertise will have the opportunity to gain access to the growing domestic market as well as the world market for these products through direct investment.

The privatization process in several of these countries is moving slowly, and the legal framework for privatization and business transactions is not always sufficient in ensuring acceptable risk. The shortage of indigenous energy supply and the uncertainty of future energy supply and the uncertainty of future energy prices may also cause problems. The securing of long-term energy deliveries to the plant at initially agreed terms is one of the keys to success. Also, access to distribution and transportation systems may prove to be difficult and expensive.

Norsk Hydro's Experiences in the Region

Norsk Hydro as an International Company

As an international company, Norsk Hydro is present in more than 100 countries. Energy is the basis of Norsk Hydro's activities. In addition to being a producer of oil, gas and hydro-power, Norsk Hydro is also a substantial consumer of energy. The company has developed a world-wide network for the production and marketing of fertilizer, and is the leading supplier of fertilizers in Europe. The company is a leading producer of aluminum metal and produces different lines of semi-fabricated products. Norsk Hydro is also one of the two largest magnesium producers in the western world. Natural gas liquids from the North Sea provide Norsk Hydro with raw materials for the production of plastic materials. The company is a major supplier of PVC in Scandinavia and the United Kingdom, and has a firm foothold in the Asian VCM markets.

Norsk Hydro's Activities in FSU and CEE

Long before the fall of the Berlin Wall, Norsk Hydro had well-established trade relations in both FSU and CEE. In CEE, fertilizer and aluminum trade accounted for the major part of the activities. Norsk Hydro was a major importer of fertilizers from the FSU as well as raw materials like apatite and ammonia for the fertilizer industry. Furthermore, the company exported alumina and other input material for the aluminum industry to the area and bought aluminum for further marketing. Norsk Hydro also imported Russian crude oil. Apart from these trading activities, Norsk Hydro technology was licensed in several of the fertilizer plants in the region.

As a result of the progress in the region's economic and structural transition, Norsk Hydro's trading and investment activities have increased substantially. Today, Norsk Hydro has offices in most countries in the region, and the company is involved in several cooperative projects.

An important reason behind our engagement is to obtain good relations with interesting local companies as well as with central and local authorities. Due to our early local presence and gradual development of activities based on a long history of cooperation, we are today evaluating a number of investment projects either as a part of the privatization process or as a participant in new projects.

Major Investment Projects in Russia

As of now, Norsk Hydro has decided to concentrate its oil and gas effort in the Barents Sea and the Timan Pechora area in the northwestern part of Russia. We are cooperating with both Russian and Western partners in order to find economically viable solutions for the development of the huge Shtokman gas field in the Barents Sea and for several oil fields in the Timan Pechora region. Over the years, Norsk Hydro has spent significant resources in the appraisal of the geological and commercial potential within these regions. This is done in close relation with local and central authorities as well as local and international companies engaged in exploration and production activities in the region. Norsk Hydro is also actively considering participation in specific fertilizer and aluminum plants in Russia.

Development of Agriculture in Ukraine

Ukraine, once the "bread basket" of Europe, has a larger arable area than any other European country. However, the productivity of the agrarian sector has been low compared to Western Europe. Since the break-up of the Soviet Union, the Ukrainian agricultural sector has suffered a major depression. Fertilizer consumption has fallen dramatically, and is presently around 25 percent of the peak at the end of the 1980s. However, with political stability and a successful restructuring of the agricultural sector, Ukraine has a huge potential for increased agricultural production and significant growth in fertilizer consumption. Our aim is to become a full-scale distributor and supplier of high-quality products and services, and we are taking the first steps to position Norsk Hydro for the transition and growth in this market.

Ukraine is also a large producer of fertilizers, based on imported Russian gas. As a partner, Norsk Hydro has been actively involved in the trade of Ukrainian fertilizers and

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Asia-Pacific Region Outlook *(continued from page 9)*

at that level until 2005. During the period 1995-2005, production at Bach Ho is expected to decline, but it will be compensated by production additions from Rang Dong, Dai Hung, and other fields. Vietnam's crude export availability, reaching 200 thousand b/d by 2000, is likely to be reduced in the middle of the next decade following the possible construction of two refineries in the country.

Brunei

Brunei's crude production has been stable for years, and little change is expected over the next five to ten years, unless the government changes its policy of controlling oil production for conservation purposes. Crude production in 1994 was 162 thousand b/d, all exported. Although annual crude production is likely to be maintained at the current level, domestic demand for oil will continue to account for a tiny fraction (less than 10 percent) through 2005.

Papua New Guinea

Papua New Guinea (PNG) produced 120 thousand b/d of crude oil from the country's only oil field, Kutubu. Output is declining, and 1994 production represented a decline of 5.3 percent over 1993. Kutubu production is expected to decline further to 75 thousand b/d in 2000 and 60 thousand b/d in 2005. Currently all PNG crude is exported. If the proposed refineries are built, crude export availability could be reduced by more than half by 2005.

In sum, by 2000 exporters will include Indonesia, Australia, China, Malaysia, Brunei, Vietnam and PNG. By 2005, many of these countries are expected to continue to export oil – but a drastically reduced amount. Some oil may also be exported from Myanmar.

As a result of these changes, exports of low-sulfur waxy crudes by the Asia-Pacific countries will decline significantly. Among Asia-Pacific crude types, light sweet crudes will be harder to find than heavy sweet crudes after 2000. The regional slate will also depend more heavily on sour crudes from the Middle East. The changing crude availability will have a major impact on refining investments, since environmental regulations will call for lower-sulfur fuel oil.

Rising Import Dependence for the Asia-Pacific Region

Asian crude production is unable to satisfy existing regional oil demand, and the gap between supply and demand will continue to widen. The result will be a major increase in oil import dependence.[10]

The Asia-Pacific region has a huge refining capacity. The 1995 distillation capacity in the region is about 16 million b/d, which represents a substantial increase over the 1990 capacity of 12.6 million b/d. The countries that have over 1 million b/d of crude distillation capacity are Japan (4.8 million b/d), China (3.7 million b/d), South Korea, (1.7 million b/d), India (1.1 million b/d), and Singapore (1.1 million b/d).

In light of rising oil demand, many countries in the region have major plans to expand their refining capacity and upgrading capabilities. However, the plans vary from country to country. For the region as a whole, additions of about 1.8 million b/d by 1997 are firmly planned, with an additional 1.3 million b/d of likely capacity by 2000. During the period 2000-2005, a possible 4 million b/d of new capacity could be added to the region, but many uncertainties exist. Associated with current plans are 1.3 million b/d of planned cracking capacities (FCC/RCC, hydrocracking, visbreaking, and coking) by 2000, of which about 60 percent of the additions will be completed by 1997. The huge and expanding refining capacity in the Asia-Pacific region implies that crude oil will account for most of the oil import dependence, and dependence on the Middle East to supply the region's crude needs will be inescapable.

In 1994, the net oil import requirements of the Asia-Pacific region amounted to 9.3 million b/d, about 57 percent of the region's petroleum product consumption. Based on our forecasts and projections, the region's overall oil import dependence is expected to rise from 57 percent in 1994 to 62 percent in 1997, and 65 percent in 2000, and by 2005 to 72 percent.

Currently, the Mideast accounts for approximately 76 percent of the region's total crude oil imports (including intraregional crude imports within the region).[11] The dependence on Middle East crude will go up to 79 percent in 1997 and 84 percent in 2000. By 2005, 92 percent of all crude imports of the region is expected to come from the Middle East, unless alternative sources of petroleum supply can be found. This sharply contrasts with the United States, where Latin America, Canada, and the North Sea will remain key exporters for the U.S. market, in addition to the Middle East.

Conclusions

Oil consumption growth in the Asia-Pacific region will continue to be robust over the next decade and beyond. Regional crude oil supply will lag far behind the overall oil needs in the region, and most of the balance can be filled only by Mideast oil. During the two decades since the first Mideast oil crisis, although much has changed within Asia and the Pacific, the region is still dependent on the Persian Gulf for oil. This dependence will grow to unprecedented levels in a few years, simply because China, Indonesia, and Malaysia will ultimately join the ranks in search of large volumes of imported oil.

The refining system in Asia has been consistently changed, upgraded, and expanded to catch up with the region's growing demand for oil in general and for lighter, cleaner, and higher-quality products in particular. As overall demand is growing steadily, surplus refining capacity in the region will wax and wane. Some countries will ultimately become product exporters, but the region as a whole will remain a net product importer for the foreseeable future.

In summary, the Asia-Pacific region faces a precarious situation in terms of future oil demand and supply. However, one of the biggest characteristics of the region's oil market is that the Asian secret is out. The competition for trading crude oil and products will become fiercer, as the region's oil market has embarked on a course of globalization. The impact of these changes will be significant for all potential oil investors and traders in the region.

Footnotes

[1] Throughout this article, all 1995 numbers are estimated unless otherwise specified.

[2] While the concepts of "demand" and "consumption" are different in economic theory, they are used interchangeably to refer

to the quantity of energy demanded, unless otherwise specified.

[3] Primary commercial energy comprises coal, oil, gas, nuclear power, and hydroelectricity.

[4] China's total oil consumption still grew in 1994, but the growth rate was considerably lower than in 1993. Indonesia's decline of oil consumption in 1994 was mainly caused by a sharp decrease of fuel oil use. The oil demand status of China and Indonesia will be further discussed.

[5] In both cases, the direct burning of crude oil is excluded from total petroleum product consumption when the share of gasoline is calculated for Japan and China here.

[6] For further discussion, see "Update of the Indonesian Oil Sector: Declining Demand in 1994, Future Imbalances, and Deregulation Outlook," by W. Prawiraatmadja and F. Fesharaki, Energy Advisory No. 158, 27 July 1995, Program on Resources, East-West Center, Honolulu, Hawaii.

[7] International bunker fuel oil and bunker gasoil consumed in Singapore are included in total demand.

[8] The crude export availability is defined as the gross exports of crude oil from a producing country, and it is the difference between domestic crude production and the demand of domestic refineries for these crudes.

[9] Part of the Timor Gap is jointly developed by Australia and Indonesia.

[10] Import dependence is defined as the share of net oil import requirements (total petroleum product consumption minus regional crude production) in the region's total petroleum product consumption.

[11] If the intraregional imports were excluded, the Middle East accounted for over 90 percent of the Asia-Pacific region's actual imports of oil (crude and products combined) in 1994.

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Opportunities for Western Companies *(continued from page 17)*

ammonia. We recently purchased an interest in an import/export terminal in Yuzhny by the Black Sea, and plan to increase the company's trade of ammonia and fertilizers with both Ukraine and Russia.

Participation in Slovalco

In 1986, Norsk Hydro and the Slovakian aluminum producer ZSNP signed a know-how agreement that required Norsk Hydro to contribute electrolysis technology. In 1993, based on the agreement, Hydro Aluminum and ZSNP formed a joint venture, in which Norsk Hydro was responsible for the replacement of ineffective and polluting production units. In addition, Norsk Hydro would also provide management assistance during the period of production testing as well as in the plant's general operation. The agreement also involves an accord with the Slovakian authorities to develop an extensive plan for environmental improvements in the aluminum production process.

Today, Norsk Hydro owns a 10 percent interest in Slovalco, and is responsible for managing the company's sales and marketing operations. In addition, Norsk Hydro is responsible for marketing Slovalco's export tonnage. This project has been extremely positive, and is an example of cooperation that can be copied in other places.

Fertilizer Production in Rostock

In early 1991, Norsk Hydro acquired 100 percent of the Rostock fertilizer plant in former East Germany. The plant's technical standard was good, but a major turnaround was required to make the plant a world-class performer. Since the takeover, fertilizer production has more than doubled to 1.6 million tons per year, while the number of employees has been reduced from roughly 900 to 320. With the introduction of efficient production and marketing, the Rostock plant is now very competitive.

This illustrates some of the pains – and the eventual rewards – of such a restructuring process. As prices of energy and salaries rise to West European levels, the securing of long-term and cost-efficient production will imply major restructuring.

Norsk Hydro is presently working on several other projects in both the FSU and CEE. Our main aim is to participate in the production, distribution and marketing of aluminum and fertilizers, as well as participate in the production of oil and gas.

Recommendations and Conclusions

The FSU and CEE have a tremendous potential for economic development. The gradual transition to an economy with productivity at the OECD level will surely bring with it pain, as has already been observed. Nonetheless, the long-term benefits for the countries and the population at large are obvious.

From a business point of view, a successful transition will require: compensation; state-of-the-art technology and know-how; and large investments.

International companies can meet each requirement. But to attract such companies, the overall conditions for the international investor must be acceptable. This means, among other things: fair sharing of the economic surplus between the host government and the investor and reliable and stable legal framework and taxation.

To attract high-quality, long-term investors, i.e., those companies which intend to stay in the country and be an integrated part of the economy, it is important to have a high degree of transparency. By this, I mean transparent and fair rules and regulations for the industry. If this is not the case, unjust discrimination and corruption may result. This will attract people or companies which are mostly interested in making a quick profit without long term considerations.

Norsk Hydro is prepared to meet the challenges in the countries in economic transition. Let us hope that the progress in market liberalization in the region will continue, and that it proves to be of the utmost benefit for the countries involved. We believe this will require strong participation by international companies and we are, therefore, pursuing a number of business opportunities within our core business areas.

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Is a Third Oil Crisis Looming Before the End of the 1990s?

*by Mamdouh G. Salameh**

As we approach the end of the 20th century, two major intractable but, nevertheless, inseparable factors will most decisively impact the price of oil and determine whether a third oil crisis could be in the offing before the end of this decade. The two factors are the shrinking *security margin* – the gap between demand and production capacity – and global oil security. The *security margin* had been large enough since the early 1980s through to the early 1990s to be able to absorb the Iran-Iraq War and the Gulf War with all their disruptions and loss of crude oil output, but no more. On the other hand, global oil security is closely linked to the geopolitics of oil and the new political order in the Gulf. The bombing of a U.S. military mission in Riyadh last November and Dhahran in June this year, serves to underscore how fragile political stability is in Saudi Arabia and the Gulf at large and indicates that any significant reduction in U.S. involvement in Saudi Arabia could presage an unraveling of the existing order and undermine global oil security.

The Perennial Problem of Capacity Expansion

A major element in global economy policy-making is the price of oil. For oil exporters such as OPEC member countries, oil remains the single most important source of income. Their annual budgets are predicated on an oil price level sufficient to generate revenue to pay for the imported goods and services required by their growing populations as well as to sustain their welfare systems. Other developing oil-exporting countries outside OPEC are affected similarly.

Simultaneously, the oil-consuming countries also watch the oil price closely since energy, of which oil is the key component, is an essential input in their production processes. Thus, the price at which oil supplies can be obtained has an important effect on the behavior of their own indices and other micro-indicators and so, indirectly, on monetary and fiscal policies that are triggered by inflation rates.

Significantly, oil-consuming countries have always looked on imported goods, such as oil, as an important source of taxation revenue, since demand for it is inelastic, i.e., to say, it varies little as the price changes. Moreover, given their concern for price stability, these countries have more room to maneuver when the border prices of these goods are low. This was demonstrated in the case of oil when, as a result of the price collapse in 1986, many of them took the opportunity to raise tax rates on petroleum products.

Thus, it is clear that the interests of the net oil exporters and importers are diametrically opposed as far as the price of oil is concerned. Both are effectively staking a claim to the significant element of "economic rent" built into the price of oil. The rent element contained in the value of a refined barrel of oil is usually distributed between the producers in the form of crude oil price, and consumer governments in the form of the tax-take on petroleum products.

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However, taxes on energy, irrespective of their stated objectives, all translate into one thing: a redistribution of the oil barrel value between producing countries and consumer governments. And the end-result is that more of the economic rent is being creamed off by consumer countries, while the implied price increase also reduces final demand. Therefore, for an oil-exporting country, petroleum taxation is not just a fiscal policy in a distant land, it impinges directly on its crude oil export prospects, thus putting pressure on crude oil prices and, ultimately, on its revenue. In 1993, for example, the per-barrel net income of oil producers was only 19 percent and 21 percent of the income earned by Italy and France, respectively. Only in the case of the United States did producers earn almost the same amount of income from the traded barrel.[1]

The present distribution of the rent in favor of the consuming countries coupled with the present regime of low crude oil prices, could have a serious impact on international oil markets in terms of the timely development of the extra production capacity needed to cope with the projected rise in global oil demand in coming years. If prices and, by implication, the share of the barrel of oil accruing to OPEC producers remain weak, they would neither have the incentive nor the resources to invest in capacity expansion in anticipation of higher demand knowing full well that consumer governments will earn several times more from such an investment.

The financial situation of OPEC's Gulf producers and, therefore, their ability to provide capital for maintaining and expanding their oil production capacity has recently become more of a problem, partly as a legacy of the weaker oil markets of the late 1980s since oil exports still generate around 90 percent of these countries' revenue.

The financial constraints of the Gulf producers have been aggravated by many factors including the weakening of the value of the U.S. dollar and the costs and consequences of two major conflicts in the region within a decade.

The recourse of the Gulf countries to large-scale borrowing to overcome their financial constraints started in the mid-1980s and was based on the assumption that budget deficits can no longer be easily covered from reserves.[2] The total external debt of the Gulf countries has consequently increased from $6.2 bn at the end of 1980 to $168 bn in 1994, representing 1.9 percent and 66 percent of GNP (at current market prices), respectively. It accounted for the equivalent of 3.4 percent of the total value of exports in 1980 and 187 percent in 1994 (see Table 1).

The most pressing challenge facing OPEC at the present time is how to cope with the weak oil price. Price signals are, to say the least, not encouraging. Given that $180 bn will be required in the next ten years, by OPEC alone, for capacity expansion, we cannot expect an opportune mobilization of capital but rather an underinvestment which will only become visible in the last years of the decade.[3]

Yet without outright investment in additional capacity, capacity constraint may start to bite at some point in the not-too-distant future. Gone are the days when we were sitting on almost 50 percent of unused capacity with prices at levels which are double those of today. In 1985, only eleven years ago, OPEC was producing at only 55 percent capacity. This

[1] See footnotes at end of text.

Table 1
External Debt Indicators of the Gulf Countries
1980-94

	External Debt ($bn)		Debt/GNP at Current Market Prices (%)		Debt/Exports (fob) (%)	
	1980	1994	1980	1994	1980	1994
Iran	6.2	20.0	6.7	44.0	43.0	123.0
Iraq	-	90.0	-	119.0[1]	-	634.0[1]
Kuwait	-	9.0	-	37.0[1]	-	78.0[1]
Saudi Arabia	-	39.0	-	31.0	-	94.0
UAE	-	10.0	-	27.0	-	47.0
Total Gulf	6.2	168.0	1.9	66.0	3.4	187.0

[1] Based on 1989 figures.

Sources: *Platt's Petroleum Insight*, Dec. 13, 1993; *Arab Oil & Gas Directory*, 1993; Author's calculations based on data from the OPEC *Annual Statistical Bulletins*, 1992-94; *MEES*, Feb. 3, 1992; The Military Balance, 1996; 96, IISS.

allowed for the great expansion of production in the late 1980s. That was sufficient to offset the loss of both Iraq and Kuwait production during the 1990-91 Gulf conflict. In 1994, capacity utilization was estimated at 89 percent. By 1995, capacity utilization has risen to 92 percent, and barring the re-entry of Iraq, capacity utilization should have risen to an estimated 94 percent in 1996 with a growth of 1 million barrels per day (mb/d) in global demand (see Table 2). This is not a comfortable situation for the incremental supplier, especially amid signs of recovery and growth in the global economy led by the U.S. economy.

Table 2
OPEC: Current Production, Production Capacity and Capacity Utilization, 1985-96
(mb/d)

	1985	1990	1994	1995	1996
Production capacity	31.00	29.00	31.00	31.00	31.00
Actual production	17.00	23.20	27.28	28.52	29.00[1]
Capacity utilization (as % of capacity)	55	80	89	92	94[1]

[1] Estimated (barring the reentry of Iraq).

Sources: IEA, 1995; Centre for Global Energy Studies, London; OPEC *Annual Bulletins, 1994-95.*

U.S. and Global Dependence on Gulf Oil

With the end of the Cold War, the Gulf region has become more important for United States' national interests and the world at large because the importance of Gulf oil is increasing. Not only does the region contain 65 percent of the world's proven crude oil reserves but there is also a growing global and U.S. dependence on Gulf oil.

In 1994, more than 33 percent of the industrialized world's oil was supplied by the Gulf. And also in 1994, the United States imported 53 percent of its oil needs, half of which came from the Gulf. By 2000, the United States could be importing 66 percent of its oil needs, three-quarters of which will also come from the Gulf (see Table 3).

And should current trends hold, the world's dependence on Gulf oil will increase with Gulf producers accounting for a projected 40 percent of the world's oil needs in the year 2000 and 48 percent in 2010. One new development will be the increasingly likely Chinese dependence on oil from the region with economic and geopolitical consequences.[4]

Table 3
U.S. Crude Oil Imports, 1985-2000
(mb/d)

	1985	1990	1991	1992	1993	1994	1995	2000	% Chg 85-00
Production	10.58	8.92	9.08	8.87	8.59	8.36	8.11	6.65	-37
Consumption	15.17	16.61	16.85	17.10	17.24	17.75	18.16	19.60	+29
Total imports	4.59	7.69	7.77	8.23	8.65	9.39	10.05	12.95	+182
Imports from Middle East	0.66	2.77	2.95	3.62	3.98	4.70	5.23	9.71	+1371
As % of Total	14	36	38	44	46	50	52	75	

Sources: *BP Statistical Review of World Energy*, 1996; International Energy Agency; U.S. Information Administration; Author's projections.

Oil Industry Capital Replacement

The capital stock of the oil industry has been aging since the early 1980s. The failure in the 1980s to renew production capacities, refineries and transportation systems can be attributed to low rates of return based on assumptions of slack oil market conditions and much lower prices than in the 1970s.[5]

A key finding in a major study on the changing demand for capital in the global oil and gas industry by *Petroleum Intelligence Weekly* estimates that the capital requirements of the industry during the next ten years will range from $800 bn to $1400 bn. Of these amounts, the upstream sector will need between $572 bn and $1000 bn depending on the pace of change in the emerging markets and the future level of oil prices.

Downstream spending requirements will be equally robust, given the continued impact of environmental regulations and product demand growth in the Asia-Pacific region, ranging from $173 bn to $230 bn. In addition, major new demands will come from new liquefied natural gas (LNG) projects and the continued pace of energy asset privatization, adding a further $55 bn to $175 bn.[6]

The oil industry is facing a dilemma: an increasing number of worldwide investment opportunities but few that could provide the scale and return required to replace reserves, production and earnings. A key issue in the 1990s will be to what extent commercial investors are prepared to accept political risks. The general trend seems to be that capital travels faster but stays closer to home. Moreover, in an uncertain world with low oil prices, investors (even oil companies) are staying short and liquid, playing margins rather than committing for long-term projects as is required for a balanced development of the global oil industry. Such a balanced development in the oil and gas sectors necessitates some $172 bn per annum to maintain present capacities. Indications are that, worldwide, probably some $100 bn per annum will be invested. Hence, there is the risk of underinvestment in the oil industry during the 1990s because of low oil prices, global fragmentations and commercial investors' short-term, close-to-home orientation.[7]

Falling Oil Stockpiles in OECD Countries

Another disturbing factor is that crude oil stockpiles in all the industrialized countries are now at their lowest level since 1980 while American stockpiles are now at their lowest levels since mid-1977, according to reports from both the International Energy Agency and the American Petroleum Institute. Low stocks are one reason some analysts say oil prices will

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Problems of Liberalization/Privatization

*Antoni Goszcz and Jerzy Michna**

In the process of societal development, the transition from the centrally planned economy to the market economy usually took place over a long period of time and to a large degree through evolution. The rapid political changes initiated in Eastern Europe in 1989 have contributed to an unprecedented, extremely fast and dynamic transition process. This process depends on economic analyses based on theoretical premises. Practically, such analyses cannot consider all of the factors influencing the transformation.

Liberalization and privatization of the economies in Eastern Europe consists to a large degree in the elimination of what was left by the centrally managed economy both in the economic and social fields.

The fundamental feature of a centrally planned economy is the system of issuing instructions with the main areas of development decided arbitrarily, without prior objective economic analyses and with total disregard of public opinion, often even disregarding the common good of the majority of society. Since the national property belonged to the state, theoretically all decisions could be easily carried out.

The currency of the countries with centrally planned economies was not exchangeable while prices were lower than in other parts of the world. Considering such conditions, economic analyses were based on erroneous premises with emphasis based on the rules of the political system.

Due to political reasons, the state was very much in favor of developing energy inefficient heavy industry, which offered the easiest way of carrying out economic plans and made it possible to create many jobs, even though the work efficiency left much to be desired. Light industry and services in general were considered to be secondary concerns. The same thinking was applied to problems of environmental protection.

Central management of the economy was facilitated by the fact that the state had a monopoly on trade with foreign countries. The state, however, was the protector of all citizens and guaranteed them payment, social services and provided the necessary resources for education, culture, health care, recreation, etc. Although payment was considerably lower than in developed countries, it did suffice to provide an average level of prosperity.

Privatization and Liberalization of the Economy

The basic condition of the economic transition from the centrally planned to the market economy was the establishment of economic policy on the basis of economic criteria and the reduction of the influence of the state on the economy, privatization of state property and liberalization of trade exchange. Such changes required proper legislative and administrative regulations.

The success of economic transition depends to a large degree on the state policy for energy.

The arbitrary establishment of prices without considering the real value of goods and services, so characteristic of the central economy, had an especially negative impact on the energy sector.

All the countries of Eastern Europe imported energy (especially oil and gas) from the former Soviet Union. Financial settlement between these countries and energy suppliers was done mainly through barter, while prices were fixed at a level much below world prices.

The structure of the energy economy of the former Comecom was characterized by strong connections between individual member countries and the energy exporter, the former Soviet Union, while connections between member countries did not exist, even when the countries were close neighbors. Some surplus energy (e.g., coal from Poland) was exported to the OECD countries, which to some degree helped the poor financial situation of the exporters. The per-capita use of primary energy in the countries of Eastern Europe was comparable to energy use in the developed countries, but the national income was much lower which is tantamount to excessive energy consumption and poor energy efficiency.

The excessive energy consumption was mainly caused by low energy prices, which were also the reason for environmental pollution, especially since the main energy source was coal (hard and brown). The excavation of coal and its burning in power stations caused contamination of the atmosphere, rivers and lakes and produced a substantial amount of waste.

In order to turn energy policy into a factor stimulating the economic transition the following activities were undertaken:

1. Restructuring of state-owned enterprises was initiated in order to make them profitable, at the same time reducing state subsidies;
2. Privatization of state-owned enterprises was initiated. Out of large, autocratic enterprises, small units were separated and then privatized. A number of agencies and other institutions were set up in this way and they have an influence on the energy economy, both at the local and national level. There were also a number of businesses established to provide equipment and machinery for efficient energy use and to offer consulting services;
3. Prices of most goods and services were liberalized, but the central government retained control of the price of energy, which was most important for the stabilization of the economy. It was assumed that the process of bringing energy prices up to world levels had to take place gradually in order to avoid excessive inflation;
4. Commercial exchange was liberalized and it is now carried out between enterprises as partners or on a producer-to-purchaser basis, without state intervention;
5. Convertible currencies were introduced;
6. Trade with OECD countries was developed;
7. Banking systems are being reformed and improved; and
8. The social insurance systems are being reformed.

Practically, however, the process of transition is extremely complex and encounters a variety of unexpected obstacles (not foreseen in the transition programs), which were intensified by the rapid pace. Although in definite minority, there were some negative experiences, which appeared in the first period of transformation as described below. These difficulties were responsible for slowing down reform introduction.

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Difficulties and Problems of Privatization and Liberalization

It appeared that the direct adaptation of the economic model from the developed countries, characterized by tough market economy rules, created a number of new problems and met strong opposition on the part of society and trade unions.

One of the basic problems in the transition period is the restructuring of the economy. Centrally controlled and inefficient enterprises were subsidized by the state. It has been noted that in order to adapt them to the market economy, the subsidies must be eliminated and efficiency increased. The restructuring, however, is usually responsible for a reduction in employment and a consequent increase in unemployment, an experience heretofore unknown in Eastern European countries.

Additional difficulties were caused by the severing of economic relations among countries of the former Comecom. These are now being renewed, though rather slowly. Attempts to speed up the process have proved fruitless so far.

As previously noted, in the centrally planned economies energy and fuel prices were considerably lower than market prices and it is necessary to raise them to world levels in order to transform the economy. It is obvious, however, that raising prices sharply results in inflation. Apart from this it will also increase family fuel and energy expenditures. The impact of this cannot be underestimated, given the low income levels. In light of inflation and social protests, the process of raising energy prices has been slowed.

Due to the limited resources of Eastern European energy suppliers, these countries have no option but to import some energy. This must now be done at international prices. This is definitely a burden on the low budgets of the importing countries and weakens their export capabilities during the transition period. Some of these countries have large amounts of coal, but the brown coal is in most cases excavated solely for the use of power stations situated in the vicinity of the mines, while the hard coal is found deep below the surface and is expensive to excavate. Costs of hard coal excavation were referred to as *low* during the time when the economy was centrally managed. When the prices began to approach world levels, it appeared that the hard coal mining industry was not profitable and though many attempts were undertaken to remedy the situation, they have not been effective.

The unavoidable slowing down of the raising of energy prices to world levels creates additional difficulties in economic decisionmaking, and results in various parts of the transition moving at a differing rates. In turn this results in the economic analyses originally used in the planning no longer being current.

The fundamental problem of the countries going through the process of economic transition is inflation, which always follows the increase of energy prices. To fight it, tough monetary policy must be applied, which understandably causes social protests.

Another problem is the lack of financial resources for the restructuring of the economy. It has been estimated that energy sector investment needed through 2000 in the countries of Eastern Europe amounts to about US$150 billion. Without financial assistance from the OECD countries it is not possible to make this investment. Unfortunately, the aid actually forthcoming has been less than earlier promised. This has slowed the pace of reform and caused a change of political attitude.

Maintaining the course of economic policy depends to a large degree on the parliament and social pressure. Instability of political and social conditions is the reason why many economic decisions are taken as *stop gaps* and in an arbitrary way to solve conflicts, without the necessary analyses to assess the accuracy of the decision.

During the transition most of the members of management teams were changed. The new managers were selected considering their political affiliations and they are not prepared professionally to tackle the problems of massive economic structural change. It should further be noted that the political parties with which the new managers are closely connected, do not have clearly defined ecological programs.

In the centrally planned economy, economic decisions were undertaken at the central level, without consultations with society. One of the conditions of transition to the market economy is to make the process of decisionmaking a societal one. It is also important to grant economic decisionmaking to local authorities and enterprises.

Following the advice of experts from developed countries, the state stopped interfering with economic processes. After the first enthusiastic period, difficulties began to emerge in large national enterprises adapting to the new conditions. The attempt to match salaries to the actual work effort resulted in substantial differences among employees.

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Fossil Fuel Production Costs *(continued from page 7)*

sequential approach and instituted the multidisciplinary approach whereby all the specialists involved (geologists, geophysicists and reservoir engineers) work together from the start of the project. New relationships were established with services and equipment companies. The latter relinquished the role of supplier to become a full partner in the project, participating in its initial definition, implicated from the start in its execution, and earning their share of the profit through improved performance, for as somebody said in a BP report: "sharing the risk and pooling expertise brings significant profits." They have also assumed the management of smaller suppliers by offering integrated services. All these changes in fact streamlined corporate structures and contributed to a certain standardization of equipment.

The upstream oil industry has, therefore, undergone a complete mutation in the space of about ten years. The combination of rapidly spreading technical progress, improved operational efficiency, and intensified competition affecting the margins of all players has led to substantial reductions in costs. These reductions are the result of both lower operating costs and the improved efficiency of the operations themselves. This evolution can be be seen worldwide. The total cost reductions achieved by the industry as a whole can only be estimated. However in less than ten years the oil companies seem to have managed to cut the technical cost of the barrel by 30-40 percent. This is a remarkable achievement for an industry that is more than 100 years old, particularly in an increasingly difficult geological and technical environment.

What is the outlook for the years to come? First, we must remember that gains in costs have basically only affected those regions where the international oil companies were active. Around half of world oil production (Saudi Arabia, Iran, Iraq, Kuwait, Mexico, Venezuela, Russia, China) has so far benefited very little from the progress that has taken place over the last ten years. The gradual opening up of some of these regions to foreign oil companies will not significantly cut costs but will provide access to substantial low or moderate cost crude oil potential. If geopolitical considerations of supply diversification were not involved, this would permit an affirmative answer to the question: "sufficient energy supply at falling prices?"

There is one current feature of the oil industry that is paradoxical from the point of view of economic theory, and that is the fact of starting by producing high-cost resources. The balance between OPEC and non-OPEC production, and in the long run between the Middle East and the rest of the world, seems to constitute the constraint required to guarantee supply at acceptable prices. Contrary to the forecasts made in the early 1980s, instead of inexorably declining, non-OPEC production has never been healthier. Concern with the finite nature of oil and gas reserves seems to have been temporarily put aside. Technological progress and human creativity have pushed back the frontiers.

Nevertheless, as shown by my previous historical review, the oil industry initiated its cost cutting policy at a time when there was great scope for gain. The experience acquired by the companies during the last decade has inexorably changed corporate thinking, but the situation ahead of us is perhaps less favorable. A slowdown in cost cutting over the last few years can be noted. Does this plateau mean that costs will rise?

There is no immediate answer to this question due to the diversity of existing situations and the disparity of available cost data. Nevertheless, there still seems to be scope for cost cutting but the opportunities are less visible due to more difficult production conditions, involving, problems of safety, of environmental protection and of dismantling installations, etc. Gains in costs are more difficult to achieve but the industry considers that it has not yet reached its limit and that there are still significant gains to be made.

So, with an adequate amount of research, there is still considerable scope for progress. For instance, the success rate in exploration can still be improved by the untiring search for improved knowledge of basins, for a better understanding of the conditions of hydrocarbon generation, and by the use of increasingly sophisticated seismic imaging techniques. Ten years ago the success rate was one well out of seven drilled, and today it is one out of four in known areas, and the target of one out of three by the beginning of the 21st century is feasible. Similarly, significant gains in drilling are still possible, both in terms of cost cutting and increased recovery rates. Furthermore, there is another area with strong potential for cost cutting and that is offshore production. It is growing steadily and concerns an increasing number of countries. A large proportion of costs stems from the necessity to install production platforms for processing the produced effluents before shipping them to the coast. The continuing progress in subsea production and multiphase pumping, the capacity to prevent hydrate formation in pipelines, and the resolution of problems of measuring effluents should gradually make it possible to limit the use of deep water production platforms.

All these developments should not only contribute to a reduction in costs, but more specifically they should provide access to new reserves. The latter will, of course, stem from new discoveries, but they will also, to a large extent, result from the mobilization of known resources that were hitherto unexploited because they were located in small, more complex, deeper and more inaccessible fields. The 200 Mb offshore field at a water depth of 150 m will always be welcome, but the new frontier of the oil industry today consists largely in better exploiting the potential that exists in mature areas or areas nearing maturity on which there is plenty of knowledge and where considerable infrastructure already exists. It is in this context that we can ensure "sufficient supply at falling prices." In this respect, the example of the United States is encouraging. Although the extent to which the country has been explored is without parallel, the American companies manage somehow to renew reserves in proportions corresponding approximately to the year's production. Areas like the Gulf of Mexico have a new life ahead of them, due mainly to deep water developments. Fields located at depths of over 1000 m, such as Shell's Mensa project at a depth of 1600 m, are taking over from the more traditional types of production.

Similarly, assuming a constant oil price in constant money, production prospects for non-OPEC countries seem reasonably safe up to 2000, with these regions likely to produce an extra 4-5 mb/d. Overall, these projections should remain valid, even if oil prices fall only slightly. A more marked fall in prices, which can never be excluded due to

OPEC's difficulty in keeping to its production ceiling, would not really affect supplies until after 2000 in view of the long lead times involved in oil and gas production and of the large proportion of initial fixed costs in production costs.

I have already mentioned the organizational changes that have taken place within the oil and gas industry. I feel that there is scope for still more change. Integrated service suppliers will be able to offer the companies even more complete services. Moreover, strategic alliances between companies and the major equipment and service companies are likely to develop further. The companies have come to realize over the last few years that individual attempts by the different players (companies and suppliers) to reduce costs can lead to a less than optimum situation, due to the loss of efficiency at the company-supplier interface. By fully involving the main suppliers from the design stage of the development of a field, new possibilities for cost cutting are apparent and this allows overall optimization of operations. This approach seems to have potential for substantial savings with respect to the various petroleum-related operations.

These are my feelings with regard to the current situation. However my long experience with the oil industry has taught me that most economic projections in the field of energy turn out in practice to be wrong. We would be better advised to follow the realistic approach of the well known French writer Saint Exupery who said "the future is not something one predicts, one has to make it happen."

In my view the oil industry is clearly heading in this direction. The progress achieved through technological impetus and the revolution in operational methods will help it to prepare to meet the challenges of the future, that is to ensure "sufficient supply at falling prices" in the short and medium term, and in the longer term to enable the mobilization of nonconventional hydrocarbons as efficiently and economically as possible.

I would now like to briefly mention the prospects for natural gas. Generally speaking, production costs of natural gas throughout the world are not as well known and are less studied than those of coal or oil. Costs vary greatly according to the size of the field, its location, the water depth if it is offshore, and climatic conditions. Natural gas production uses the same techniques as oil production and is generally carried out by the same companies. Although there are some constraints that are specific to natural gas production, most of the gains in production costs that we have just observed for oil apply equally to natural gas.

Consequently I think it is more relevant to look at the cost of logistics. International transports costs, whether by pipeline or methane carrier, constitute a major component of the cost of gas delivered to the consumer country, as we have already noted. Around 45 percent of the total cost of delivered gas is pipeline transportation costs and transit fees payable to the countries concerned when it is shipped in gaseous state, or the cost of domestic transportation from the field to the coast, liquefaction and transportation by methane carrier when the gas is shipped in liquid state. This is an estimation of the situation in France in 1995. France uses four natural gas suppliers: two of them are relatively close to France (the Netherlands and Norway) and their costs of gas delivered to the French frontier are fairly low. This is why 45 percent is in reality very low in relation to the situation that will prevail in Europe in the years to come. When the time comes for gas to be supplied by producers that are further afield, transportation could amount to 60-80 percent of the CIF cost. The overland transportation of natural gas is 3 to 5 times greater than that of oil for the same amount of energy, and the cost of maritime transportation by methane carrier is approximately 10 times higher. This puts into perspective the implications of reductions in logistical costs for a sufficient supply of natural gas in a moderate energy price context. On the basis of current prices and costs, many more distant sources of natural gas are not competitive. If there is a reduction in energy prices, natural gas would be the fossil fuel whose development is most likely to be affected, in spite of its undeniable advantages in terms of supply source diversification, lower CO_2 emissions and its efficiency in electricity generation. It is, therefore, urgent to reduce transportation costs.

Like oil production, cost cutting will be the result of better standardization of equipment, increased competition and very cost-conscious project teams. Nevertheless, since natural gas transportation is intrinsically capital-intensive, potential gains will be related to technological progress and economies of scale. This is particularly true for natural gas transportation by methane carrier. In view of the technological advances currently achieved, we can today contemplate the possibility of doubling the unit size of liquefaction trains and using larger capacity methane carriers. These developments would allow an immediate overall gain of around 10 percent, which could be increased to 20-25 percent with greater technological changes. With respect to natural gas transportation by overland or subsea pipeline, in addition to the economies of scale already mentioned, there is potential for cost cutting through improved steel quality which would make it possible to reduce pipe thickness and welding time and consequently the time required for laying the pipeline. This factor has a significant impact on costs where subsea pipelines are concerned.

These cost reductions are fundamental for two reasons. First they will make new gas projects cost effective and second they will allow acceptable prices to be charged for gas delivered to consumer countries. However, the development of sufficient natural gas supplies will no doubt involve some thinking on the principle of fixing gas prices. The very high value of natural gas in some of its applications, such as electricity generation, should earn it a premium and possibly lead, in the long term, to disassociation of its price from that of oil. Pricing formulas that protect the seller against a fall in oil prices and the purchaser against the risk of a rise in prices should be designed. There is scope here for energy economists.

I conclude by returning to the question of oil. The last 25 years seem to have illustrated the fact that oil costs and prices follow similar trends. When prices rise, costs also increase, causing the industry to turn to new regions with costly barriers to cross in terms of technology and infrastructure. On the other hand, once prices have decreased, the companies have further exploited their assets, made full use of the existing infrastructure, developed greater synergy with their main suppliers (both in terms of reduced cost of services and through strategic alliances formed) and have thus achieved significant cost reductions. We have seen that, unless there is a price collapse, there are good prospects in the medium

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Third Oil Crisis Looming ? *(continued from page 21)*

rise. Another is the belief that America's oil-guzzling economy is gathering steam with unemployment on a downward trend.

Even before the latest outbreak of Middle East terrorist attacks against Israel and U.S. military personnel in Saudi Arabia, some influential voices in Washington were starting to express deep concern about the growing U.S. dependence on Gulf oil. It has been pointed out by these same voices that during previous oil crises, the United States was competing for crude oil supplies with its NATO allies and Japan, a circumstance that permitted a cooperative response to supply shortfalls. But in the future, the main competitors will be the east Asian countries, particularly China, which by 2010 will be consuming more oil than the U.S., and which are already establishing stronger ties with the Gulf countries. Yet, in the face of these impending problems, the U.S. is selling part of its strategic oil reserve. The U.S. government has sold 7 million barrels (mb) of the reserve to raise money to help balance the Federal budget and is contemplating the sale of a further 32-75 mb.

Oil Security: The Iran and Saudi Factors

Because of its victories in both the Cold War and the Gulf War, the United States is now the pre-eminent external power in the Gulf. This factor, in addition to the financial needs of the Gulf producers, has helped the United States and its allies in the Group of Seven gain a substantial degree of oil security. Without revolutionary changes inside the Gulf Cooperation Council (GCC) states, especially Saudi Arabia, there is very little prospect that Gulf oil will be withheld from international markets in the near future.[8]

However, there is a growing hostility between the United States and Iran. Iran has embarked on a huge military modernization program and a build-up of military capability. But it is Iran's attempts to acquire nuclear and missile technology that are worrying the U.S. The current Iranian conventional and unconventional rearmament programs taken together underscore, in the opinion of the U.S., the Iranian desire for regional hegemony. Not surprisingly, Iran opposes a U.S. military presence in the Gulf region and GCC ties with the U.S. because it regards them as obstacles to achieving its regional goals.[9]

Therefore, unless Iran curbs its nuclear and missile programs and acquiesces to the new order in the Gulf as well as puts an end to its opposition to the U.S.-brokered peace process in the Middle East and its sponsorship of terrorism, hostility between the U.S. and Iran could escalate into an armed conflict which could see the U.S. making a pre-emptive strike against Iranian nuclear installations and Iran retaliating by mining the Straits of Hormuz. In such a dire situation, oil shipments through the Straits of Hormuz could be threatened and global oil security could be undermined, leading to rocketing oil prices reminiscent of the late 1970s.

And to complicate matters further, there is growing resistance by the Saudi Islamic Fundamentalist movement to an American military presence in Saudi Arabia. The Saudi fundamentalists oppose the basing of American troops on the *holy* soil of Saudi Arabia and seek to replace the Saudi ruling family with a government that would adhere more strictly to Islamic law. This has been demonstrated by the June 25 bombing in Dhahran in which 19 American military personnel were killed and the November 1995 bombing attack in Riyadh that killed five Americans. The Saudi fundamentalists are threatening more such attacks. Further, each enlargement of the American presence there and in the GCC states, will make matters worse. All of this will be directed to suppressing the radical Islamic movement and strengthening the Saudi government. It will have the opposite effect.[10]

It is the political failure of the United States to address the issue of its growing dependence on imported oil that led it to be continuously involved in Gulf politics and security issues. The consequences for regional security are twofold. On the one hand, the U.S. commitment is now intrinsic to the prevailing balance of power and any significant reduction in U.S. involvement could presage an unraveling of the existing order and also undermine oil security. On the other hand, the U.S. and allied Western presence is viewed with antipathy not only by those regimes that it is designed to contain, but also by Islamic militant groups who see it as underpinning governments to which they are opposed.[11]

The Gulf War is likely in the future to be seen as the unnecessary victory that eventually led to America's forced withdrawal from the Gulf region. It will be seen as having weakened the security of U.S. access to Gulf oil. It will be understood as having accomplished this by providing Washington with the rationale for substituting a permanent American military presence on the Arabian Peninsula (there are 5,000 American troops in Saudi Arabia) for what previously had been an extremely discreet diplomatic and commercial presence. This will be seen as having undermined the pro-American governments of the region and strengthened radical Islamic movements.

Conclusions

Increasing global dependence on OPEC oil (mainly Gulf oil), tightening production capacity, shortfalls in the replacement of the capital stock of the oil industry and falling crude oil stockpiles in the U.S. and other industrialized countries, all point to a hardening of oil prices, probably within this decade. To these factors must be added the risks of a major shift of energy patterns such as major closedowns of nuclear capacity, caused by another nuclear accident, any interruption of Russian gas supplies to Western Europe, a blockage of the Straits of Hormuz or a hasty withdrawal of American troops from Saudi Arabia. Under such conditions, one has to seriously consider the possibility of a third oil crisis of a magnitude capable of again disrupting the global economy, triggered again by political upheavals in the Middle East.

Footnotes

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[4] Zalmy Khalidzad, "The United States & The Persian Gulf: Preventing Regional Hegemony," *Survival*, Vol. 37, No. 2, Summer 1995, pp. 95-96.

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[7] Herman Mulder, "Energy: The Risk of Underinvestment," *Petroleum Review*, London, Dec. 1993, pp. 569-570.

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[9] Ibid., pp. 99-106, also the *Sunday Times*, London, 21, July 1996, p.p. 14-15.

[10] *The Japanese Times*, Sunday, 30 June 1996, p.21.

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North American Energy *(continued from page 15)*

Perspective on the Future

I would like to close with a brief summary of the dynamics of the North American energy market as we enter the 21st century. The most visible long-term change is the sweeping deregulation of gas and electric utility markets and the transportation of their fuels. This is part of an ongoing process, not limited to North America. It reflects the current philosophy that the market is a better allocator of these fuels than the government.

Another changing attitude in the United States is the tacit acceptance of growing dependence on imported oil. Until recently there was a highly politicized fear in the States of ever becoming more than 50 percent dependent on imported oil, even including Canadian imports. There is still talk from various special interest groups that our growing import dependency threatens our national security. But the official position – while this might be true, the economic benefits of low cost foreign oil supplies outweigh the security risks and, therefore, nothing needs to be done to arrest this trend – is likely to remain the basis of our oil import policy. The government's misguided sale of a small share of our Strategic Petroleum Reserve for budgetary reasons is an indication of the downgrading of our national security concern.

Gas will clearly be the "fuel of the future" in stationary energy uses in both countries. It will also have a small but growing role in automotive fuels. The known North American resource bases can support the expected growth in gas demand well into the next century.

Coal was the principal source of electric power generation at the beginning of the 20th century and will have the same position at the beginning of the 21st century and probably several decades into it. It will also continue to be North America's only fuel with a net export balance.

Nuclear power was invented in the United States 51 years ago and is now being gradually phased out. There have been no new plants built for over 20 years and existing ones are gradually reaching the limit of their operable life span. The reason for the phasing out of this most advanced form of power production is largely public fear of accidents and the nuclear waste disposal problems. Had nuclear power maintained its projected growth of the 1960s, American coal production would by now be in a decline phase. But as we all have learned, projections and reality often have quite separate lives.

Footnotes

[1] Most energy forecasts in this article are based on projections by the Petroleum Industry Research Foundation, Inc.

Problems of Liberalization *(continued from page 23)*

This was a new experience in a society accustomed to equal distribution of income. This contributed to the slowing down of the privatization and liberalization of the economy. There was also an increase in commercial activities based on loopholes in the laws and in the so called *black market.*

When reforms were initiated, the determination of society was overestimated. Also not considered was the lack of a clearly defined concept of socioeconomic change to the new conditions. This caused strikes and numerous social protests, especially since the lower standard of living was followed by a more limited, protective role by the state. The budget deficits necessitated the limiting of resources for health care, education, culture, recreation, sports, etc., which brought about a significant deterioration in these areas of socioeconomic life.

The lack of funds and privatization of companies made it impossible to quickly overcome economic recession. Weak economies of the Eastern European countries without the necessary financial support find it especially difficult to solve their problems. Due to social reasons, some of the unprofitable companies will have to be supported by the state. However, the lack of funds and social resistance slow down the reform process, which only further complicates the problem. The assistance offered by the OECD countries has so far been relatively insignificant in this matter.

An improvement of some areas of socioeconomic life did take place *several years* after economic reforms were initiated. The positive aspects in the majority of Eastern European countries are:

- An increase in energy prices, followed by lower inflation and economic stabilization in a significant number of companies;
- Strengthening of the currency and the development of the individual consumer market;
- Progressive privatization of national property;
- Structural changes in the job market; an increase in employment in the private sector and lower unemployment;
- An increase in international trade especially with the developed countries;
- Lower energy consumption in transportation; and
- The use of OECD countries' assistance (credits, subsidies).

Aims of Energy Policy in the Transition Period

The aim of energy policy for energy management in countries in the transition period is to introduce into the energy sector the principles of the market economy. This means:

- To provide the national economy with energy safety and a sufficient amount of high quality energy with prices based on economic realities. (The import of oil has been increased from Middle East and European countries. In 1995, the Czech Republic, Poland, the Slovak Republic and Hungary joined the energy network of Western European countries);
- To render energy policy independent of outside and subjective factors;
- To negotiate profitable agreements with energy suppliers based on competitive prices;
- To eliminate monopolies of energy producers and to modernize energy systems on the basis of developed country standards so that energy users have the possibility of choosing their suppliers. Since elimination of monopolies in the short period of time is impossible, systems for social control of prices should be developed. One possible solution is to entrust the problem to local authorities;
- To use modern technology, making possible more efficient energy consumption, including introduction of mechanisms to stimulate and obtain social acceptance for these activities;
- To protect the environment in all energy sectors;
- To educate society about efficient energy use on the basis of experience from the developed countries; and
- To consider the implications of the principles of sustainable development.

Extremely important is the development of long-term energy policies of the states on the basis of reliable, multicriteria analyses and balances. These policies should consider not only problems of the countries, but also economic trends in the market. In developing these policies, Western European solutions could not be totally adopted, since these are only partly helpful for countries in a transition period. Fast liberalization and privatization irrespective of the social costs actually slows down the process of transition. Moreover, such solutions are not well prepared and do not consider the very important social problem of unemployment.

Problems of Environmental Protection

The restructuring of companies in the energy sector is related to problems of environmental protection.

The most effective method of environmental protection is saving energy. The less energy consumption and the more effective the use of energy, the less the deterioration of the environment. This is why energy sector development should take place on the principles of sustainable development.

In the time of centrally planned economies, for political and social reasons, heavy and mining industries were generally developed with relatively high energy consumption and environmental contamination. Limited financial resources did not permit attention to environmental considerations. The problems of environmental pollution were considered a secondary issue and sometimes were even used as the reason for undertaking economic decisions. This is why the current ecological costs are so enormous. They cover not only new investments but also modernization of old ones.

Programs for environmental protection encounter financial problems. Ecological investments in the energy sectors are very expensive. Companies trying to carry out such programs encounter difficulties including high interest rates. If a profitable company does decide to go ahead with the investment, then prices will increase and inflation will be higher. In order to avoid this situation, some of the most urgent projects are financed from state budgets, but considering the limited resources of Eastern European countries, it will take a long time before significant environmental protection in the energy sector is achieved. It is possible to speed

up this process only with assistance from developed countries and this assistance cannot be limited only to consulting and advice, but must include financial resources as well, on conditions it is possible for the Eastern European countries to accept.

Elimination of barriers in trade and liberalization will increase the amount of transported goods and will cause environmental deterioration, especially since it will be mostly road transport requiring new routes causing an increase of toxic emissions, noise, etc. This will probably present new problems, which will have to be solved. So far not much attention has been paid to this issue.

Further Reforms

It is necessary to carry out the complex reform of companies in the energy sector and to set up competitive structures. The majority of companies in the energy sector still operate as national enterprises. This means that these companies have a monopoly in the field of energy supply and are able to effectively protect their interests at the expense of energy consumers. Once the monopoly is abolished, or at least limited, the opportunity may appear for competition in the field of energy supply.

In the first stage, after small companies were privatized, the second stage was initiated, in which large enterprises were turned into state treasury ventures. Total privatization is expected to be completed in the third stage, after legislative processes have been finished, the value of the property has been realistically established and energy prices have risen to world levels. The strengthening of the private sector and its development is necessary to increase the efficiency of the energy sector and the effectiveness of energy use.

Further changes should include:

- Establishment of an institutional basis to support the transition process;
- Introduction of new methods of economic management adapted to market conditions;
- Modernization of the technical infrastructure in the energy sectors including environmental protection; and
- Reaching the status in which both import and export of energy are possible on the basis of the market economy; this may happen only after complete convertibility of the national currency has been introduced.

One of the significant problems here is to consider equal rights of the energy users in relation to the rights of producers and distributors of energy.

Fossil Fuel Production Costs *(continued from page 25)*

term for balanced production between OPEC and non-OPEC regions, that is, until the beginning of the next century. After that, modifications in the geopolitical environment and in the supply-demand balance could completely change the picture. I will, therefore, conclude on a low-key note by simply expressing my confidence in the creativity and capacity to adapt of our industry in meeting the challenges that are bound to arise. There is a saying in France that "uniformity leads to boredom." Well, we shall never be bored in the oil and gas industry.

References

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"Oil, Gas & Coal: Supply Outlook," IEA, 1995.

"Coal Information," 1994.

"Performances Profiles of Major Energy Producers 1993," Energy Information Administration, U.S. Department of Energy, January 1995.

"Oil and Gas Reserves Disclosures," Arthur Andersen & Co.

"Petroleum Economics," Jean Masseron, 1990.

Polish Association Elects Krawczynski

The IAEE Polish Affiliate has elected a new President, Dr. Franciszek Krawczynski, Director of Energy Planning in the Ministry of Planning, Warsaw. At the same time the members adopted a new program to take a more active role in promoting international energy issues in the economy of Poland, most importantly to reflect the views and needs of consumers on the direction of energy policy. There are now 30 individual members and five institutional members of the Polish IAEE Affiliate, the Association for the Polish Energy Economy.

Zbigniew Mantorski

Book Review

The U.K. Energy Experience - A Model or a Warning?

Editors: Dr. Gordon MacKerron, S.P.R.U., University of Sussex
Dr. Peter Pearson, Imperial College Univ. of London
Imperial College Press, London, 510 pp. A5 Hardback. ISBN 1-86094-022-6.

This book provides a fascinating cross-section of informed views on the subject title. Although a compendium of a conference, it is a stand-alone addition for libraries and for serious students in all walks of life, of the rich tapestry of energy experience that has made Britain, almost willy-nilly, a model for all to consider in relation to their own energy predicament – not least for the British themselves to ask "whither next?" What other nation since the end of World War II has experienced total nationalization of its energy producers while moving from self sufficiency based on coal to import dependency dominated by oil, only to discover in the North Sea the greatest oil and gas fields in Europe just as import prices exploded; to undergo further state intervention offshore, and then to denationalize the lot under conditions of falling world prices but still able to increase the flow of indigenous hydrocarbons through new technology and to move towards greater integration of fuel markets in the U.K. with world and European markets, taking interfuel competition and choice to the final consumer to an unprecedented extent that is still developing. What are the essentials, as distinct from the happenings, that can be distilled out and adopted or avoided for the future?

Last year the British Institute of Energy Economics decided to hold an academic conference at Warwick University to gather opinions and analysis from the British academic community and other researchers into this topic and at which a volume of proceedings was available for participants. So large was the response that is was decided to produce this book for wider readership, which also has the advantage of including several papers not available in the proceedings volume. There are three dozen chapters and forty five individual authors whose work is represented, from the seminal plenary address of David Newbery, Professor of Economics at Cambridge, whose opening paragraph quotes the U.K. Energy Secretary of State, Nigel Lawson (now Lord Lawson and President of BIEE) in 1981 "the business of government is not the government of business"; to the closing plenary given by Peter Davies, Chief Economist of British Petroleum, whose final paragraph, after noting that a growing list of countries is using the U.K. as a model, warns that the model is not complete, new issues are emerging with few role models to resolve key issues and ends, "The debate will continue." It is to that end that this book is now available to the wider community not present at Warwick last December – and it is to that end also that plans are now afoot for a further conference to extend the debate, to be held at Warwick University in April 1977.

Tony Scanlan, London

EFCEE *(continued from page 10)*

of research on problems on which the EFCEE could make a useful contribution to the EU activities in the energy field.

As a result the following reports have been made:

- Security of supply in the light of the extension of EU-membership (1994);
- The "Acquis communautaire in the energy field" (Survey of EU energy legislation, 1995-1996); *
- Mediterranean energy flows: past, present and future (1995);
- The integration of Poland in the EU Energy Market (1995)
- The integration of Hungary in the EU Energy Market (1995); and
- The Baltic Energy Links (1996).

At present, studies are set up on Romania, the Czech Republic and Slovenia.

Outlook

Currently the European Intergovernmental Conference is analyzing the future content of the cooperation between member countries with respect to the various sectors covered by the Treaty of Rome, the Internal Market Treaty and the Treaty of Maastricht. In preparation of the present negotiations, the EU Commission issued a Green Paper and then on basis of this document a White Paper spelling out how the Commission sees its task in the energy field. The EFCEE is analyzing this paper carefully to ascertain how it could supply building blocks for future European energy structures.

Pieter Vander Meiren

* This publication (5 Volumes - 970 p. A4) is a major reference book presenting the text and analysis of all EU decisions, directives, recommendations, etc., in the energy field, classified by sector (coal, oil, natural gas, electricity, renewables). It can be obtained at cost price from EFCEE-Secretariat.

Fall 1996 Publications List

Sustainable Industrialization. David Wallace (1996). 87 pages. Price £11.95. Contact: Jane Chapman, Energy & Environmental Program, Royal Institute of International Affairs, Chatham House, 10 St Jame's Square, London SW1Y 4LE. Phone: 071-957-5711. Fax: 071-957-5710. E-mail: eepriia@gn.apc.org

Petrole '95. Comite Professionnel Du Petrole (1996). Price: $150.00. Contact: Comite Professionnel du Petrole, B.P. 282 - 92505 Rueil Malmaison Cedex, France. Phone: 47-16-94-63. Fax: 47-08-10-57.

Green Globe Yearbook (1996). Price: £35.00. Contact: Oxford University Press, Saxon Way West, Corby, Northamptonshire, NN18 9ES, United Kingdom. Phone: 44-1536-454534.

International Environment Reporter (Subscription). Price: $1885.00. Contact: BNA International, Heron House, 10 Dean Farrar Street, London SW1H 0DX, England. Phone: 44-171-222-8831. Fax: 44-171-222-5550.

Azerbaijan: The Next Big Oil Play. Price: $560.00. Contact: FT Energy Publishing, Maple House, 149 Tottenham Court Road, London W1P 9LL, United Kingdom. Phone: 44-171-896-2241. Fax: 44-171-896-2275.

Kazakhstan: Investment Opportunities in the Energy Sector. Price: $560. Contact: FT Energy Publishing, Maple House, 149 Tottenham Court Road, London W1P 9LL, United Kingdom. Phone: 44-171-896-2241. Fax: 44-171-896-2275.

Environmental Modeling & Assessment. Price: $235.00. Contact: Baltzer Science Publishers, Asterweg 1A, 1031 HL Amsterdam, The Netherlands. Phone: 31-20-6370061. Fax: 31-20-6323651.

The Fundamentals of the Asian Energy Industry. Price: $125.00. Contact: The Petroleum Economist, Ltd., PO Box 105, Baird House, 15/17 St Cross Street, London EC1N 8UN, United Kingdom. Phone: 44-171-831-5588. Fax: 44-171-831-5313.

Software Guide to Energy and Environment. Price: DM 160.00 plus VAT & postage. Contact: FIZ Karlsruhe, Bibliographic Service, D-76344 Eggenstein-Leopoldshafen, Germany.

Database Guide to Energy and Environment. Price: DM 160.00 plus VAT & postage. Contact: FIZ Karlsruhe, Bibliographic Service, D-76344 Eggenstein-Leopoldshafen, Germany.

Energy Marketing Handbook: A Nontechnical Guide. Price: $79.95. Contact: PennWell Publishing Company, PO Box 21288, Tulsa, OK 74121. Phone: 918-831-9421. Fax: 918-831-9555.

Power Industry Dictionary. Price: $69.95. Contact: PennWell Publishing Company, PO Box 21288, Tulsa, OK 74121. Phone: 918-831-9421. Fax: 918-831-9555.

Calendar

November 1996, International Gas Conference. Kish Free Zone Island. Contact: Dr. H. Zaheri, Fax: 9821-2220149, Tehran, Iran.

13-15 November 1996, Divesting Utility Assets: Tapping New Business Opportunities in Generation, Transmission, and Distribution. San Francisco, California. Contact: International Quality & Productivity Center, 150 Clove Road, PO Box 401, Little Falls, NJ 07424-0401.

21-22 November 1996, Energy and Security in Asia: Implications for Business. Boston, Mass. Contact: Michael C. Lynch, MIT Japan Program. Phone: 617-253-5806. Fax: 617-253-9300. E-mail: wilfrid@mit.edu

26-30 November 1996, 2nd Conference: Dam Safety Evaluation. Trivandrum, India. Contact: C.V.J. Varma, Member Secretary, Central Board of Irrigation & Power, Malcha Marg, Chanakyapuri, New Delhi-110021, India. Phone: 91-11-3015984/ 3016567. Fax: 91-11-3016347.

28-29 November 1996, Asian Oil & Gas Conference. Singapore. Contact: Supardi Sujak, Conference Manager, Asia Business Forum, Pte., Ltd., Phone: 65-2276772. Fax: 65-2226869.

28-29 November 1996, Future Integration of the Baltic Sea States Gas Supply. Tellinn, Estonia. Contact: Mrs. Virve Kurnitski, Estonian Academy of Sciences, Kohtu 6, Tallinn EE001, Estonia. Phone: 372-2-451925. Fax: 372-2-451829. E-mail: riho@tan.ee

5-6 December 1996, Annual IAEE/BIEE/RIIA Conference. Controlling Carbon and Sulphur: International Investment and Trading Initiatives. Contact: Diana Bailey, Royal Institute of International Affairs, Chatham House, 10 St. James's Square, London SW1Y 4LE, England. Phone: 44-171-957-5700. Fax: 44-171-957-5710.

4-6 December 1996, POWER-GEN '96 International. Orlando, Florida, USA. Contact: Laura Ariane, Conference Manager, PennWell, 3050 Post Oak Blvd., Ste. 205, Houston, TX 77056. Phone: 713-963-6236. Fax: 713-963-6284. E-mail: lauraa@pennwell.com

11 December 1996, Transformation in the Gas Industry: Meeting the Challenge of Competition. London, U.K. Contact: Brenda Ribero, The Economist Conferences, 15 Regent Street, London SW1Y 4LR, United Kingdom. Phone: 44-171-830-1116. Fax: 44-171-931-0228.

11 December 1996, SNS Energy Day 1996 "Is There a Large-scale Future for Biomass Energy in Industrialized Countries?" Stockholm Sweden. Contact: Susanne Rothschild-Lundin. Phone: 46-8-453-99-77. Fax: 46-8-24-22-44.

11-12 December 1996, Global Energy Finance & Investment. New York City, USA. Contact: Conference Coordinator,

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Calendar *(continued from page 31)*

Institute for International Research, 708 Third Avenue, 4th Floor, New York, NY 10017-4103. Phone: 212-661-8740. Fax: 212-661-6677.

16 January 1997, Restructuring in the Electricity Industry: 1998 and Beyond. London, U.K. Contact: Brenda Ribero, The Economist Conferences, 15 Regent Street, London SW1Y 4LR, United Kingdom. Phone: 44-171-830-1116. Fax: 44-171-931-0228.

22-24 January 1997, 20th IAEE International Conference. New Delhi, India. Contact: IAEE Headquarters, 28790 Chagrin Blvd., Ste. 210, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737. E-Mail: IAEE@IAEE.org

10-12 February 1997, Global Energy Forum: Strategies for the 21st Century. Houston, Texas, USA. Contact: Breda Nolan, CERA, 20 University Road, Cambridge, MA 02138. Phone: 617-497-0423. Phone: 617-441-2609.

16-17 February 1997, International Gas Conference. Kish Free Zone Island, Iran. Contact: Dr. Hamid Zaheri, Managing Director, Iranian Association for Energy Economics, No. 125 Zafar Ave., Tehran, Iran. Phone: 98-21-225-7633 or 98-21-225-7649. Fax: 98-21-222-0149.

14-15 April 1997, Second BIEE/Warwick University Academic Conference: "The International Energy Experience: The Economics of Markets, Regulation and Environment." Warwick, U.K., Contact: Mary Scanlan, BIEE, London. Phone: 44-181-997-3707. Fax: 44-181-566-7674.

21-23 April 1997, Asian Oil & Minerals. Bali, Indonesia. Contact: Europe Energy Environment Ltd., London. Phone: 44-171-600-6660. Fax: 44-171-600-4044.

28-29 April 1997, Oil & Gas in Latin America: The Challenges Ahead. London, England. Contact: Jenni Wilson, Centre for Global Energy Studies, 17 Knightsbridge, London SW1X 7LY, England. Phone: 44-171-235-4334. Fax: 44-171-235-4338.

25-28 May 1997, 8th Global Warming International Conference & Expo. New York, New York, USA. Contact: Global Warming International Center, PO Box 5275, Woodridge, IL 60517. Phone: 630-910-1551. Fax: 630-910-1561.

17-19 June 1997, Sub-Saharan Oil & Minerals. Mauritius. Contact: Europe Energy Environment, Ltd., Johannesburg. Phone: 27-11-442-3230. Fax: 27-11-442-4198.

2-4 July 1997, European Conference: Austrian A.E.E. and E.F.C.E.E.: "The Integration of Central European, Baltic and Balkan Countries in the European Energy Economy." Vienna. Contact: Peter Vander Meiren, E.F.C.E.E., Belgium. Phone/Fax: 32-15-20-48-57.

7-10 September 1997, USAEE/IAEE 18th North American Conference. San Francisco, California, USA. Contact: USAEE/IAEE Headquarters, 28790 Chagrin Blvd., Ste. 210, Cleveland, OH 44122. Phone: 216-464-2785. Fax: 216-464-2768. E-Mail: IAEE@IAEE.org

11-15 November 1997, Fifth Chemical Congress of North America. Cancun, Quintana Roo, Mexico. Contact: 5NACC Congress Secretariat, c/o American Chemical Society, Room 420, 1155-16th St., NW, Washington, DC 20036. Phone: 202-872-4396. Fax: 202-872-6128.

13-16 May 1998, 21st IAEE International Conference. Quebec City, Canada. Contact: IAEE Headquarters, 28790 Chagrin Blvd., Ste. 210, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737. E-Mail: IAEE@IAEE.org

19-21 November 1998, 7th International Energy Conference and Exhibition - ENERGEX '98. Manama, Bahrain. Contact: Dr. W.E. Alnaser, Conference Secretariat, Dean, Scientific Research, University of Bahrain, PO Box 32038, Bahrain. Phone: 973-688381. Fax: 973-688396. E-mail: EA607@isa.cc.uob.bh

9-12 June 1999, 22nd IAEE International Conference. Rome, Italy. Contact: IAEE Headquarters, 28790 Chagrin Blvd., Ste. 210, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737. E-Mail: IAEE@IAEE.org

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